

Therapeutic Breast Massage in Lactation for the Management of Engorgement, Plugged Ducts, and Mastitis

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Abstract

Background: Many women in developed countries do not meet their breastfeeding goals and wean early because of breast pain.

Objective: This study aimed to describe clinical response to therapeutic breast massage in lactation (TBML) in the management of engorgement, plugged ducts, and mastitis.

Methods: Breastfeeding women presenting with engorgement, plugged ducts, or mastitis who received TBML as part of their treatment were enrolled (n = 42). Data collected at the initial visit included demographic, history, and exam data pre-TBML and post-TBML. Email surveys sent 2 days, 2 weeks, and 12 weeks following the initial visit assessed pain and breastfeeding complications. A nested case control of engorged mothers (n = 73) was separately enrolled to compare engorgement severity.

Results: Reasons for the visit included engorgement (36%), plugged ducts (67%), and mastitis (29%). Cases, compared to controls, were significantly more likely to have severe engorgement (47% vs 7%, $P < .001$). Initial mean breast pain level among those receiving TBML was 6.4 out of 10. Following TBML, there was significant improvement in both breast (6.4 vs 2.8, $P < .001$) and nipple pain (4.6 vs 2.8, $P = .013$). All women reported immediate improvement in their pain level. At the 12-week survey, 65% found the massage treatment very helpful. The majority of the women with a new episode of mastitis or plugged duct during the study follow-up found the techniques learned during the office visit very helpful for home management of these episodes.

Conclusion: In office, TBML is helpful for the reduction of acute breast pain associated with milk stasis. Mothers find TBML helpful both immediately in-office and for home management of future episodes.

Keywords

blocked ducts, breast engorgement, breastfeeding, breastfeeding experience, breastfeeding practices, breastfeeding support, breast pain, expression, mastitis

Well Established

Breast pain is a major cause of weaning. The likelihood of weaning increases the longer pain persists, and measures to resolve pain quickly are important. Engorgement, plugged ducts, and mastitis are commonly associated with acute breast pain. Emptying the breast is an important step in treatment algorithms for these conditions, and manual expression and massage techniques can help.

Newly Expressed

In-office, therapeutic breast massage in lactation provides an immediate, clinically significant reduction in acute breast pain associated with engorgement, plugged ducts, and mastitis.

Background

Despite being recognized as the biological norm of infant nutrition,¹ many women in developed countries do not meet their breastfeeding goals.²⁻⁴ US national data demonstrate that women less than 1 month postpartum commonly cite

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pain as a reason for weaning; 29% reported that “breastfeeding was too painful,” and 24% noted that “my breasts were overfull or engorged.”^{2,5-7} Given that the likelihood of weaning prematurely increases the longer pain persists,⁶ the need for interventions to resolve pain quickly remains important.

Engorgement, plugged ducts, and mastitis are common causes of pain that may lead to the temporary or permanent cessation of breastfeeding.⁸ According to the World Health Organization, although engorgement, plugged ducts, and mastitis are distinct entities, their pathogenesis involves the common denominator of milk stasis.⁹ There is consensus in the literature that breast emptying has a role in the management of all 3 conditions.^{9,10}

Some studies suggest that manual massage and expression techniques may help empty the breast, reduce pain, and assist in symptom resolution. Storr¹¹ studied 25 mothers and found that self-massaging 1 breast prefeeding decreased later engorgement symptoms in the same breast. In an observational study, Zhao et al¹² reported promising results regarding a 6-step manual technique for plugged duct treatment. Although no studies have specifically examined the effect of manual practices for mastitis, Thomsen et al¹³ showed that emptying the breast decreased the duration of mastitis and improved treatment outcomes. These and other studies^{12,14-16} support hands-on techniques for the treatment of milk stasis and its associated acute breast pain. However, further research is needed to quantify symptom relief and the effectiveness of particular milk removal techniques.

This study was undertaken to evaluate clinical symptoms following in-office therapeutic breast massage in lactation (TBML) for the treatment of engorgement, plugged ducts, and mastitis. Quantifying clinical response will provide information for future randomized controlled trials and evaluate the role of massage and hand expression in treatment regimens. We hypothesized that TBML would provide immediate symptom improvement, result in a clinically significant decrease in acute breast pain, and that mothers would find learning techniques at the visit helpful for future episodes at home.

