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# Breast Pathology That Contributes to Dysfunction of Human Lactation: a Spotlight on Nipple Blebs

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## Abstract

Nipple blebs are blister-like fibrinous lesions that form on the surface of the nipple during lactation, and can result in orifice obstruction and mastitis. They likely result from superficial extension of underlying ductal plugging, and can present concurrently with hyperlactation and mammary dysbiosis. Despite their prevalence, few formal reports on nipple blebs exist. In this perspective, we review the experience of a breastfeeding medicine practice that receives referrals for patients with nipple blebs, and provide preliminary insight into etiology, management, and outcomes of these lesions.

## Introduction

While a wide range of breast pathologies can contribute to dysfunction during human lactation and lead to early cessation of breastfeeding, clinical experience and translational research remain limited regarding the management and prevention of these conditions. In particular, nipple blebs represent a particularly challenging complication of lactation and warrant further study.

Nipple blebs, or “milk blisters,” are inflammatory lesions located on the surface of the nipple in breastfeeding women. They often present with significant latch pain and/or an obstructed ductal orifice [1, 2]. This clinically can manifest as plugging and mastitis, and can lead to early weaning [3]. Though few formal reports on nipple blebs exist [4], one case series in which patients underwent punch biopsy of the lesions showed histiocytes with foamy cytoplasmic vacuoles and fibrin deposition; no bacteria or fungi were present [5].

Blebs appear grossly as a blister-like fibrinous lesion and are generally serous or white in color, depending on the presence of obstructed milk deep to the surface. They may become

more hemorrhagic, scabbed, or scarred if they have been traumatized by attempted unroofing. While some women may experience a single bleb localized to one nipple orifice, others may develop multiple blebs over different orifices on their bilateral nipples. Figure 1 illustrates the varied clinical appearance of blebs: unifocal (Fig. 1A); multifocal (Fig. 1B); scabbing from acute unroofing by patient (Fig. 1C); and, hypertrophic scarring from chronic unroofing (Fig. 1D).

In this perspective, we review the experience of a breastfeeding medicine practice that receives referrals for maternal breastfeeding complications such as nipple blebs. We consider potential etiologic factors and describe interventions and outcomes in this population. We ultimately advocate for future research that will enable us to better understand these challenging lesions as well as the variety of other breast pathologies that remain poorly understood in the setting of human lactation.

## Demographics

While no studies document the incidence of nipple blebs, patients with nipple blebs represent 17% of all referrals in our breastfeeding medicine practice. Among 34 women treated for blebs from 11/2016 to 05/2019, mean age was 31.4 years (standard deviation (SD) 4.4, range 21–44). Approximately half of the women were of Hispanic ethnicity (55.9%), while twelve were non-Hispanic white (35.3%), two were Asian, and one was Native American. Sixteen women (47.1%) were three or fewer months postpartum at the time of the initial breastfeeding medicine consultation. Time postpartum ranged from three weeks to three years; excluding the

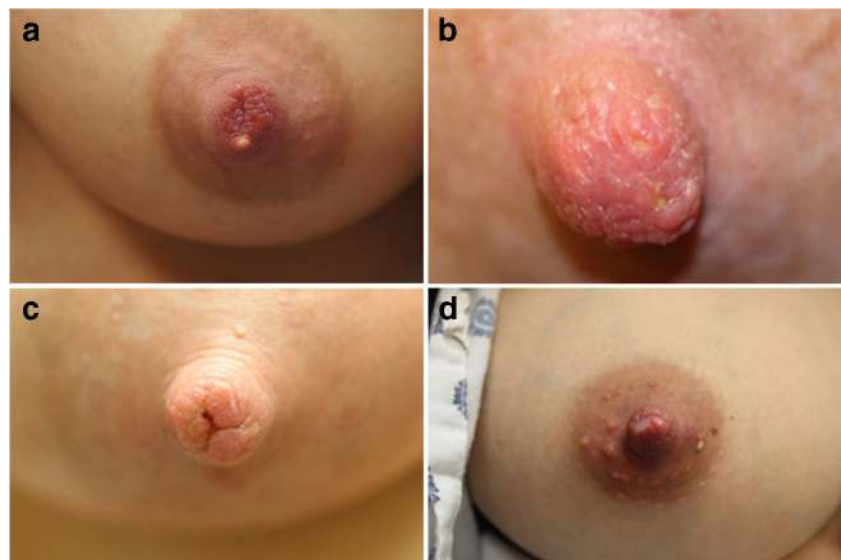
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**Fig. 1** Nipple bleb appearance can be variable. **a** Single bleb. **b** Multifocal blebs. **c** Bleb with scabbing from acute unroofing by patient. **d** Hypertrophic, scarred bleb from chronic unroofing; image also shows accessory drainage of milk through a Montgomery gland



