

# Challenges in the Management of Breast Conditions During Lactation



Katrina B. Mitchell, MD, IBCLC<sup>a,\*</sup>, Helen M. Johnson, MD, IBCLC<sup>b</sup>

## KEYWORDS

- Lactation • Breastfeeding • Breast cancer • Mastitis • Breast abscess
- Hyperlactation • Breast mass • Nipple bleb

## KEY POINTS

- Inflammatory conditions in lactation such as mastitis, abscess, and phlegmon can be resolved with attention to principles of luminal obstruction and fluid homeostasis.
- Nipple-areolar complex (NAC) lesions such as blebs and dermatitis require individualized care and attention to global phenomena in the lactating breast.
- Chronic pain in lactation responds well to the neuromodulatory and vasodilatory properties of the selective serotonin reuptake inhibitor (SSRI) class of drugs.
- Benign and malignant masses in the breastfeeding population require unique management, and no diagnostic evaluation should be delayed due to lactational status.
- Ultrasound, mammogram, and magnetic resonance imaging (MRI) with gadolinium contrast are safe in lactation and do not require interruption of breastfeeding.

## INTRODUCTION

Formal medical education on the topic of lactation and breastfeeding remains limited. Breast surgical oncology fellowships focus on the clinical and operative management of malignant disease, and research funding also largely supports investigation into breast cancer treatment. Nevertheless, complications of lactation often result in early and unnecessary cessation of breastfeeding, contributing to maternal and infant morbidity and mortality.<sup>1,2</sup> Early weaning also results in increased health care expenditures.<sup>3</sup> The financial impact of breastfeeding support is apparent at the United States Breastfeeding Committee (USBC) Calculator at [www.usbreastfeeding.org/saving-calc](http://www.usbreastfeeding.org/saving-calc). The World Health Organization (WHO) recommends exclusive breastfeeding until 6 months and continued breastfeeding for at least 2 years.<sup>4</sup>

---

<sup>a</sup> Department of Surgical Oncology, Ridley-Tree Cancer Center, Sansum Clinic, 540 W. Pueblo Street, Santa Barbara, CA 93105, USA; <sup>b</sup> Department of Surgery, Brody School of Medicine, East Carolina University, 600 Moyer Boulevard, Greenville, NC 27834, USA

\* Corresponding author.

E-mail address: [kbm9002@me.com](mailto:kbm9002@me.com)

Twitter: [@HelenMJohnsonMD](https://twitter.com/HelenMJohnsonMD) (H.M.J.)

Breast surgeons and other health care providers must be confident in their ability to identify common conditions affecting the lactating breast and should offer effective management strategies to ensure timely resolution. In this review, we describe common maternal complications of lactation, as well as the presentation of other benign and malignant breast diseases in the setting of breastfeeding. We discuss the evaluation, diagnosis, and treatment modalities that ensure optimal support of breastfeed-ing mothers and infants (dyads).

## INFLAMMATORY AND OBSTRUCTIVE CONDITIONS

### Overview

Surgical consult most often will be indicated in patients presenting with inflammatory and obstructive conditions in the lactating breast. Like other common surgical diseases such as appendicitis or diverticulitis, these complications of lactation exist along a spectrum (Fig. 1). Acute obstruction in the setting of excessive milk production and plugging (analogous to acute appendiceal orifice obstruction) can lead to inflammatory mastitis that can progress to infectious mastitis requiring antibiotic treatment. If untreated, this can progress to abscess formation or phlegmon. Persistent obstruction that does not progress to mastitis will form a galactocele that initially is sterile but can become infected with instrumentation and/or other bacterial seedings. Specific conditions are discussed in detail later in discussion.

### Hyperlactation/oversupply

When faced with a mother experiencing a condition in this spectrum, providers should first evaluate for hyperlactation or “oversupply.”<sup>5</sup> When mothers are producing breast-milk in excess of what an infant needs for appropriate growth, they can experience

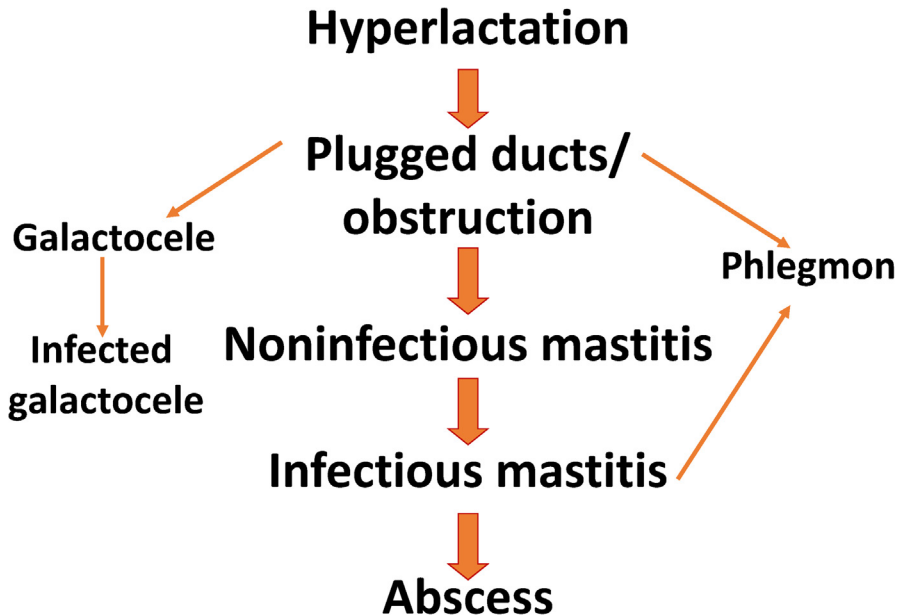


Fig. 1. Inflammatory and obstructive conditions in the lactating breast exist along a spectrum from hyperlactation to abscess formation, with other related etiologies such as galactocele and phlegmon.

recurrent obstruction. Hyperlactation may be iatrogenic (stimulated by overexpression of milk via a pump or galactagogues, ie, herbal or prescription medications that stimulate milk production) or idiopathic (physiologic variation in milk production among different individuals). Symptoms of hyperlactation in the mother include frequent plugging, mastitis, nipple blebs, and pain. Babies may refuse the breast, gag, pull back, be diagnosed with “reflux,” or be excessively fussy with explosive stools. They often will have supranormal weight gain.<sup>5</sup>

Initial management includes discontinuing any galactagogues and iatrogenic pumping. Mothers should be encouraged to remove breastmilk physiologically; if a baby is satisfied after feeding, she should let her breast remain full. If a mother is exclusively pumping, she should not pump more than is needed for healthy infant growth. In general, she should pump every 3 to 4 hours for no more than 15 minutes. If a mother feels she must pump more frequently or for longer durations than this, it often is because she feels she is engorged or concerned about developing mastitis. However, pumping to empty ultimately stimulates more overproduction of milk.<sup>5</sup> Average infants consume 4 to 5 ounces (120–150 mL) in one feeding, and mothers should not pump more than what their infant needs.

