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Change in mode of feeding after ultrasonic therapy for lactating mothers with blocked mammary ducts

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Objectives: To retrospectively evaluate the effectiveness of ultrasonic therapy for severe breast engorgement or blocked mammary ducts, and to report the change in the mode of feeding after ultrasonic therapy and lactation consultation for mothers.
Methods: Medical records of mothers who underwent ultrasonic therapy for blocked milk ducts between November 2017 and 2020 at the Princess Margaret Hospital were retrieved. The physiotherapist assessed the visual analogue scale score for pain before and after therapy. The mode of feeding was recorded at the first consultation and at 2 weeks after the latest therapy.
Results: A total of 285 women aged 17 to 44 years underwent ultrasonic therapy for blocked milk ducts. 20.7% and 79.3% of women had one and both breasts affected, respectively. The total number of breasts included for analysis was 511. The number of ultrasonic therapies per breast varied from one to 13. After the first ultrasonic therapy, the mean pain score improved from 5.5 to 2.8, with a mean reduction of 2.7, which represented a mean of 54.7% reduction in pain score. Similarly, reduction of pain score was significant in subsequent ultrasonic therapy sessions ($p<0.001$). There was a trend towards association between the number of therapies and reduction in pain score ($r= -0.07$, $p=0.079$). At 2 weeks after the latest therapy, mothers who practised exclusive breastfeeding increased from 49.1% to 64.3%.
Conclusion: Ultrasonic therapy is effective for treatment of symptomatic postpartum breast engorgement and blocked milk ducts. It should be promulgated to all lactating mothers.

Keywords: Breast feeding; Mammary glands, human; Ultrasonic therapy

Introduction

Breastfeeding is the first step in promotion of health and wellbeing of infants and their families. The World Health Organization recommends that babies be exclusively breastfed for at least the first 6 months of their lives for optimal growth, development, and health[1]. The benefits of breastfeeding to both infants and mothers are well recognised[1,2].

Breastmilk provides optimal nutrition for newborn babies and protects against infectious disease such as otitis media, respiratory infection, diarrhoea, eczema, and allergy[3,4]. It also helps prevent future obesity and diabetes mellitus[5]. For mothers, breastfeeding reduces the risks of postpartum haemorrhage, anaemia, and breast and ovarian cancer[6,7]. Nonetheless, women may discontinue breastfeeding prematurely owing to biophysical, psychosocial, and sociodemographic factors[8,9]. Breast engorgement, despite a normal biological process during the immediate postpartum period, is a common cause of formula-milk supplementation and early cessation of breastfeeding. Within postpartum days 3 to 5, the breasts become swollen, hard, throbbing, aching, tender, and painful if emptying of breastmilk is insufficient. This may be due to improper positioning, infrequent nursing, and early or unnecessary supplementation with formula feeding. In severe cases, milk stasis occurs and may result in blocked ducts and further aggravation of the engorgement.

Two-thirds of breastfeeding mothers experience blocked ducts, which make lactation painful and difficult and cause anxiety and frustration to mothers and babies[10]. Conventional managements for difficult breastfeeding include watchful waiting (as blocked ducts often

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resolve within 24 hours), thermal therapy, cabbage leaf treatment, acupuncture, self-massage, use of herbal tea or pharmaceuticals, and ultrasonic therapy[11,12]. Ultrasonic therapy is a successful strategy to treat blocked milk ducts in lactating mothers[12-15]. It can reduce pain and inflammation and accelerate healing after soft tissue damage[16,17]. This study aims to retrospectively evaluate the effectiveness of ultrasonic therapy for severe breast engorgement or blocked mammary ducts, and to report the change in the mode of feeding after ultrasonic therapy and lactation consultation for mothers.

Methods

This study was approved by the Kowloon West Cluster Research Ethics Committee (reference: KW/EX-21-114(161-14)). Medical records of mothers who underwent ultrasonic therapy for blocked milk ducts between November 2017 and 2020 at the Princess Margaret Hospital were retrieved. In April 2016, a lactation consultation clinic was established to facilitate continuation of breastfeeding by reducing pain from blocked milk ducts through ultrasonic therapy by physiotherapists. Mothers with breastfeeding-related problem (mastitis, blocked ducts, and breast engorgement) with fever were assessed by a consultant and then referred to a physiotherapist for ultrasonic therapy. The physiotherapist assessed the visual analogue scale score for pain before and after therapy. The mode of feeding was recorded at the first consultation and at 2 weeks after the latest therapy. The mother was instructed to call back if symptoms persisted or recurred.