latter outlier, the mean postpartum interval at presentation was 3.7 $\pm$  2.4 months. Half of the women were primiparous. Of the 17 multiparous patients, nearly all breastfed another child (88.2%), although none had previously experienced a nipple bleb. Of the fifteen women (44.1%) who were using a breast pump, two were exclusively pumping and thirteen were pumping in addition to breastfeeding. Nearly one-third (29.4%) produced excess milk for infant requirements, while two did not produce enough milk and were using galactagogues. Six mothers (17.6%) had a history of prior mastitis. Twenty-three women (67.6%) recently received antibiotics, including eight women who had delivered by Cesarean section. Five women (14.7%) gave birth to newborns who required admission to the neonatal intensive care unit (NICU).

## Management

All patients with blebs referred to the breastfeeding medicine practice were counseled about the importance of physiologic breastfeeding with omission of pumping if they were not separated from their infant or exclusively pumping. Patients with hyperlactation (milk production in excess of infant's needs) also were instructed to follow an individualized management plan to decrease their milk production [6]. Triamcinolone, a mid-potency topical steroid cream, was prescribed to nearly all patients (94.1%) in order to thin the inflamed, fibrinous tissue obstructing the nipple orifice and to reduce pain with latch [5]. Patients were instructed to apply a thin layer of the cream to the bleb several times per day after breastfeeding.

Most patients were also advised to take sunflower lecithin by mouth, although it was not recommended to two patients who were not expected to derive significant benefit; one patient had

already weaned at the time of presentation and another had a chronic bleb with significant scar tissue. Prior to 2018, patients took lecithin in capsule form (4.8 g four times daily) while thereafter patients were recommended to ingest 5–10 g daily of organic powdered lecithin due to anecdotal data suggesting greater efficacy. Fifteen patients (44.1%) also were prescribed antibiotics for concurrent acute or subacute mastitis. Five patients received therapeutic ultrasound due to substantial plugging [7]. Two blebs causing acute obstruction were unroofed using a sterile needle [4]. One patient had used Gential violet for a diagnosis of yeast and ulcerated the surface of her nipple (Fig. 2); this was treated with closed wound care.

Several outlier patients underwent unique interventions. One patient who presented with an uncomplicated bleb at five months postpartum was not compliant with lecithin or topical triamcinolone therapy. She repeatedly unroofed her bleb at home for several months, then re-presented twelve months later with a more hypertrophic, painful bleb. At this point, 0.25 cc of triamcinolone acetonide (Kenalog) 40 mg/cc was injected into the bleb, which improved her pain and decreased the size of the bleb. A second injection of 0.25 cc Kenalog was attempted three weeks later. This injection worsened her pain, and no



**Fig. 2** Ulcerated nipple bleb in setting of topical Gential violet application

additional injection was performed. She subsequently presented five months later and requested excision of the increasingly hypertrophic lesion (Fig. 3A) that was performed with sharp excision in the clinic (Fig. 3B). Pressure was held for hemostasis and no suture was placed. She was provided with nipple balm and instructed to keep the area lubricated and closed until follow up one week later. At that time, the patient demonstrated resolution and healing of the previously hypertrophic scar, although a focal pinpoint bleb remained (Fig. 3C). Pathology identified the lesion to be squamous hyperplasia.

Another unique patient suffering from significant hyperlactation presented with multiple episodes of acute mastitis requiring antibiotic therapy; recurrent plugging that necessitated therapeutic ultrasound; subacute mastitis and chronic pain that were improved from supplemental probiotics; and, blebs that were temporized with use of oral sunflower lecithin and topical steroid cream. Hyperlactation was managed with block feeding, as well as pseudoephedrine and sage as needed. At six months postpartum, she elected to begin estrogen-containing oral contraceptive therapy to reduce milk production. Her blebs and other symptomatology resolved within two weeks and she remained asymptomatic at sixteen months postpartum.

Finally, one patient presented with severe subacute mastitis and multifocal nipple blebs in the setting of exclusive pumping. She underwent breastmilk culture that demonstrated multidrug resistant (MDR) *Staphylococcus aureus* and underwent intravenous antibiotic treatment. The blebs resolved with this treatment [8].