If persistent hyperlactation remains after addressing iatrogenic factors, alteration of feeding behaviors, herbs such as sage and peppermint, and medications such as pseudoephedrine can be used. Estrogen-containing contraceptives are contraindicated before 6 weeks postpartum due to thromboembolism risk, but can be considered after this time for severe cases. Cabergoline also can be used for individual doses in selected patients.<sup>5</sup>

### **Engorgement**

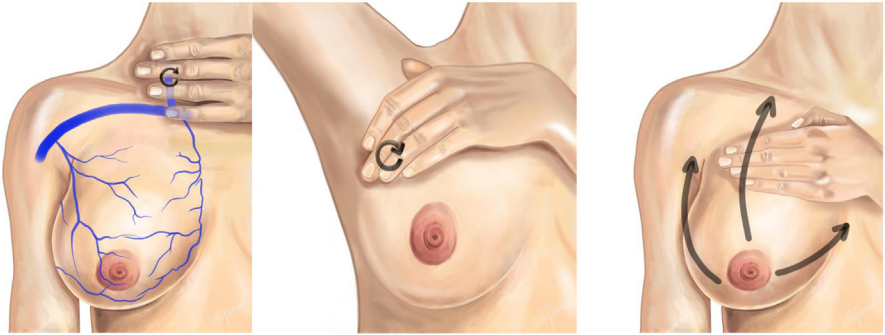
---

Postpartum engorgement typically peaks on day 5,<sup>6</sup> and subsequently improves. Engorgement during this time is related more to interstitial edema than obstruction of milk. After this time point, patients may perceive engorgement as plugging or mastitis and therefore always should be evaluated with an office examination rather than treated over the phone. Significant engorgement can be very uncomfortable for patients and they may describe feeling systemically ill, though evaluation will show normal vital signs and no focal findings. Ultrasound can delineate the difference between engorgement and a true obstructed duct. The patient should be instructed to use ice or heat for comfort, take ibuprofen and/or acetaminophen, wear a supportive bra, and perform lymphatic massage, which can greatly improve symptomatology (**Fig. 2**).<sup>7</sup> Therapeutic breast ultrasound can also be used to reduce pain and edema.<sup>8</sup>

Breast and nipple-areolar complex (NAC) lymphedema may begin during pregnancy. Any extreme growth or asymmetry should prompt medical evaluation to rule out inflammatory breast cancer<sup>9</sup> or gigantomastia<sup>10</sup> (which, in rare cases, can progress to tissue necrosis). As a result of this breast lymphedema, many of these mothers may also struggle with infant latch and milk transfer in the early postpartum period and therefore should be followed very closely. Treatment is per engorgement as above.

Axillary engorgement may occur in the setting of accessory breast tissue.<sup>11</sup> The tissue ultimately will involute and become less symptomatic if it is not continually stimulated, and treatment is as above. Complications such as mastitis should be treated accordingly. Circumstances of extremely large volume accessory tissue that causes repeated infections, physical discomfort, and chafing may warrant surgical intervention before or between pregnancies. However, it should be noted that any residual accessory tissue can hypertrophy and require repeated resection.

## Breast Lymphatic Massage



**Fig. 2.** Gentle lymphatic massage during pregnancy and lactation can alleviate engorgement pain and other tissue edema in the setting of inflammatory and obstructive conditions.

### ***Plugging***

Breast plugging results from transient or persistent obstruction with subsequent collection of milk. It is unknown whether plugs result from differences in the viscosity of milk, alterations in the breastmilk microbiome that may predispose to plug formation, anatomic variations such as tortuous ducts, or simple changes in feeding patterns. Likely, different factors contribute in unique and/or additive ways in different patients. Plugs that last for more than 24 to 48 hours require evaluation with examination and/or imaging to rule out a mass or the formation of an abscess or galactocele.<sup>12</sup>

Treatment of plugs includes resolving hyperlactation as described above. If a patient is experiencing an acute plug, she should attempt to eliminate pumping until it resolves. Pumping stimulates production without physiologically removing milk from the breast as well as a dynamic baby's suck will. Patients should not massage their breasts vigorously, as this can transform a simple plug into phlegmonous inflammatory mass.

Other interventions include the following:

- Moist heat before nursing to attempt to active the immune system and promote dislodgement of milk plug; ice may also alleviate tissue inflammation and edema<sup>13</sup>
- Sunflower lecithin, an emulsifier, can be taken by mouth for acute plug treatment and prophylaxis<sup>14</sup>
- The homeopathic remedy poke root (*phytolacca*) also can be useful in eliminating acute plugs
- For patients with recurrent plugging and nipple blebs with a clinical concern for subacute mastitis, the homeopathic treatment *staphylococcinum* 5 tablets twice weekly can provide prophylaxis
- Therapeutic ultrasound treatment to the affected area, which acts like lithotripsy of sticky milk, can be especially effective in reducing inflammation and tissue edema, and releasing an acute plug<sup>15</sup>

### Acute Mastitis

Mastitis represents the progression of unrelieved obstruction to inflammatory and then infectious mastitis.<sup>13</sup> Because the lactating breast is so vascular, mastitis can produce a transient systemic inflammatory response syndrome (SIRS)-like response and make women feel systemically ill with malaise, fever, and tachycardia.<sup>16</sup> With more mild mastitis, some patients and providers may prefer to avoid antibiotics.<sup>13</sup> This is a reasonable approach, as inflammatory mastitis may improve and then self-resolve in 24 to 48 hours with conservative measures such as moist heat, ice, nonsteroidal antiinflammatory medication, and eliminating pumping. Therapeutic ultrasound also may be beneficial in relieving ductal inflammation and allowing milk stasis to clear.<sup>15,17</sup> As above, patients should always undergo office evaluation rather than treatment by telephone triage to ensure correct diagnosis and prevent unnecessary antibiotic usage.

Any significant presenting symptoms or examination findings such as induration and edema warrant upfront antibiotics.<sup>16</sup> As most lactational mastitis results from *Staphylococcus aureus*, dicloxacillin 500 mg four times per day is first-line for treatment.<sup>13</sup> Clindamycin or trimethoprim-sulfamethoxazole can be used if previous history of methicillin-resistant *S aureus* (MRSA) or suspicion for resistance on presentation.<sup>18</sup> Dosing regimens are detailed in **Box 1**. Probiotics containing *Lactobacillus salivarius* or *L. fermentum* may be helpful in reducing the duration of mastitis and/or preventing recurrent mastitis.<sup>19</sup> Any hyperlactation and/or ineffective pump techniques should be addressed and resolved, and mothers who are exclusively pumping should be assisted in transitioning to direct breastfeeding. The baby's mouth flora interacting with the breast microbiome can help maintain healthy homeostasis and a more favorable microbiota composition.<sup>20,21</sup>

### Recurrent Mastitis

Recurrent mastitis requires reevaluation of inciting factors such as persistent hyperlactation, and patients should undergo office evaluation as above. Some women may have no clear etiology for recurrent mastitis, though previous antibiotic exposures such as c-section births and NICU admissions may play a role in altering the breast microbiome and promoting recurrent plugging and mastitis.<sup>20</sup>

#### Box 1

##### Recommended antibiotic regimens for acute infectious lactational mastitis

###### First-line

Dicloxacillin or flucloxacillin 500 mg by mouth four times per day for 10 to 14 days

###### Methicillin-resistant *S aureus* coverage

Refer to institutional/community antibiograms for local resistance patterns

Clindamycin 300 mg by mouth four times per day for 10 to 14 days

Trimethoprim/sulfamethoxazole 160 to 800 mg by mouth twice per day for 10 to 14 days; avoid if breastfed infant is full term and less than 8 days of age or is jaundiced, ill, stressed, premature, or G6PD deficient

###### Alternate therapy

Erythromycin 250 to 500 mg by mouth four times per day for 10 to 14 days

Consider for the history of penicillin hypersensitivity, though resistance is common

From Mitchell KB, Johnson HM. Breast Conditions in the Breastfeeding Mother. In: Lawrence RA, Lawrence RM, eds. *Breastfeeding: A Guide for the Medical Profession*, 9<sup>th</sup> edition. <https://doi.org/10.1016/B978-0-323-68013-4.00016-X>; with permission

With recurrent mastitis, women should undergo a clean-catch breastmilk culture that involves sterilizing the nipple and breast with chlorhexidine, then using sterile gloves to hand express into a sterile culture container without touching the container (Fig. 3).<sup>13</sup> The fluid should be sent as “body fluid culture” rather than a “wound culture” or “abscess culture” and sensitivity testing for antibiotics should be obtained. Most often, these breastmilk cultures will grow a strep or staph species and antibiotics can be tailored according to the culture.