Methods

Study Population

This study was conducted at Breastfeeding Medicine of Northeast Ohio (BFMEDNEO), a referral practice for mothers in Northeast Ohio needing specialized medical evaluation for breastfeeding difficulties. This practice is located at a private suburban pediatric practice in Cleveland, Ohio, viewed by the community as breastfeeding friendly.

Study Design

This prospective study consisted of 2 arms. Arm 1 was designed to assess the effect of TBML on engorgement,

plugged ducts, and mastitis and was conducted from June 2013 through March 2014. Inclusion criteria were breastfeeding women (1) 18 years or older presenting to BFMEDNEO with a history of acute breast pain, (2) diagnosed with engorgement, plugged duct, or mastitis at the visit, and (3) treated during the office visit with TBML. Diagnosis of engorgement, plugged duct, and mastitis was made according to standard criteria,^{9,17} following history and physical exam by the treating provider. Women were excluded if there was clinical evidence of abscess confirmed by follow-up ultrasound.

Arm 2 provided a control comparison to the engorged mothers treated with TBML. It was conducted at the general pediatric practice from December 2013 through January 2014. Inclusion criteria were all breastfeeding mothers 18 years or older presenting at the initial newborn pediatric office visit. Mothers were excluded from the control group if they received TBML.

All cases were recruited by the treating practitioner. All participants gave written informed consent. The research study was approved by the University Hospitals of Cleveland Institutional Review Board.

All women receiving in-office TBML completed a patient questionnaire at the initial visit for demographic information and clinical history. History, exam, and treatment data were collected. Pain, engorgement levels, home treatments, feeding patterns, and breastfeeding complications were collected via email questionnaires administered at 2 days, 2 weeks, and 12 weeks. All data were collected and managed using the REDCap electronic data capture tools hosted at University Hospitals of Cleveland.¹⁸ All women in arm 1 received treatment with TBML from trained clinicians. Descriptions of these techniques have been outlined earlier.^{18,19} In brief, they embrace the principles of

1. Focused gentle massage toward the axillae.
2. Alternating gentle massage and hand expression.

The massage is continually adjusted to the patient's comfort level. Details of the TBML techniques are outlined in Appendix A (available online). The visit was not limited to TBML but was combined with a full consult by an International Board Certified Lactation Consultant/registered nurse and/or breastfeeding medicine physician. During the visit, mothers received basic breastfeeding support (ie, latch correction, feeding patterns, milk supply assessment, engorgement education) as clinically indicated. They also received instruction on hand expression and gentle massage techniques. If clinically indicated following medical evaluation, antibiotic prescription, removal of white spot or nipple bleb with a sterile needle,²⁰ and breast milk cultures were performed and recorded. For mothers diagnosed with mastitis, antibiotics were prescribed along with other standard protocol measures including milk removal, supportive measures, and analgesia as recommended.¹⁰

In arm 2, history, exam, and survey data were collected as in arm 1. Also like arm 1, this routine visit was integrated with a lactation consultation²¹ that provided basic breastfeeding support, hand expression, and massage education.

Descriptive Measures

Descriptive variables including history of breastfeeding problems, prior treatment history, current breastfeeding-related diagnoses, breast milk bacterial species growth, and 12-week data for weaning and breastfeeding complications were recorded as previously described.²² Mothers presenting with engorgement were asked additional categorical questions on previous hand expression and massage instruction as well as hospital birthing practices, such as pacifier use, formula supplementation, and rooming-in. All mothers were asked to respond to the question, "What remedies have you tried at home before the initial visit?" Categorical answers included nothing, feeding the baby more frequently, reverse pressure softening, hand expressing, pumping, massage, cool and warm compresses, and lecithin.

Outcome Measures

Outcome variables included breast and nipple pain, engorgement severity for the engorged mothers, and plugged duct severity for the mothers with plugged ducts.

Breast and nipple pain severity in the past 24 hours was rated on a numerical rating scale from 0 to 10, with 0 indicating pain free and 10 indicating the most severe pain.^{19,23} Pain was rated by the patient at the initial visit premassage and postmassage treatment and in 2-day and 12-week email surveys in response to the questions, "How bad has your breast pain been in the past 24 hours?" and "How bad has your nipple pain been in the past 24 hours?" Pain was also rated during examination with manual expression of breast milk and nipple tenderness to light touch premassage and postmassage.