## Outcomes

Sixteen patients were followed until bleb resolution. Mean time to resolution was 6.6 +/- 5.2 weeks. Exactly half resolved

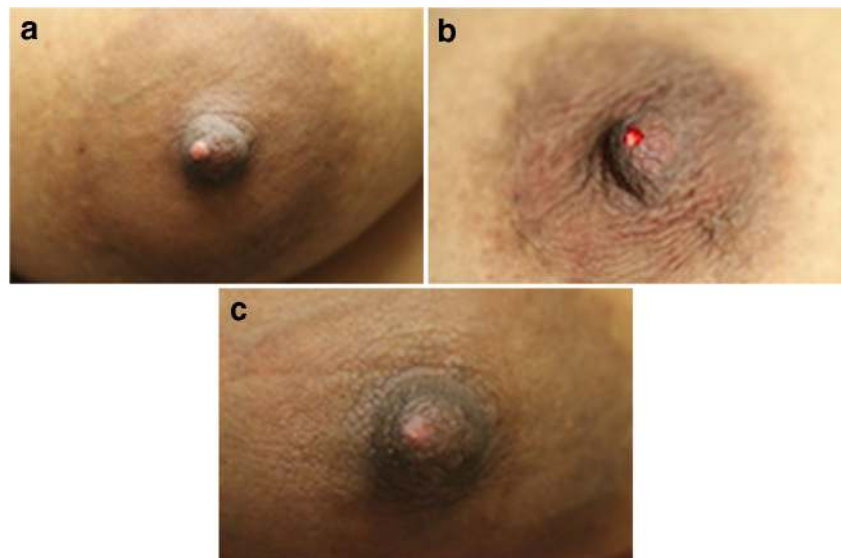
within one month, and all but three (81.3%) resolved within two months. Of these patients followed until resolution, all were instructed to take lecithin; one was noncompliant. Most (87.5%) were also treated with triamcinolone. Unroofing with a sterile needle was performed in two patients with subsequent decompression of obstructed milk, although there was persistence of small, non-obstructing blebs.

Eight women (50%) had concurrent acute or subacute mastitis and completed a course of antibiotics. Relative to women without mastitis, women with mastitis had a wider range of resolution time: 2–20 weeks versus 2–7 weeks. The two groups were similar in age, ethnicity, months postpartum, primiparity, breast pump use, topical steroid use, and lecithin use ( $p > 0.05$ ) (Table 1). To investigate whether concurrent acute or subacute mastitis requiring antibiotics affects bleb resolution time, we performed nominal logistic regression analysis. Following univariate analysis, mastitis was a significant predictor of resolution time  $> 1$  month (OR 9.0, 95% CI 0.9–86.5,  $p = 0.041$ ). On serial bivariate analysis, presence of mastitis remained significant when controlling for steroid use ( $p = 0.048$ ), but not when controlling for lecithin use ( $p = 0.085$ ).

## Conclusions and Future Research

Nipple blebs are common complications of lactation, and are frequently encountered by breastfeeding medicine specialists and lactation consultants. Several aspects of etiology, risk factors, and overlapping conditions demonstrated in our cohort illuminate potential clinical and cellular-level linkages. Achieving optimal outcomes in patients suffering from nipple blebs involve addressing underlying plugging and dysbiosis. However, our experience is preliminary and we advocate for

**Fig. 3** Hypertrophic, chronic bleb before **a**, immediately after **b**, and one week after **c** excision





**Table 1** Demographics, treatment patterns, and time to bleb resolution for 16 patients with complete follow-up. Data are presented as observed counts and column percent

Variable	Overall (n = 16)	Simple bleb (n = 08)	Bleb and mastitis (n = 08)	p-value <sup>a</sup>
Mean age (years)	33.2 ± 4.1	33.3 ± 3.2	33.1 ± 5.1	0.95
Months postpartum	3.4 ± 1.9	2.9 ± 1.7	3.8 ± 2.2	0.39
Primiparous				
No	9 (56.3%)	6 (75.0%)	3 (37.5%)	0.31
Yes	7 (43.8%)	2 (25.0%)	5 (62.5%)	
Prior lactation				
No	8 (50.0%)	3 (37.5%)	5 (62.5%)	0.62
Yes	8 (50.0%)	5 (62.5%)	3 (37.5%)	
Ethnicity				
Hispanic	9 (56.3%)	3 (37.5%)	6 (75.0%)	0.31
Non-Hispanic	7 (43.8%)	5 (62.5%)	2 (25.0%)	
Pumping				
No	8 (50.0%)	4 (50.0%)	4 (50.0%)	1.00
Yes	8 (50.0%)	4 (50.0%)	4 (50.0%)	
Lecithin				
No	1 ( 6.3%)	1 (12.5%)	0 ( 0%)	1.00
Yes	15 (93.8%)	7 (87.5%)	8 (100%)	
Antibiotics				
No	8 (50.0%)	8 (100%)	0 ( 0%)	n/a
Yes	8 (50.0%)	0 ( 0%)	8 (100%)	
Topical steroid				
No	2 (12.5%)	1 (12.5%)	1 (12.5%)	1.00
Yes	14 (87.5%)	7 (87.5%)	7 (87.5%)	
Mean time to bleb resolution (weeks)	6.6 ± 5.2	4.0 ± 1.7	9.3 ± 6.3	0.05

<sup>a</sup> Continuous variables were compared by the student's t-test. Categorical variables were compared by Fisher's exact test

future basic science and clinical studies to better characterize these lesions. As blebs may disrupt the breastfeeding relationship and therefore place maternal and infant health at risk, both improved understanding of pathophysiology and stronger evidence for specific treatments are needed.