Because mastitis results initially from obstruction, women likely will benefit from sunflower lecithin (see plugging above) for prophylaxis. Homeopathic regimens and probiotics also can be considered for prevention.<sup>22,23</sup>

### **Subacute Mastitis**

Subacute mastitis presents most often with several weeks of deep, aching breast pain and/or shooting pains that patients may describe as “shards of glass.” It also can present concurrently with NAC pain. It occurs most often in patients with previous antibiotic exposure, recurrent mastitis, hyperlactation, and exclusive pumping.<sup>20,24,25</sup> Generally, no breast erythema or induration is present as with acute mastitis; however, the nipple may demonstrate biofilm or nipple blebs. These patients require breastmilk culture, which generally grows *Staphylococcus* and/or *Streptococcus* species,<sup>26</sup> and antibiotics can be tailored according to susceptibilities.<sup>27</sup> If culture is negative but clinical suspicion is high, patients can be treated empirically with a 4 to 8-week course of antibiotics that cover *S. aureus*.<sup>28</sup> An extended course of macrolides such as azithromycin 500 mg daily for 30 days may be particularly effective as these antibiotics target intracellular bacteria that thrive in the nonacute setting.<sup>28</sup> Patients with biofilms and multidrug-resistant strains also may benefit from probiotics.

### **Abscess**

An abscess may result from incompletely treated mastitis<sup>29</sup> or transformation of an uninfected galactocele into an infected galactocele.<sup>12</sup> Generally, an abscess resulting from mastitis presents with an antecedent history of erythema and systemic symptoms with a lack of resolution after several days of antibiotics, or recurrent symptoms after initial improvement, with development of a fluctuant mass. An infected galactocele generally presents as an initial mass-like area or “plug” that then becomes erythematous and indurated. Regardless of the etiology (which may be difficult to

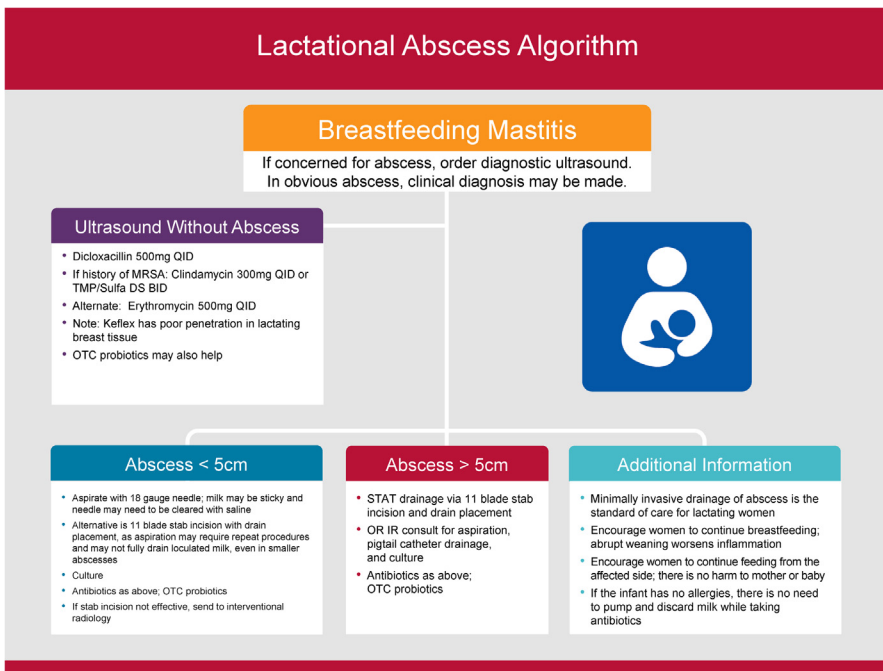


**Fig. 3.** Mid-stream clean-catch breastmilk culture using sterile gloves. (Courtesy of Kelly Rosso, MD, Sun City, AZ.)

determine in late presentation), principles of abscess management are the same: adequately drain the infected fluid and treat surrounding erythema with antibiotics.<sup>30</sup>

While current protocols recommend that lactational abscess should be treated with aspiration rather than surgical incision and drainage,<sup>31</sup> a single aspiration may not effectively drain fluid in this clinical scenario.<sup>32</sup> Unlike other infected fluid in the body, breastmilk can be extremely viscous and septate quickly.<sup>33</sup> Even a large-bore needle may not adequately drain a larger or more complex fluid collection. If deep in the breast, interventional radiology (IR) can disrupt loculations and place an 8 French drainage catheter. However, most lactational abscesses are superficial and located in the retroareolar region and are therefore amenable to drainage under local anesthesia in the office. This eliminates delay to intervention, the stress of the operating room for the patient, and unnecessary separation of the breastfeeding dyad. Additionally, traditional drainage catheters can pose more of a challenge to manage with breastfeeding infants, and should be avoided unless needed for deeper collections. An algorithm for the management of lactational abscesses is illustrated in **Fig. 4**.

The supplies for and steps of in-office drainage of superficial lactational abscesses are detailed in **Box 2** and **3**, respectively. A very small incision with an 11 blade scalpel results in a defect barely larger than that of a large-bore needle, and allows access to the abscess cavity with a hemostat or other instrument to break up loculations through blunt dissection. A small penrose stent or other superficial wicks can be placed to decompress the cavity for 3 to 5 days; because breastmilk will always continue to be produced, the drain should not remain in place for longer periods of time. Packing material should not be used in a lactating breast, as it becomes soaked immediately with breastmilk, will promote inflammation, and will delay healing. A penrose or other wick allows the cavity to decompress and the lactating breast to close naturally without additional trauma (**Fig. 5**).



**Fig. 4.** Algorithm for treatment of lactational abscess.

**Box 2****Supplies for in-office drainage of lactational abscess**

- Chlorhexidine
- Sterile gloves, drapes
- 25 gauge needle and 10 cc 2% lidocaine without epinephrine
- 11 blade scalpel
- 18 or 16 gauge needle with 10 cc syringe
- Hemostat, needle driver, Adson's forceps, scissors
- 1/4 inch penrose drain
- 4 to 0 prolene suture
- Culture containers
- Gauze

For retroareolar abscesses, attempt to place the 11 blade incision outside the area that would be traumatized by the infant's mouth and/or breast pump. In particular, repeated pump suction trauma can potentiate fistula formation and persistence.<sup>34</sup> Otherwise, the incision or aspiration site should be expected to close within several days after the procedure or removal of IR or penrose drain. The theoretical risk of milk fistula is extremely low, even with operative intervention on lactating patients.<sup>35</sup> If a small fistula does occur, it can be managed with basic wound care principles of keeping the area clean and dry and diverting milk flow away from the fistula tract by promoting drainage through the nipple (eg continued physiologic breastfeeding) and/or insertion of a diverting catheter. Patients should *not* be instructed to "keep their breasts empty" or "pump to empty," as this suprphysiologic stimulation of milk production will in fact potentiate plugging, mastitis, and persistent fistula.