Maternal response to massage treatment was recorded categorically following in-office treatment. Mothers were asked, "How has pain changed?" (same, more pain, less pain) and the percentage they felt their symptoms had improved (none, 10%, 25%, 50%, 75%, resolved).

Engorgement severity was rated on Humenick et al's²⁴ engorgement scale: (1) soft, no change; (2) slight change; (3) firm, nontender; (4) firm, beginning tenderness; (5) firm, tender; or (6) very firm and very tender. Engorgement severity was recorded for right and left breast separately, premassage and postmassage treatment, and at the 2-day survey.

Plugged duct severity was rated as (0) none; (1) less than 3 cm; (2) greater than 3 but less than 5 cm; (3) greater than or equal to 5 cm; or (4) multiple plugged areas. Plugged duct severity was recorded premassage and postmassage treatment.

Assessment of Mothers' Perception of In-Office Therapeutic Treatment

At the end of the 2-day and 12-week survey, mothers were asked, "Do you feel the massage in the office was helpful?" If helpful, they were asked, "What was helpful about the visit and the massage?" At the 2-week and 12-week survey, they were asked, "Were the treatments learned during the visit helpful for future episodes of mastitis or plugged duct?" Mothers categorically responded (not helpful, somewhat helpful, helpful, very helpful) and were given additional space to respond descriptively.

Analyses

Once collected, the data were exported from REDCap to SPSS software (SPSS, Inc, Chicago, Illinois, USA) and analyzed under the supervision of the project investigator. Descriptive statistical analyses were performed to examine the distribution and normality of data. The main analyses tested clinical response to TBML for pain level, engorgement severity, and plugged duct size. To further identify differences in treatment responses, we analyzed the group as a whole and then categorized 2 treatment groups: engorgement ($n = 15$) and mastitis/plugged duct (MPD) ($n = 27$). Mastitis and plugged duct were initially evaluated as 1 subgroup since 2 patients were diagnosed with both mastitis and plugged duct. A further subanalysis was performed separating mastitis and plugged duct treatment response. Those 2 patients diagnosed with both mastitis and plugged duct were excluded from this subanalysis to more clearly differentiate treatment response for plugged duct and mastitis.

Our primary analysis was to assess pain, engorgement, and plugged duct severity pre-TBML and post-TBML for the total sample. Categorical variables were described with frequency and percentages and compared between engorgement and MPD groups using Pearson chi-square tests. Fisher exact test was used when the expected count was less than 5. Continuous variables were described as means and standard deviations (SDs) or median and range as appropriate. Paired t test was used to compare pain, engorgement, and plugged duct severity pretreatment and posttreatment, both for the entire group and for the subanalysis of the mastitis and plugged duct groups. Power calculations were performed using Stata version 11.1 with the command SAMPSI. Power analysis revealed that in order to observe our difference in mean pain levels premassage and postmassage treatment ($\beta = 0.80$ and $\alpha = 0.05$), a sample size of 25 patients was needed.

A secondary case-control analysis compared engorged mothers treated with TBML with the control group. The groups were compared in terms of sample characteristics, delivery information, hospital experience, feeding patterns,

Table 1. Sample Characteristics and Home Remedies.

Sample Characteristic	Total (N = 42), No. (%)
Maternal age, median (range), y	32 (23-43)
Infant age, median (range), wk	5 (0-148)
Private insurance	34 (85)
College graduate	33 (79)
Caucasian	31 (78)
Returning to work	26 (62)
Multiparous	23 (55)
Exclusive breastfeeding	30 (71)
Breastfeeding goal > 12 months	27 (66)
Vaginal delivery	27 (64)
Previously taught hand expression	33 (79)
Previously taught breast massage	22 (52)
Remedy Tried at Home Before Initial Visit	
Nothing	2 (5)
Feeding the baby more frequently	12 (29)
Reverse pressure softening	3 (7)
Hand expressing	18 (43)
Pumping	26 (62)
Massage	26 (62)
Cool compresses	15 (36)
Warm compresses	29 (69)
Lecithin	4 (10)

initial exam, pain, and engorgement severity at the 2-day survey, and breastfeeding rates and complications at the 12-week survey.