Data collected included mother age, parity, baby maturity at birth, mode of delivery, interval between delivery and therapy, number of therapy sessions received, pain score before and after ultrasonic therapy, mode of feeding, whether baby was separated from mother after delivery, and use of breast pump.

The Shapiro-Wilk normality test was used to examine the distribution of reduction in pain score after ultrasonic therapy. The pain score before and after ultrasonic therapy was compared using the paired *t* test or Wilcoxon signed-rank test for each ultrasonic therapy. Association between pain score reduction and the number of ultrasonic therapies was estimated using the linear mixed-effects model with random slope (number of ultrasonic therapies) and intercept (breast nested within subjects) and was adjusted by pre-therapy pain score, age, parity, and maturity. The mode of feeding before the first therapy and at 2 weeks after the latest therapy was compared using the McNemar-Bowker test. A p value of <0.05 was considered statistically significant. Statistical analysis was performed using version 4.1.1 with 'Ime4', 'ggplot2', and 'ggpubr' packages.

Results

Between November 2017 and 2020, 285 women aged 17 to 44 (mean, 32.1) years underwent ultrasonic therapy for blocked milk ducts (Table 1). 16 (5.6%) women delivered their babies at <37 weeks of gestation. 189 women were primiparous and 96 women were multiparous. 105 (36.8%) women were separated from their infants who were admitted to neonatal units. The most common breastfeeding issue was breast refusal (22.8%), followed by milk insufficiency (11.6%) and sore nipples (14.0%). 20.7% and 79.3% of women had one and both breasts affected, respectively. The total number of breasts included for analysis was 511. The number of ultrasonic therapies per breast varied from one to 13.

After the first ultrasonic therapy, the mean pain score improved from 5.5±2.4 to 2.8±2.2, with a mean reduction of 2.7, which represented a mean of 54.7% reduction in pain score (Table 2). Similarly, reduction of pain score

Table 1. Baseline characteristics of mothers with blocked milk ducts

Characteristic	Mothers with blocked milk ducts (n=285)*
Age, y	32.1±4.5
Maturity, wk	38 (38-39)
<34	14 (4.9)
34-36	2 (0.7)
≥37	269 (94.4)
Parity	
1	189 (66.3)
2	79 (27.7)
3	16 (5.6)
4	1 (0.4)
Mode of delivery	
Normal spontaneous delivery	150 (52.6)
Vacuum extractor/forceps delivery	29 (10.2)
Caesarean section	106 (37.2)
Breast affected	
Single	59 (20.7)
Both	226 (79.3)

* Data are presented as mean ± standard deviation, median (interquartile range), or No. (%) of participants

was significant in subsequent ultrasonic therapy sessions (p<0.001). There was a trend towards association between the number of therapies and post-therapy pain score (*r*= -0.07, p=0.079, Table 3).

At 2 weeks after the latest therapy, 16 mothers were lost to follow-up, with the attrition rate being 5.6%. Before ultrasonic therapy, 49.1% of mothers breastfed exclusively, 50.6% supplemented with formula milk, and 0.4% formula-fed only. At 2 weeks after the latest therapy, the corresponding percentages were 64.3%, 31.2%, and 4.5%, respectively. 21.6% changed from mixed breast- and formula-feeding to exclusive breastfeeding, 8.9% changed from exclusive breastfeeding to mixed breast- and formula-feeding, and 69.5% did not change the mode of feeding (Table 4). The changes were significant (p<0.001, marginal homogeneity test).

Discussion

Blocked milk ducts are characterised by pain, swelling, heat, hardness of breast tissue, skin tightness, and discomfort, and are challenging for mothers physically and emotionally. In a survey performed in our hospital in 2015, 82.7% of mothers opted for breastfeeding, but the percentage dropped to 35.3% at 4 weeks after delivery, because 24% of mothers complained of blocked ducts that led to reduced milk production and difficult lactation[18]. Pain from blocked ducts is a major barrier to breastfeeding. In the present study, the percentage reduction in pain score after ultrasonic therapy ranged from 52.1% to 67.5%.

Ultrasonic waves generated from the piezoelectric crystal provide stable cavitation and acoustic streaming and enhance tissue fluid interchange and local blood flow. The improved local circulation facilitates removal of milk from the engorged breast and leads to less pain and congestion. The nursing mothers can continue to breastfeed once the drainage of breast milk and pain resolved[12,14]. Ultrasonic therapy enables faster resolution of pain and hardness in the breasts from the second therapy onwards[14].