**Box 3****Steps of in-office drainage of lactational abscess**

- Prep and drape the affected area
- Inject lidocaine superficially and deeply surrounding abscess cavity
- If using needle, attempt to aspirate under ultrasound guidance to ensure adequate drainage of the cavity
- If any question of septations or incomplete drainage, make 11 blade stab incision to open/access cavity; avoid retroareolar incision if possible so that baby's latch and/or pump does not traumatize site and promote persistent fistula development
- Use hemostat to gently probe entire cavity and release loculations
- Suture 1/4 inch penrose in place with 4 to 0 prolene as wick in skin and cut short
- Provide gauze and counsel patients they may experience some leakage from site, but this is normal/expected and helps clear the infection; replace gauze as needed to maintain dry skin
- Consider therapeutic ultrasound daily to reduce inflammation/edema
- Discontinue drain on average at day 2 to 3, maximum day 5
- If any concern for undrained cavity, refer to interventional radiology for drainage catheter)





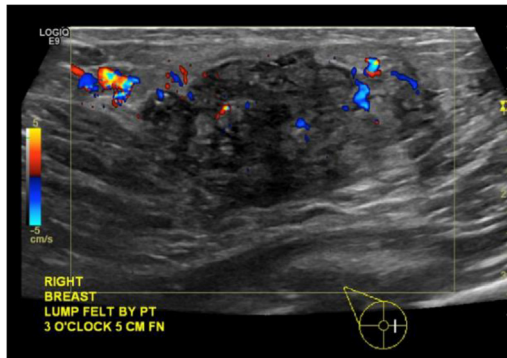
Fig. 5. Penrose wick for treatment of lactational abscess.

Occlusive dressings (eg, Tegaderm) will lead to skin maceration and may exacerbate tape allergy. Women should be counseled that the worst possible outcome is that the fistula would remain patent until weaning, at which point it would regress. However, this represents an extraordinarily uncommon scenario and women should be counseled accordingly and encouraged to continue breastfeeding. Surgeons and radiologists should not avoid any necessary procedure on the lactating breast due to this very rare theoretic concern.<sup>36</sup>

### **Galactocele**

Galactoceles are milk retention cysts that result from ductal obstruction, that is, unrelieved plugging.<sup>37</sup> Galactoceles may be small and incidental, and only visualized when a breast is imaged for other reasons. Their appearance on imaging can be variable, and they may calcify over time.<sup>38</sup> They alternatively may present as much larger masses that can be disfiguring, uncomfortable, and/or interfere with latch. While surgeons and radiologists may traditionally advise aspiration of galactoceles to confirm diagnosis and/or relieve symptoms, patients should be counseled that they almost invariably refill with milk—particularly if larger at presentation. This phenomenon results from the fact that it is necessary to decompress the cavity long enough to enable associated ductal plugging to clear.

Repeated aspirations can risk conversion of a sterile galactocele to an infected galactocele that can appear more like an abscess with induration and erythema.<sup>39</sup> Patients can be offered aspiration with the explanation of this concern or can be offered upfront 11 blade stab incision and penrose placement for 2 to 3 days, versus an IR catheter drain for similar decompression. Patients should continue to breastfeed to promote drainage through the nipple and passage of the milk plug. They should avoid pumping, use sunflower lecithin and phytolacca to reduce plugging, and address and resolve hyperlactation.



**Fig. 6.** Ultrasound image of lactational phlegmon demonstrating hyperemia, edema, and indistinct hypoechoic mass without focal fluid collection.

### ***Phlegmon***

A lactational phlegmon is a mass-like area of indistinct fluid formation in the absence of a focal drainable collection. A phlegmon may develop in the setting of antecedent mastitis and/or plugging.<sup>40</sup> History is notable for excessive, deep breast massage, which potentiates microvascular injury, edema, and inflammation. On examination, providers may appreciate a large mass in a ductal distribution with or without overlying erythema; erythema most often correlates with mastitis history. On imaging, an indistinct mass-like area is present that may demonstrate vascularity and mimic malignancy (**Fig. 6**). If any imaging characteristics warrant biopsy, the patient should proceed. Pathology results with phlegmon will most often show acute or chronic mastitis.

Patients with phlegmon may warrant extended course antibiotics to suppress inflammation and treat infection with unresolved mastitis history.<sup>40</sup> Surgeons can attempt initial aspiration or small 11 blade stab incision and drainage, though this generally does not yield substantial fluid drainage. Therapeutic ultrasound<sup>15</sup> may promote coalescence into a drainable fluid collection and therefore promote earlier definitive resolution. Phlegmon most often will involute over time and should be followed with interval imaging every 3 months until resolution.<sup>40</sup>

### **CLINICS CARE POINTS: INFLAMMATORY AND OBSTRUCTIVE CONDITIONS**

- Continue normal (not increased) breastfeeding from affected breast, as this promotes physiological removal of breastmilk and relief of obstruction
- If breastfeeding is not possible, hand express and avoid pumping, which overstimulates milk production and ineffectively removes milk
- Do not massage the breast, as this causes microvascular injury, inflammation, and increased tissue edema
- Prescribe antibiotics for surrounding erythema
- Consider therapeutic ultrasound as adjunctive therapy for reducing tissue edema, inflammation, and pain
- Breastmilk is viscous and septate quickly, so aspiration may not resolve abscess, galactocele, or infected galactocele definitively at the index procedure

- Due to difficulty of managing drainage catheters with an infant, avoid catheter use if the collection is superficial
- Consider in-office drainage with a very small 11 blade stab incision to allow hemostat access to break up loculations and resolve more definitively with initial intervention
- Remove drains within 3 to 5 days and do not place to suction (will promote continued breastmilk drainage)
- Do not use packing on a lactating breast, as it will become soaked with milk, promote excessive granulation, and delay wound healing
- After aspiration, stab incision, or drain placement, encourage patients to continue normal breastfeeding to promote drainage through nipple rather than the procedure site to decrease the risk of milk fistula
- Counsel patients that milk fistula is rare, does not pose a health risk to mother or baby, and generally self-resolves within a few weeks
- Do not instruct patients to “pump to empty” or “keep the breast empty,” as this will cause supraphysiologic milk production and potentiate plugging, mastitis, and persistent fistula

## CONDITIONS INVOLVING THE NIPPLE-AREOLAR COMPLEX

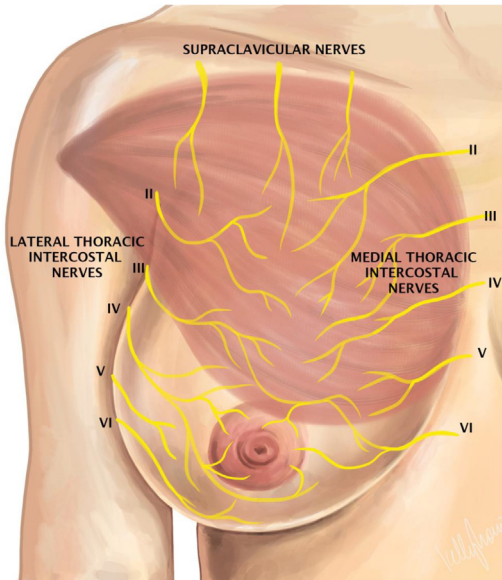
### *Pain*

More than 90% of lactating women will experience nipple or breast pain at some point during breastfeeding.<sup>41</sup> Engorgement, hyperlactation, plugging, mastitis, subacute mastitis/bacterial dysbiosis, vasospasm, and nonspecific functional pain are the most common etiologies of breast pain during lactation.<sup>42</sup> Women who resume menstruation during breastfeeding may experience NAC and/or breast pain before their cycle, and women who become pregnant also may notice increased NAC sensitivity. Because of the rich innervation of the breast<sup>43</sup> and serotonin receptors in the mammary epithelium<sup>44</sup> (**Fig. 7**), nonspecific functional pain that includes shooting, burning, and pain with latch responds very well to the selective serotonin reuptake inhibitor (SSRI) class of drugs.<sup>42</sup> In addition, untreated perinatal mood and anxiety disorders (PMADs) may reduce pain threshold and increase the perception of neuropathic pain. Sertraline is the preferred SSRI in lactation, though all other drugs in the class are safe as well.<sup>45</sup> The common maternal conditions discussed later in discussion can cause pain and should be evaluated for and treated individually.