Results

In our primary analysis, we tested the hypothesis that in-office TBML results in a significant decrease in acute breast pain. We quantitatively measured pain by asking mothers their impression of pain level before and after in-office massage. We also tested the hypothesis that engorgement and plugged duct severity would decrease.

During the 10-month study period, 43 mothers received TBML for acute breast pain associated with milk stasis. One was excluded from the analysis because of abscess diagnosed upon ultrasound evaluation. We analyzed 42 mothers diagnosed with engorgement (36%), plugged ducts (67%), and mastitis (29%) (Table 1). Median maternal age was 32 years and median infant age was 5 weeks. Both the engorgement and MPD groups had similar baseline characteristics with regard to maternal age, parity, breastfeeding intent, return to work, education, insurance, and previous instruction on hand expression and massage. Mothers presenting with MPD were significantly more likely to be Caucasian (57% vs 89%, $P = .044$) and have older infants (0.7 vs 10 weeks, $P < .001$). Most mothers had tried home remedies, as stated above, before presenting at the initial visit (Table 1).

Initial Pain Levels, Engorgement, and Plugged Duct Severity

To test our primary hypothesis that in-office TBML results in a significant decrease in acute breast pain, we assessed baseline breast and nipple pain in the 24 hours preceding the office visit, pain duration, and pain on examination (Table 2). Initial mean (SD) breast pain for the entire sample was 6.43 (2.5). Median duration of pain before office visit was 24 to 48 hours for engorged mothers and 72 to 96 hours for MPD ($P = .013$). On examination, mothers with engorgement compared to MPD had higher levels of both breast tenderness (8.27 vs 6.5, $P = .041$) and nipple tenderness (6.93 vs 4.3, $P = .021$). Ninety-three percent of engorged mothers presented with periareolar swelling. Engorgement severity was recorded on both breasts. Each breast was considered independently for a final sample of 30. On the Humenick engorgement scale, 53% were very firm, very tender. Initial evaluation of plugged duct severity revealed that the swollen area measured greater than 5 cm for 36% of cases (Table 2).

Treatment response. We assessed clinical response to in-office TBML treatment in terms of pain, engorgement, and plugged duct severity (Table 2).

Pain outcome. Breast and nipple pain significantly decreased after hands-on treatment with a mean (SD) decrease of 3.9 (2.4) for breast pain and 2.1 (3) for nipple pain ($P < .01$). A subanalysis of mothers with mastitis and plugged duct revealed that both the mastitis and plugged duct groups independently reported a significant ($P < .001$) decrease in maternal breast pain and breast tenderness on exam following treatment (Appendix B).

Engorgement outcome. The number of mothers with periareolar swelling on exam significantly decreased (93% vs 7%, $P < .001$) following TBML. Engorgement severity was assessed on the Humenick²⁴ 6-point scale. Pretreatment mean engorgement severity was 5.31 (between firm, tender and very firm, very tender). Posttreatment mean engorgement severity was 3.48 (between firm, nontender and firm, beginning tenderness). Mean (SD) engorgement severity significantly changed by 1.82 (1.6) levels ($P < .01$). When looking at specific levels of engorgement, significantly fewer mothers reported very firm, very tender breasts posttreatment (0%) as compared to pretreatment (53%) ($P < .01$).

Plugged duct outcome. Plugged duct severity significantly decreased following treatment. Only 7% of mothers had a plugged duct measuring greater than 3 cm posttreatment as compared to before massage (68% vs 7%), and for 57% of mothers, the plugged ducts were resolved ($P < .001$).

Case Control Engorgement Severity

To better understand the sample of breastfeeding mothers who received in-office treatment, we performed a nested

Table 2. Treatment Response to Therapeutic Breast Massage in Lactation.