Table 2. Pain score before and after ultrasonic therapy

Session	No. of breasts	Mean±standard deviation pain score		Mean (95% confidence interval)		p Value
		Before ultrasonic therapy	After ultrasonic therapy	Reduction in pain score	% Reduction in pain score	
1	511	5.5±2.4	2.8±2.2	2.7 (2.6-2.9)	54.7 (52.1-57.2)	<0.001
2	285	5.3±2.2	2.8±2.1	2.5 (2.4-2.7)	52.3 (49.1-55.4)	<0.001
3	105	5.0±2.3	2.6±2.1	2.4 (2.1-2.7)	52.1 (46.2-58.0)	<0.001
4	69	4.5±2.2	2.4±2.2	2.1 (1.8-2.4)	55.7 (48.0-63.4)	<0.001
5	43	5.0±2.3	2.7±2.1	2.3 (1.9-2.7)	54.5 (45.3-63.8)	<0.001
6	24	5.2±2.4	3.0±2.1	2.1 (1.5-2.7)	45.9 (34.0-57.8)	<0.001
7	23	3.8±2.6	1.7±2.2	2.1 (1.3-2.9)	67.5 (52.9-82.1)	<0.001
≥8	22	4.6±2.2	2.0±1.7	2.6 (2.1-3.2)	64.0 (52.3-75.7)	<0.001

Table 3. Multivariable mixed-effects model for association between the number of therapies and post-therapy pain score

Variable	Coefficient (95% confidence interval)	p Value
(Intercept)	1.74 (0.71-2.80)	0.002
No. of ultrasonic therapies	-0.07 (-0.14-0.01)	0.079
Pain score before ultrasonic therapy	0.30 (0.26-0.34)	<0.001
Mother age	-0.01 (-0.03-0.02)	0.527
Parity	-0.03 (-0.22-0.16)	0.793
Maturity, wk		
<34	Reference	-
34-36	-0.33 (-0.90-0.32)	0.296
≥37	-0.30 (-0.74-0.20)	0.232

Table 4. Mode of feeding before the first ultrasonic therapy and at 2 weeks after the latest therapy (n=269)*

Mode of feeding before the first ultrasonic therapy	Mode of feeding 2 weeks after latest therapy			Total
	Exclusive breastfeeding and/or expressed breastmilk feeding	Breastfeeding and/or expressed breastmilk feeding supplemented with formula feeding	Formula feeding	
Exclusive breastfeeding and/or expressed breastmilk feeding	115	13	4	132
Breastfeeding and/or expressed breastmilk feeding supplemented with formula feeding	58	71	7	136
Formula feeding	0	0	1	1
Total	**173**	**84**	**12**	**269**

* Data are presented as No. of mothers; p<0.001, marginal homogeneity test

Each recurrence of blocked ducts causes pain and lump formation and elevates the pain score back to 4.5 to 5.0[12]. In our patients, some received >8 ultrasonic therapies. Each ultrasonic therapy could reduce the pain score to 2.1 to 2.7, which represented 52.1% to 67.5% reduction in pain score. No adverse effect was reported.

In the present study, only a trend towards an association between the number of ultrasonic therapies and the post-therapy pain score was observed. Nevertheless, there was a significant change in the mode of feeding. The first ultrasonic therapy was performed at a mean of 56±22.6 postpartum days. This may be a reason for the change in the mode of feeding, as some mothers would have returned to work after maternity leave. Overall, the percentage of breastfeeding increased. However, 13 mothers changed from exclusive breastfeeding to mixed feeding; four mothers changed from exclusive breastfeeding to complete formula feeding; and seven mothers changed from mixed feeding to formula feeding. These changes may not result from the adverse effect of the ultrasonic therapy.

One limitation to the present study is the selection bias, owing to the nature of the retrospective study. There was no control group to adjust for confounders. There was no randomisation of patients. Nonetheless, the use of a control group without ultrasonic therapy is considered unethical. The 2-week follow-up after the latest therapy by phone should have been increased to 4 to 6 weeks.

Conclusion

Ultrasonic therapy is effective for treatment of symptomatic postpartum breast engorgement and blocked milk ducts. It should be promulgated to all lactating mothers.

Contributors

All authors designed the study, acquired the data, analysed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Data availability

All data generated or analysed during the present study are available from the corresponding author on reasonable request.

Ethics approval

This study was approved by the Kowloon West Cluster Research Ethics Committee (reference: KW/EX-21-114(161-14)). The patients were treated in accordance with the tenets of the Declaration of Helsinki. The patients provided written informed consent for all treatments and procedures and for publication.

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