### *Trauma*

Nipple trauma should be treated according to principles of closed wound care (**Box 4**), with expectation for healing time of 7 to 10 days once appropriate therapy is initiated. Mothers should be reassured that breastfeeding should continue during this time, as mechanical debridement promotes wound healing and the infant’s oral flora feedback to the mother’s breast is important to maintain a healthy microbiome. Nipples should be not be “dried out”; they also should not be soaked in warm or Epsom salt, which can cause maceration. Nipple shells, which worsen NAC edema and potentiate trauma, should be avoided. Nipple shields can lead to mastitis, plugging, and reduced milk transfer and also should be avoided. A supportive bra can reduce breast and NAC lymphedema, and altering feeding positions can enable atraumatic latch.

Open wounds should be covered with a nipple balm that does not contain petroleum or lanolin, which can be allergenic. Balm should be dressed with a nonstick gauze pad or a hydrogel pad. Other alternatives include Polymem, which contains substances that keep the wound moist and absorb excessive fibrinous exudate. Due to its complex mechanism of action and need to contact skin/wounds directly,



**Fig. 7.** Complex innervation of the breast impacts lactating patients' sensitivity to acute and chronic pain. (Courtesy of Kelly Rosso, MD, Sun City, AZ.)

Polymem should not be used concurrently with balm. Mepilex also can serve as an alternative dressing, though it does not adhere to lactating nipple tissue well.

Topical antibacterial ointments are not necessary for the setting of nipple trauma and can promote the allergic reaction, further complicating trauma. Patients may report initial improvement in pain with all purpose nipple ointment (APNO), likely due to the steroid component of the compound. Because the lactating nipple is highly vascular<sup>46</sup> and heals effectively, cutaneous infection is uncommon. If true cellulitis exists, oral antibiotics will be more effective at treating the infection than topical applications.<sup>47</sup>

Patients who have experienced significant trauma may benefit from a short course of topical steroid to reduce pain and allow for continued breastfeeding. While some providers may counsel patients to pump rather than breastfeed until trauma improves, this approach should be considered cautiously. Pumping can cause additional trauma to the nipple if flanges fit incorrectly, and can promote hyperlactation, plugging, and mastitis. Patients may feel they are becoming reliant on pumping, and the baby may not want to return to the breast.

#### Box 4

##### Nipple trauma management

- Keep wounds moist and closed at all times with balm and occlusive covering, or specialized wound healing dressing alone in accordance to accepted wound care practices; discuss burn analogy with patients
- Avoid petroleum- and lanolin-based products to decrease the potential for allergy
- Use single-agent balms and creams to prevent polypharmacy
- Temporary steroid cream use may alleviate pain associated with significant trauma
- Consider selective serotonin reuptake inhibitor (SSRI) to improve neuropathic pain

## Vasospasm

---

Vasospasm of the nipple represents a constriction of the vasculature that can translate into a significant nipple and/or radiating deep breast pain.<sup>48</sup> The nipple can become white, then purple and red as blood flow returns. Patients most commonly experience the associated shooting/burning pain after breastfeeding or pumping. Vasospasm also can be present when mothers move from a hot shower to a cold room or enter air conditioning. Associated ischemia can result in fissuring and other trauma. Secondary vasospasm can occur in the setting of preexisting trauma. Wound care should be addressed as above. Vasospasm can be interrupted by using constant warmth with heating pads, disposable hand warmers, microwaveable breast pads, warm rice packs, and insulating fabric such as wool (**Box 5**). Calcium channel blockers such as nifedipine can be used for severe cases, though side effects of low blood pressure, fatigue, and headache should be considered.<sup>49</sup> As above, SSRIs can be used to reduce neuropathic pain and can promote improved blood flow through vasodilatory mechanisms.<sup>50</sup>

## Blebs

---

Nipple blebs are inflammatory fibrinous-like lesions that occlude the nipple orifice and likely result from underlying ductal plugging.<sup>14</sup> Nipple blebs can cause exquisitely tender latch and shooting pain deeper into the breast. They may be single or multiple, unilateral or bilateral. Single blebs likely are related to hyperlactation, plugging, and/or subacute mastitis/breast dysbiosis localized to a single ductal-lobular unit. Multiple and recurrent blebs are more likely related to a global dysbiosis and hyperlactation that promotes persistent and recurrent plugging.<sup>24</sup> These conditions should be addressed and treated.

Efficacious treatment of nipple blebs includes topical 0.1% triamcinolone steroid cream applied in small volume directly to the bleb surface (**Box 6**). This can help reduce inflammation and associated occlusion until underlying plugging resolves. Sunflower lecithin, phytolacca, and therapeutic ultrasound can reduce underlying plugging. Sterile unroofing should be reserved for select cases of acute obstruction with impending mastitis. Repeated unroofing should be avoided as this will result in scarring and chronic obstruction. Avoid Epsom salt, olive oil, and other compounds as this may exacerbate surface plugging and macerate tissue.

## Dermatitis

---

Dermatitis presents with erythema, pruritis, and flaking. Dermatitis affecting both the NAC and breast during lactation is extremely common, both due to maternal and infant factors. Dermatitis may occur unilaterally and be limited to a focal area. The reason for this is sometimes clear (eg, infant only nurses from one breast) but may be ambiguous.

### Box 5

#### Vasospasm management

- Treat underlying or associated trauma
- Around-the-clock continual warmth with breast pads, heating pads, microwaveable packs
- Calcium channel blockers for extreme cases, with counseling about potential side effects
- Selective serotonin reuptake inhibitors (SSRI) for pain and vasodilatory action

**Box 6****Nipple bleb management**

- Treat underlying conditions such as hyperlactation and subacute mastitis/dysbiosis that may be contributing to plugging
- Use 0.1% triamcinolone cream to reduce surface inflammation and sunflower lecithin and/or phytolacca to reduce plugging
- Do not soak bleb in Epsom salt, olive oil, or other compounds as this may macerate tissue or worsen surface plugging
- Do not continually probe or unroof, as this will potentiate scar tissue formation

Treatment includes identifying and eliminating allergens. In some cases, the specific allergen may never be identified. Common allergens include the following:

- Laundry or dish detergents
- Bras and nursing pads
- Balms and creams, particularly those containing lanolin and petroleum
- Pump parts
- Nipple shields
- Infant ingestion of foods or medications to which mother may be allergic
- Infant touching, for example, plants/trees/other substances to which mother may be allergic

Topical steroid cream (eg, 0.1% triamcinolone) can reduce itching and flaking.<sup>47</sup> Oral antihistamines can cause sedation and reduction in milk production,<sup>51</sup> and are not generally advised unless itching has become very severe. Topical antihistamines may be less effective. Acupuncture may be helpful in patients with more significant pruritis and/or development of hives.

## **BENIGN BREAST MASSES AND OTHER BREAST CONDITIONS**

Several benign breast masses and breast conditions occur only during pregnancy and lactation. Other general breast conditions may present in the setting of pregnancy or lactation, but are not related to lactation. All require special considerations for management in the lactating patient.