### Etiology, Risk Factors, and Overlapping Conditions

Etiology and risk factors for the development of blebs likely vary and/or are additive, depending on the individual. Nipple blebs appear, in part, to represent a surface manifestation of deeper plugging in the breast [9]. Unfortunately there is a dearth of data regarding the pathophysiology of plugging. Anecdotally, women who report "fatty appearing milk" may be more likely to experience plugging and nipple blebs [10], and it is possible that individual variability in milk composition [11] may impact the viscosity of milk and likelihood of plugging. In other individuals, plugging may result from hyperlactation and/or an imbalance between milk production and extraction [6, 10]. Hyperlactation most often presents with both breasts producing more milk in excess of infant's needs. Individual lobules of the breast may also demonstrate

localized hyperlactation, plugging, and nipple bleb formation. A patient in our cohort with a unifocal bleb experienced a lactating adenoma in the quadrant draining to the associated orifice. It is possible that the dense glandular tissue associated with the lactating adenoma contributed to localized hyperlactation.

Some clinicians theorize that nipple blebs result from surface latch trauma [4] and epidermal overgrowth [5, 12]. However, blebs appear in women who have no history of trauma; we believe the inflammatory infiltrate on biopsy likely is related to superficial extension of deeper plugging. Further, unifocal versus multifocal variation in the presentation of blebs also do not support a traumatic etiology. Plugging as a primary etiology of bleb formation is further supported by the fact that many women with blebs resolve with use of oral sunflower lecithin, an emulsifier. Finally, many women in our cohort responded to a combination of lecithin and oral antibiotics, which treated both dysbiosis and plugging.

Subacute mastitis, or breast dysbiosis, can overlap in presentation with hyperlactation, or can present alone [13]. Subacute mastitis may promote plugging and bleb formation due to an imbalance of favorable and pathologic bacteria [8]. In addition to affecting the diversity within the milk

microbiome [14], the concentration of pathogens and/or somatic cells may alter the viscosity and adhesive properties of milk. Altered breastmilk microbiome has been demonstrated with cesarean births; it is possible that this alteration contributed to dysbiosis and formation of blebs in these patients [15]. Other environmental exposures also may contribute to dysbiosis and bleb formation [15]. For example, several women in our cohort had one or more risk factors for colonization with multidrug resistant (MDR) pathogens including the following: immunosuppression, NICU exposure, working in a healthcare setting or childcare environment, and receipt of procedures in Mexico during an outbreak of MDR surgical site infections [16].

### Management and Outcomes

Patients with blebs experience significant pain and early breastfeeding cessation, and optimal treatment regimens continually are evolving. Ineffective strategies for bleb management include frequent unroofing and application of Gentian violet or other caustic agents. These interventions potentiate trauma and development of scarring. Topical steroid cream applied to the surface of the bleb combined with oral sunflower lecithin appears to be a promising and effective treatment for unifocal blebs. Multifocal blebs present a more challenging situation requiring a more complex treatment paradigm that involves management of hyperlactation and dysbiosis. Our limited data suggest that blebs associated with acute or subacute mastitis may take longer to resolve than simple blebs, despite adequate antibiotic therapy. Research examining differences among these patients and their individualized management and treatment is needed.

### Advocacy and Lobbying

We advocate for basic science research as well as larger clinical trials to better understand these nipple lesions. While breastfeeding cessation rates due specifically to blebs are difficult to calculate, the associated complications such as mastitis are known to decrease breastfeeding duration [17]. Because duration and exclusivity of breastfeeding is tied closely to favorable maternal and infant health outcomes, reducing the morbidity caused by blebs is essential.

We would encourage investigation of cellular dysregulation mechanisms that may contribute to hyperlactation, both focusing on general glandular dysfunction and as well as individual lobules of the breast. We also would advocate for comprehensive breastmilk analysis, including fat and microbiota composition. Given the effectiveness of the emulsifier lecithin in treating blebs and plugged ducts, comparative studies focused on the viscosity and adhesive properties of breastmilk from women with and without these conditions may provide insight into the pathophysiology of these lesions. Breast ultrasound imaging may also help demonstrate common anatomic factors

such as dense glandular tissue, tortuous ducts, or certain patterns of retroareolar ductal convergence.

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