Pain (n = 42)	Premassage	Postmassage	Mean (SD) Change	P Value ^a
	Mean (SD)			
Breast pain level (maternal report)	6.4 (2.5)	2.8 (1.5)	3.6 (2.2)	< .001 ^b
Nipple pain level (maternal report)	4.6 (3.9)	2.8 (2.4)	1.8 (3.2)	.001 ^b
Breast tenderness (on exam)	7.14 (2.7)	3.26 (1.8)	3.9 (2.4)	< .001 ^b
Nipple tenderness (on exam)	5.2 (3.7)	3.1 (2.4)	2.1 (3)	< .001 ^b
Engorgement (n = 30)	No. (%)			
1. Soft, no change	0 (0)	1 (2)		1.00
2. Slight change	0 (0)	3 (10)		.237
3. Firm, nontender	2 (7)	5 (17)		.424
4. Firm, beginning tenderness	3 (18)	14 (47)		.002
5. Firm, tender	11 (37)	5 (17)		.08
6. Very firm and very tender	16 (53)	0 (0)		< .001
Engorgement severity, mean (SD)	5.31 (1.2)	3.48 (1.2)	1.82 (2.6)	< .001 ^b
Plugged Duct (n = 28)	No. (%)			
Resolved/gone	0 (0)	16 (57)		< .001
1. 1-3 cm	9 (32)	10 (36)		.778
2. > 3 but < 5 cm	5 (18)	2 (7)		.422
3. > 5 cm	11 (39)	0 (0)		< .001
Plugged duct level, mean (SD)	2.29 (1)	0.5 (.3)	1.8 (1.1)	< .001 ^b

^aPearson chi-square for dichotomous variables unless noted by superscripted b for paired t test.

case-control study on engorged mothers. During this arm, 95 mothers were screened, 20 declined, and 2 were excluded because they received TBML. Seventy-three were enrolled for the final analysis. We compared the mothers treated in-office with TBML for breast engorgement with the control group. There was no difference between case and control for baseline characteristics, delivery, or hospital information. However, cases were less likely to drain 1 side before switching to the second side (67% vs 89%, $P = .038$) (Table 3). There was no difference between groups for exclusive breastfeeding (67% vs 88%, $P = .06$), although the lack of difference could represent a type II error given the low power (0.40). Cases were less likely to be exclusively direct breastfeeding (40% vs 82%, $P = .002$) and were more likely to cite pain as the reason for not doing so (27% vs 4%, $P = .015$). Those mothers treated in-office for engorgement were significantly more likely to have very severe engorgement (47% vs 7%, $P < .001$), cracked nipples (73% vs 37%, $P = .01$), and more severe nipple tenderness (6.9 vs 3.2, $P < .001$) and breast tenderness on exam (8.3/10 vs 2.1/10, $P < .001$).

Massage and In-Office Treatment

Median length of massage time was 30 minutes with a range of 15 to 60 minutes with no significant difference between MPD and engorgement groups ($P = .137$).

Eight mothers (17%) had a bleb unroofed. Fourteen mothers (33%) were prescribed oral antibiotics; however, at the 2-day survey, only 8 mothers had taken the antibiotics. Two mothers had ultrasounds, 1 revealing no mass and the second a benign solid mass. Seventeen mothers (40%) had a breast milk culture sent, with 5 (30%) of the cultures growing *Staphylococcus aureus*.

Follow-Up

Thirty-eight women completed the 2-day survey. Ninety-two percent reported pain improvement and 43% reported pain resolution. Forty-one women completed the final survey. At 12 weeks, 65% of mothers were exclusively breastfeeding as compared to 71% at the initial visit, and 5 (14%) had weaned. Two weaned because of low milk supply, 2 planned on weaning, and 1 weaned because of both low milk supply and continued pain. At 12 weeks, 6 women reported a new episode of mastitis (17%) and 10 women reported a new episode of plugged duct (27%) occurring at some point during the 12-week follow-up. One mother, originally seen for engorgement, reported treatment for an abscess.

Follow-up between the case and control engorgement groups was similar. Whereas the TBML treatment group presented with significantly more severe engorgement at the initial visit, by the 2-day survey, there was no difference in pain

Table 3. Engorgement Case Control Comparisons.