### ***Related to Pregnancy and Lactation***

- **Lactating adenoma**  
Lactating adenomas can present during pregnancy and grow and persist during lactation.<sup>52</sup> They will regress spontaneously with weaning. They demonstrate a characteristic appearance on ultrasound similar to a fibroadenoma, and show dense collections of glandular tissue when biopsied. Follow these lesions with serial examination and imaging, and consider core needle biopsy for the confirmation of diagnosis.<sup>12</sup>
- **Abscess, phlegmon, galactocele**  
See subsections above under “Inflammatory and Obstructive Conditions”
- **Gigantomastia**  
The incidence of gestational gigantomastia is poorly understood and likely represents a wide variety of presentations from significant breast growth to skin ulceration and necrosis.<sup>10</sup> Patients experiencing significant breast growth during pregnancy require attentive supportive care, including wearing an

appropriate bra and using techniques of lymphatic massage to reduce tissue edema. If there is any concern for asymmetry or other findings suggesting focal mass or concern for inflammatory breast cancer, diagnostic evaluation should be undertaken.<sup>12</sup>

- **Dependent edema**  
Dependent edema is common in gigantomastia and larger breasts. As above, patients should use a supportive bra and practice lymphatic massage. If symmetric and in the dependent portions of the breasts, patients should be reassured.<sup>12</sup>
- **Prominent axillary and/or intramammary lymph nodes**  
Prominent axillary and/or intramammary lymph nodes also are common during pregnancy and lactation. Ultrasound can demonstrate normal morphologic appearance such as the preservation of fatty hilum.<sup>12</sup>
- **Prominent accessory breast tissue**  
see “Engorgement” under “Inflammatory and Obstructive Conditions” above
- **Bloody nipple discharge**  
Up to 24% of pregnant and lactating women may experience transient bloody nipple discharge in the later weeks of pregnancy and/or the early postpartum period.<sup>53</sup> This generally occurs in a bilateral, multi-duct presentation and is related to increasing vascularity of the breast and/or transient microvascular trauma and has been called “rusty pipe syndrome”.<sup>54</sup> This discharge should decrease and resolve by approximately 2 weeks postpartum. Persistent, unilateral, or single duct discharge or discharge developing spontaneously later in lactation warrants further evaluation with diagnostic breast imaging.<sup>12</sup> Pumped breastmilk colonized by *Serratia marcescens* also may be pink in color and it is important to ascertain whether patients noticed blood when pumping or noticed a color change in stored milk.<sup>55</sup> Patients with hyperlactation and/or taking blood thinners also may experience transient bloody discharge. Nevertheless, imaging evaluation should be considered.
- **Mastalgia**  
See “Pain” under “Conditions Involving the Nipple Areolar Complex” above

### ***Not Related to Pregnancy and Lactation***

---

While any mass, including cancer, can present during pregnancy and lactation, common lesions in childbearing women include fibroepithelial lesions such as fibroadenoma and idiopathic granulomatous mastitis (IGM). These conditions in particular may require unique treatment approaches.

- ***Benign masses***  
Benign masses will undergo growth and evolution in features during pregnancy and lactation. These changes can be challenging for radiologists to characterize and surgeons to manage. For example, fibroadenomas traditionally are excised if they grow or change. However, limited data exist regarding the rate and amount of expected growth, as well as other changes in morphology and vascularity that can occur.<sup>56</sup> It is wise to prove the benign nature of any lesion before pregnancy with a core needle biopsy.
- ***Idiopathic granulomatous mastitis***  
IGM, already a challenging clinical condition to manage, can become even more complex and distressing for the patient during pregnancy and lactation. Symptoms may begin during pregnancy. Imaging and core needle



biopsy to confirm diagnosis is indicated. Patients may begin treatment with oral steroids, which are held in the peripartum period. No current literature on the intralesional injection of Kenalog exists in pregnant patients. During lactation, several different treatment approaches can be considered, including oral steroids; intralesional steroids; methotrexate; and, supportive management alone, including aspiration of fluid collections and wound care for fistulae.<sup>57,58</sup> Oral steroids may reduce milk production in both breasts and also may contribute to insomnia and anxiety.<sup>51</sup> Intralesional injections require weaning on the affected breast due to the high oral dose that infants can ingest from nursing or expressed milk.<sup>59</sup> The lactational safety of methotrexate is not well delineated,<sup>60</sup> though azathioprine is safe.<sup>61</sup> Given that IGM is inflammatory rather than infectious disease, repeated courses of antibiotics and wound cultures are not indicated.

## BREAST CANCER AND BREASTFEEDING

Patients with a history of breast cancer may wish to breastfeed subsequent children, and patients who are pregnant or lactating may develop new breast cancer. These clinical scenarios should involve prenatal counseling with a breastfeeding medicine physician and/or lactation consultant, and close support in the postpartum period. As detailed in the imaging section below, ultrasound, mammogram, and magnetic resonance imaging (MRI) are safe and effective in lactation; MRI is not recommended during pregnancy due to gadolinium toxicity in the fetus.<sup>62</sup> Staging studies such as bone scan, positron emission tomography (PET) scan, and computed tomography (CT) scan with iodinated contrast are safe during lactation.<sup>63</sup> While full details regarding counseling and management of this patient population are detailed in the Academy of Breastfeeding Medicine Breastfeeding and Breast Cancer protocol<sup>64</sup> as well as Johnson and Mitchell's review *Breastfeeding and Breast Cancer: Managing Lactation in Survivors and Women with a New Diagnosis*,<sup>65</sup> a summary is provided in [Table 1](#) later in discussion:

## BREAST IMAGING

### *Breast Cancer Screening*

---

Updated recommendations for breast cancer screening in the lactating patient population have emerged in recent years.<sup>66</sup> While shared decision making is encouraged, the American College of Radiology recommends screening lactating patients according to guidelines for nonlactating patients.<sup>67</sup> Patients should bring a pump to the radiology suite and empty their breasts just before imaging.<sup>66</sup> MRI with gadolinium contrast is safe and breastfeeding does not need to be interrupted.<sup>68</sup> Specific technical approaches using diffusion tensor imaging (DTI) in MRI may improve the visualization of cancer and may be considered during lactation.<sup>69</sup> Due to increased density of tissue during lactation, patients also may benefit from whole breast screening ultrasound in addition to mammogram.<sup>67</sup>

### *Diagnostic Imaging*

---

Ultrasound is the first step in diagnostic imaging for lactation.<sup>12</sup> Mammograms will be used if needed as an adjunct to ultrasound.<sup>67</sup> MRI with gadolinium is safe in lactation.<sup>63</sup>



**Table 1**  
**Breast cancer treatments and their potential impacts on lactation in (A) women with a history of breast cancer, (B) women diagnosed with breast cancer while pregnant, and (C) women diagnosed with breast cancer while lactating**

<b>A. History of Breast Cancer</b>	
<b>Treatment</b>	<b>Potential Impact on Lactation</b>
Chemotherapy	<ul style="list-style-type: none"> <li>• Due to histopathologic changes in breast parenchyma, may experience reduced production in both breasts</li> <li>• Alternatively, due to individual variation in physiology, may experience normal production</li> </ul>
Surgery	<ul style="list-style-type: none"> <li>• No lactation after bilateral mastectomy and donor milk options should be explored</li> <li>• Lactational capacity may be reduced following breast-conserving therapy due to the removal of ductal tissue, scarring, and neurovascular damage as well as significant radiation changes (below)</li> <li>• Recommend breastfeeding from contralateral breast in the setting of breast-conserving therapy or mastectomy</li> </ul>
Radiation	<ul style="list-style-type: none"> <li>• Due to histopathologic changes in breast parenchyma, reduced milk production, and skin and nipple areolar complex changes, do not recommend breastfeeding from affected breast</li> </ul>
Endocrine therapy	<ul style="list-style-type: none"> <li>• Contraindicated with lactation</li> </ul>
<b>B. Breast Cancer Diagnosed while Pregnant</b>	
<b>Treatment</b>	<b>Potential Impact on Lactation</b>
Chemotherapy	<ul style="list-style-type: none"> <li>• Per above regarding production volume</li> <li>• If given before mid-pregnancy, may impair lactogenesis I</li> <li>• Postpartum, patients may breastfeed until treatment resumes</li> <li>• Shared decision making regarding expressing and discarding milk until therapy complete, vs weaning using cabergoline (prolactin antagonist)</li> </ul>
Surgery	<ul style="list-style-type: none"> <li>• See above <i>history of breast cancer</i></li> </ul>
Radiation	<ul style="list-style-type: none"> <li>• Contraindicated during pregnancy; See above <i>history of breast cancer</i></li> </ul>
Endocrine therapy	<ul style="list-style-type: none"> <li>• Contraindicated during pregnancy; See above <i>history of breast cancer</i></li> </ul>
<b>C. Breast Cancer Diagnosed while Lactating</b>	
<b>Treatment</b>	<b>Potential Impact on Lactation</b>
Chemotherapy	<ul style="list-style-type: none"> <li>• Shared decision making regarding expressing and discarding milk until therapy complete, vs weaning</li> <li>• If patient elects to express and discard, patients should be counseled that chemotherapy will decrease milk volume and alter microbiome, infant may refuse to return to the breast, and the risk of mastitis is greater when immunosuppressed</li> </ul>
Surgery	<ul style="list-style-type: none"> <li>• For surgical treatment alone, weaning due to very low risk of milk fistula is not necessary, but other considerations as above <i>history of breast cancer</i></li> <li>• A 24 h interruption in breastfeeding is recommended after radiotracer administration for sentinel lymph node biopsy; No data regarding vital dyes used for lymph node biopsy</li> <li>• Perioperative care should be tailored to support the breastfeeding dyad</li> </ul>
Radiation	<ul style="list-style-type: none"> <li>• See above <i>history of breast cancer</i></li> </ul>
Endocrine therapy	<ul style="list-style-type: none"> <li>• See above <i>history of breast cancer</i></li> </ul>

## SUMMARY

As breastfeeding rates continue rise, it is imperative that breast surgeons are competent in caring for benign and malignant diseases presenting in the lactating breast. While the largest volume of patients will develop conditions on the inflammatory-obstructive spectrum such as mastitis and abscess, many others will experience NAC conditions or present with breast masses. Surgeons can drain fluid collections in the clinic rather than the operating room, reducing patient stress and providing definitive point-of-care management. Breast cancer screening and diagnostic breast imaging are safe in lactation, and biopsies of suspicious lesions should not be delayed due to lactational status. Management of breast cancer in lactating women requires multidisciplinary collaboration including a breastfeeding medicine specialist or lactation consultant.

## DISCLOSURE

The authors have nothing to disclose.

## REFERENCES

1. Stuebe A. The risks of not breastfeeding for mothers and infants. *Rev Obstet Gynecol* 2009;2(4):222–31.
2. Stuebe AM, Horton BJ, Chetwynd E, et al. Prevalence and risk factors for early, undesired weaning attributed to lactation dysfunction. *J Womens Health (Larchmt)* 2014;23(5):404–12.
3. Stuebe AM, Jegier BJ, Schwarz EB, et al. An Online Calculator to Estimate the Impact of Changes in Breastfeeding Rates on Population Health and Costs. *Breastfeed Med* 2017;12(10):645–58.
4. World Health Organization. Infant and Young Child Nutrition: Global strategy on infant and young child feeding. 55th World Health Assembly. 2002. Available at: [http://apps.who.int/gb/archive/pdf\\_files/WHA55/ea5515.pdf?ua=1](http://apps.who.int/gb/archive/pdf_files/WHA55/ea5515.pdf?ua=1). August 7, 2020.
5. Johnson HM, Eglash A, Mitchell KB, et al. ABM Clinical Protocol #32: Management of Hyperlactation. *Breastfeed Med* 2020;15(3):129–34.
6. Hill PD, Humenick SS. The occurrence of breast engorgement. *J Hum Lactation* 1994;10(2):79–86.
7. Witt AM, Bolman M, Kredit S, et al. Therapeutic breast massage in lactation for the management of engorgement, plugged ducts, and mastitis. *J Hum Lact* 2016;32(1):123–31.
8. McLachlan Z, Milne EJ, Lumley J, et al. Ultrasound treatment for breast engorgement: A randomised double blind trial. *Aust J Physiother* 1991;37(1):23–8.
9. Ueno NT, Espinosa Fernandez JR, Cristofanilli M, et al. International consensus on the clinical management of inflammatory breast cancer from the morgan welch inflammatory breast cancer research program 10th anniversary conference. *J Cancer* 2018;9(8):1437–47.
10. Mangla M, Singla D. Gestational gigantomastia: a systematic review of case reports. *J Midlife Health* 2017;8(1):40–4.
11. Lesavoy MA, Gomez-Garcia A, Nejdil R, et al. Axillary breast tissue: clinical presentation and surgical treatment. *Ann Plast Surg* 1995;35(4):356–60.
12. Mitchell KB, Johnson HM, Eglash A. ABM clinical protocol #30: breast masses, breast complaints, and diagnostic breast imaging in the lactating woman. *Breastfeed Med* 2019;14(4):208–14.

13. Amir LH. Academy of Breastfeeding Medicine Protocol Committee. ABM clinical protocol #4: Mastitis, revised March 2014. *Breastfeed Med* 2014;9(5):239–43.
14. Mitchell KB, Johnson HM. Breast pathology that contributes to dysfunction of human lactation: a spotlight on nipple blebs. *J Mammary Gland Biol Neoplasia* 2020;25(2):79–83.
15. Lavigne V, Gleberzon BJ. Ultrasound as a treatment of mammary blocked duct among 25 postpartum lactating women: a retrospective case series. *J Chiropr Med* 2012;11(3):170–8.
16. WHO. Mastitis: causes and management. Publication Number WHO/FCH/CAH/00.13. Geneva (Switzerland): World Health Organization; 2000.
17. Jiménez E, Delgado S, Arroyo R, et al. Infectious mastitis during lactation: An underrated condition (II). *Acta Pediatr Esp* 2009;67:125–32.
18. Branch-Elliman W, Golen TH, Gold HS, et al. Risk Factors for *Staphylococcus aureus* Postpartum Breast Abscess. *Clin Infect Dis* 2011;54(1):71–7.
19. Amir LH, Griffin L, Cullinane M, et al. Probiotics and mastitis: evidence-based marketing? *Int Breastfeed J* 2016;11:19.
20. Moossavi S, Sepehri S, Robertson B, et al. Composition and variation of the human milk microbiota are influenced by maternal and early-life factors. *Cell Host Microbe* 2019;25(2):324–35.e4.
21. Demmelmair H, Jiménez E, Collado MC, et al. Maternal and perinatal factors associated with the human milk microbiome. *Curr Dev Nutr* 2020;4(4):nzaa027.
22. Fernández L, Arroyo R, Espinosa I, et al. Probiotics for human lactational mastitis. *Benef Microbes* 2014;5(2):169–83.
23. Crepinsek MA, Crowe L, Michener K, et al. Interventions for preventing mastitis after childbirth. *Cochrane Database Syst Rev* 2012;10:CD007239.
24. Mitchell KB, Eglash A, Bamberger ET. Mammary dysbiosis and nipple blebs treated with intravenous daptomycin and dalbavancin. *J Hum Lact* 2020;36(2):365–8.
25. Jimenez E, Arroyo R, Cardenas N, et al. Mammary candidiasis: A medical condition without scientific evidence? *PLoS One* 2017;12(7):e0181071.
26. Mediano P, Fernández L, Jiménez E, et al. Microbial diversity in milk of women with mastitis: potential role of coagulase-negative staphylococci, viridans group streptococci, and corynebacteria. *J Hum Lact* 2017;33(2):309–18.
27. Eglash A, Plane MB, Mundt M. History, physical and laboratory findings, and clinical outcomes of lactating women treated with antibiotics for chronic breast and/or nipple pain. *J Hum Lact* 2006;22(4):429–33.
28. Eglash A, Proctor R. Case report: a breastfeeding mother with chronic breast pain. *Breastfeed Med* 2007;2(2):99–104.
29. Amir LH, Forster D, McLachlan H, et al. Incidence of breast abscess in lactating women: report from an Australian cohort. *BJOG* 2004;111(12):1378–81.
30. Stevens DL, Bisno AL, Chambers HF, et al. Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2014;59(2):e10–52.
31. Valente SA, Grobmyer SR. Mastitis and Breast Abscess. In: Bland KI, Copeland EM, Klimberg VS, et al, editors. *The breast: Comprehensive management of benign and malignant diseases*. 5th edition. Philadelphia,: Elsevier; 2018. p. 93–103.e2.
32. Irusen H, Rohwer AC, Steyn DW, et al. Treatments for breast abscesses in breastfeeding women. *Cochrane Database Syst Rev* 2015;(8):CD010490.