Sample Characteristic	Case (n = 15), No. (%)	Control (n = 73), No. (%)	P Value ^a
Maternal age, years (range)	33 (23-40)	31 (23-42)	.571
Infant age, weeks (range)	0.71 (0.43-4.86)	0.57 (0.43-1.43)	.13
Private insurance	13 (93)	64 (88)	1.00
College graduate	11 (73)	63 (86)	.247
Caucasian	8 (57)	59 (81)	.080
Working mother	11 (73)	56 (77)	.780
Multiparous	11 (73)	36 (49)	.089
Breastfeeding goal > 12 months	7 (47)	44 (61)	.301
Delivery information			
Vaginal delivery	12 (80)	60 (80)	1.00
Natural	3 (25)	11 (18)	.687
Intravenous fluids during delivery	12 (80)	68 (93)	.126
Hospital experience			
Pacifier	6 (40)	23 (32)	.552
Room-in with infant	14 (93)	68 (94)	.866
Hand expression taught	10 (67)	44 (60)	.643
Formula supplement	4 (27)	10 (14)	.271
Feeding patterns			
Exclusive breastfeeding	10 (67)	64 (88)	.06
Direct breastfeeding exclusively	6 (40)	60 (82)	.002
Drain 1 side first	8 (67)	61 (88)	.040
Offer both	10 (77)	54 (81)	.72
Alternate	10 (83)	65 (97)	.105
Initial exam			
Engorgement very severe	7 (47)	4 (7)	< .001
Breast tenderness on manual expression, mean (SD)	8.3 (2.7)	2.3 (3)	< .001
Cracked nipples	11 (73)	27 (37)	.01
Periareolar swelling	14 (93)	26 (36)	.01
2-Day Outcome	Case (n = 15)	Control (n = 56)	
Engorgement very severe	1 (8)	3 (5)	.563
Breast pain	3.0 (2.6)	2.6 (2.4)	.61
Nipple pain	2.7 (2.8)	3.7 (2.4)	.183
Pain-free breasts	5 (39)	24 (36)	1.00
12-Week Outcome	Case (n = 13)	Control (n = 64)	
Pain-free breasts	11 (85)	58 (92)	.343
Current exclusive breastfeeding	7 (58)	44 (67)	.536
Weaned	3 (25)	7 (10)	.168
Breastfeeding complications			
Mastitis	3 (21)	4 (6)	.15
Plugged duct	3 (25)	12 (19)	.70
Abscess	0	3 (5)	.07

^aPearson chi-square used except in cases when cell count less than expected and then Fisher exact t test used.

or engorgement severity between groups. Furthermore, at 12 weeks, there was no difference in pain, exclusive breastfeeding, or breastfeeding complications (Table 3). However, the possibility of a type II error remains given the low power to detect differences at the 12-week follow-up due to a small sample size (eg, the power to detect a difference in mastitis

outcome was only 0.295). To further check whether our non-significant results were due to a lack of statistical power, we conducted post hoc power analyses (with $\beta = 0.80$ and $\alpha = 0.05$, two-tailed), which indicated that sample size would have to increase to 415 ($n = 83$ for case and $n = 332$ for control) to be powered to evaluate 12-week outcomes.

Table 4. Mothers' Impressions on Therapeutic Breast Massage in Lactation.

Question	Impression
What was helpful about the visit and the massage?	<p>"Pain relief was amazing."</p> <p>"The immediate relief and learning the techniques."</p> <p>"It was great to learn how to proceed to do it and how useful it is."</p> <p>"Massage and resolving mastitis helped me meet my goal of exclusive breastfeeding. I would not have succeeded without this help."</p> <p>"Massaging your own breast while nursing can sometimes be challenging. Having a professional assist was more effective."</p>
Were the treatments learned during the visit helpful for future episodes of mastitis or plugged duct?	<p>"I felt like I was getting a plugged duct in my right breast a week ago and I did the massaging and it cleared up!"</p> <p>"I learned how to do it, and when I had a new episode of plugged duct, I was able to resolve it by myself quickly using hand expression and breast massage techniques that I learned."</p>

To further evaluate potential benefits from in-office treatment and whether the techniques could be taught for use at home, we asked mothers in the 12-week follow-up about what home treatments they tried if they developed a subsequent plugged duct or mastitis and if massage and hand expression were helpful. Among those mothers experiencing an episode of plugged duct or mastitis, all found the techniques helpful for home treatment, with 60% of mothers with mastitis and 80% with plugged ducts finding them "very helpful."

Mothers' Impressions

In-office immediately following TBML treatment, mothers were asked to rate how their pain changed. All mothers reported less pain. Eighty-six percent of mothers at the 2-day survey and 82% at the 12-week survey found the massage helpful, with 65% of mothers at 12 weeks finding the massage very helpful.