33. Alatalo D, Hassanipour F. An Experimental Study on Human Milk Viscosity. Paper presented at: ASME 2016 International Mechanical Engineering Congress and Exposition, November 11–17, 2016. Phoenix, Arizona, USA.
34. Johnson HM, Mitchell KB. Is Milk Fistula a Legitimate Concern or an Unfounded Fear?: A Cohort Study to Estimate Incidence. . American College of Surgeons Clinical Congress Scientific Forum; October 30, 2019, 2019; San Francisco, CA.
35. Dominici LS, Kuerer HM, Babiera G, et al. Wound complications from surgery in pregnancy-associated breast cancer (PABC). *Breast Dis* 2010;31(1):1–5.
36. Johnson HM, Mitchell KB. Is Milk Fistula a Legitimate Concern or an Unfounded Fear? A Cohort Study to Estimate Incidence. *J Am Coll Surg* 2019;229(4):S37–8.
37. Joshi S, Dialani V, Marotti J, et al. Breast disease in the pregnant and lactating patient: radiological-pathological correlation. *Insights Imaging* 2013;4(5):527–38.
38. Chatpitanrut P, Kongmebhoh P, Muttarak M. Imaging appearances of breast disorders during pregnancy and lactation. *Hong Kong J Radiol* 2015;18:160–8.
39. Ghosh K, Morton MJ, Whaley DH, et al. Infected galactocele: a perplexing problem. *Breast J* 2004;10(2):159.
40. Johnson HM, Mitchell KB. Lactational phlegmon: A distinct clinical entity affecting breastfeeding women within the mastitis-abscess spectrum. *Breast J* 2020;26(2):149–54.
41. Dennis CL, Jackson K, Watson J. Interventions for treating painful nipples among breastfeeding women. *Cochrane Database Syst Rev* 2014;12:Cd007366.
42. Berens P, Eglash A, Malloy M, et al. ABM clinical protocol #26: persistent pain with breastfeeding. *Breastfeed Med* 2016;11(2):46–53.
43. Schlenz I, Kuzbari R, Gruber H, et al. The sensitivity of the nipple-areola complex: an anatomic study. *Plast Reconstr Surg* 2000;105(3):905–9.
44. Matsuda M, Imaoka T, Vomachka AJ, et al. Serotonin regulates mammary gland development via an autocrine-paracrine loop. *Dev Cell* 2004;6(2):193–203.
45. Sriraman NK, Melvin K, Meltzer-Brody S. ABM clinical protocol #18: use of anti-depressants in breastfeeding mothers. *Breastfeed Med* 2015;10(6):290–9.
46. van Deventer PV, Graewe FR. The blood supply of the breast revisited. *Plast Reconstr Surg* 2016;137(5):1388–97.
47. Barrett ME, Heller MM, Fullerton Stone H, et al. Dermatoses of the breast in lactation. *Dermatol Ther* 2013;26(4):331–6.
48. Buck ML, Amir LH, Cullinane M, et al. Nipple pain, damage, and vasospasm in the first 8 weeks postpartum. *Breastfeed Med* 2014;9(2):56–62.
49. Anderson JE, Held N, Wright K. Raynaud's phenomenon of the nipple: a treatable cause of painful breastfeeding. *Pediatrics* 2004;113(4):e360–4.
50. Jaffe IA. Serotonin reuptake inhibitors in Raynaud's phenomenon. *Lancet* 1995;345(8961):1378.
51. Anderson PO. Drugs that Suppress Lactation, Part 2. *Breastfeed Med* 2017;12:199–201.
52. Barco Nebreda I, Vidal MC, Fraile M, et al. Lactating Adenoma of the Breast. *J Hum Lact* 2016;32(3):559–62.
53. Kline TS, Lash SR. The bleeding nipple of pregnancy and postpartum period; a cytologic and histologic study. *Acta Cytol* 1964;8:336–40.
54. Kural B, Sapmaz S. Rusty pipe syndrome and review of literature. *Breastfeed Med* 2020;15(9):595–7.
55. Quinn L, Ailsworth M, Matthews E, et al. *Serratia marcescens* colonization causing pink breast milk and pink diapers: a case report and literature review. *Breastfeed Med* 2018;13(5):388–94.

56. Qian Y, Chang C, Zhang H. Ultrasound imaging characteristics of breast lesions diagnosed during pregnancy and lactation. *Breastfeed Med* 2019;14(10):712–7.
57. Lei X, Chen K, Zhu L, et al. Treatments for idiopathic granulomatous mastitis: systematic review and meta-analysis. *Breastfeed Med* 2017;12(7):415–21.
58. Kim BS, Koo BY, Eom TI. Usefulness of ultrasound-guided intralesional steroid injection in management of idiopathic granulomatous mastitis. *JSU* 2016;3(2):40–5.
59. KENALOG®-40 INJECTION (triamcinolone acetonide injectable suspension, USP): Package Insert. Reference ID: 2961557. Bristol-Myers Squibb Company. 2011. Available at: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2011/014901s038lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2011/014901s038lbl.pdf). December 2, 2020.
60. Pistilli B, Bellettini G, Giovannetti E, et al. Chemotherapy, targeted agents, antiemetics and growth-factors in human milk: how should we counsel cancer patients about breastfeeding? *Cancer Treat Rev* 2013;39(3):207–11.
61. Birru Talabi M, Clowse MEB. Antirheumatic medications in pregnancy and breastfeeding. *Curr Opin Rheumatol* 2020;32(3):238–46.
62. Practice Bulletin Number 179: Breast Cancer Risk Assessment and Screening in Average-Risk Women. *Obstet Gynecol* 2017;130(1):e1–16.
63. Mitchell KB, Fleming MM, Anderson PO, et al. ABM Clinical Protocol #30: Radiology and Nuclear Medicine Studies in Lactating Women. *Breastfeed Med* 2019;14(5):290–4.
64. Johnson HM, Mitchell KB. ABM Clinical Protocol #34: Breast Cancer and Breastfeeding. *Breastfeed Med* 2020;15(7):429–34.
65. Johnson HM, Mitchell KB. Breastfeeding and Breast Cancer: Managing Lactation in Survivors and Women with a New Diagnosis. *Ann Surg Oncol* 2019;26(10):3032–9.
66. Johnson HM, Lewis TC, Mitchell KB. Breast cancer screening during lactation: ensuring optimal surveillance for breastfeeding women. *Obstet Gynecol* 2020;135(1):194–8.
67. diFlorio-Alexander RM, Slanetz PJ, Moy L, et al. ACR Appropriateness Criteria((R)) Breast Imaging of Pregnant and Lactating Women. *J Am Coll Radiol* 2018;15(11s):S263–75.
68. Administration of contrast media to women who are breast-feeding. In: ACR Committee on drugs and contrast Media. American College of radiology Manual on contrast Media, version 10.3. 11th edition. American College of Radiology; 2018. p. 99–100.
69. Nissan N, Allweis T, Menes T, et al. Breast MRI during lactation: effects on tumor conspicuity using dynamic contrast-enhanced (DCE) in comparison with diffusion tensor imaging (DTI) parametric maps. *Eur Radiol* 2020;30(2):767–77.