When asked to describe what they found helpful, mothers were likely to mention at least 1 of 3 themes: immediate relief, learning specific techniques, or support received (Table 4). Mothers saw value in the in-office TBML and were pleased with this service. No mothers found the service unhelpful. One mother noted that the massage did not help relieve her symptoms because later ultrasound evaluation revealed that she had a benign solid mass rather than a plugged duct. Nevertheless, she noted, "I believe the breast massage helped to increase my milk production."

Discussion

The primary findings of our study reveal that TBML provides immediate significant pain reduction for engorgement, plugged ducts, and mastitis. We also demonstrate that TBML reduces engorgement severity and provides immediate size reduction—and, at times, complete resolution—for plugged ducts. Furthermore, mothers reported that TBML was helpful both immediately and for future episodes of mastitis

and plugged ducts. To our knowledge, this is the first study to quantitatively examine clinical response to therapeutic breast massage along with mothers' perception of care.

Our study shows that TBML provides an important additional treatment option for the clinician facing a case of engorgement. It is common for clinicians to recommend feeding more frequently and applying warm or cold compresses and cabbage leaves for the treatment of engorgement.^{8,25} In our study, many women had already tried home treatments and continued to have severe symptoms. Therapeutic breast massage in lactation offered an immediate decrease in engorgement severity which, as confirmed by our 2-day survey, continued beyond the office visit.

An additional strength of the study is that we put our sample in context by comparing the mothers receiving TBML for their engorgement with a control group of postpartum mothers from a similar patient population. Our results suggest that although the majority of mothers do not have severe engorgement postpartum, those mothers who do are likely to find immediate pain relief from TBML. Furthermore, there was no difference in exclusive breastfeeding or breastfeeding complications between the groups at the 12-week follow-up, although this should be interpreted with caution given the sample size.

This was a pilot study and, thus, long-term follow-up was a study limitation. Our study was not adequately powered to evaluate the effect of treatment on weaning, breastfeeding rates, or mastitis or plugged duct recurrence. Future studies could identify whether TBML has an effect on long-term breastfeeding complications or success.

Empowering mothers to resolve complications at home may be a critical skill for extending breastfeeding duration. The 12-week follow-up was a study strength because it identified the potential benefit of training mothers in the hands-on techniques. Our study is the first to ask if mothers found the techniques helpful both immediately and in the future. Our results were encouraging because mothers with repeat episodes of milk stasis reported an ability to use the techniques

after in-office instruction. This suggests that TBML can be taught to mothers and other professionals. Further study will need to evaluate the most effective way to teach the massage technique, in particular how hands-on demonstration compares to verbal or written teaching. Whereas teaching the TBML techniques may be empowering to mothers, it is important to emphasize that TBML complements other interventions, and mothers and health care providers should continue to use established protocols for treatment.^{9,10} Other treatments are especially important in cases of infectious mastitis where milk stasis, although a contributing factor, is not the only etiology, and antibiotics and other interventions may be required.¹⁰

Given that our study was a descriptive pilot study, we could not compare TBML with other reported treatments for milk stasis¹³ and therefore cannot assess relative efficacy. Also, given that it was not a randomized controlled trial, we cannot assess placebo effect on pain reduction. Like other studies, we found clinical improvement with hands-on treatment for plugged duct and engorgement.^{12,13,16} Similar to the Thomsen et al¹³ study, we found symptomatic improvement in mastitis with breast emptying. Future randomized studies are needed to compare TBML with other hands-on treatments for milk stasis.

The study was conducted at a breastfeeding medicine practice where teamwork between lactation consultants and physicians allows the ability to clinically evaluate for serious complicating conditions such as abscess. We did not use TBML in isolation but, rather, in the context of full breastfeeding support. All practitioners in this study received specific training on TBML techniques. Therefore, the reproducibility of this study may be limited by breastfeeding support, experience, skill level of practitioners, and training availability. In addition, the study population was an educated, primarily Caucasian group committed to breastfeeding. The benefits of TBML should not be extrapolated to other settings.

Conclusion

When treating mothers for acute breast pain associated with milk stasis, our study supports a role for TBML in providing immediate clinically significant improvements in pain, engorgement, and plugged duct severity. Mothers find this treatment helpful and continue to use the techniques learned for future episodes.

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Supplementary Material

Supplementary material for this article is available online at <http://jhl.sagepub.com/supplemental>.

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