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Original Article

Lactation prescription plus acupoint stimulation improves breastfeeding quality and alleviates breast tenderness in parturients undergoing cesarean section

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Abstract: Purpose: This retrospective study primarily discusses the influence of lactation prescription plus acupoint stimulation on breastfeeding quality and breast tenderness of parturients after cesarean section (CS). Methods: First, 149 parturients presented between July 2018 and July 2021 for CS were selected, including 74 cases (test group) treated with lactation prescription plus acupoint stimulation and 75 cases (control group) intervened by routine western medicine nursing intervention. The breastfeeding status, milk yield at 48 hours postpartum, breast tenderness (Visual Analogue Scale, VAS), neonatal weight at 42 days after delivery, and laboratory indexes (white blood cell count, WBC; adrenocorticotropin, ACTH; prolactin, PRL) were compared between the two cohorts. Finally, multivariate analysis was carried out using the logistic regression model to identify factors leading to low milk production in mothers 48 hours after CS. Results: The test group was observed with a higher exclusive breastfeeding rate, higher milk yield at 48 hours postpartum, and milder breast tenderness (lower VAS score) than the control group. Higher neonatal weight at 42 days postpartum was also determined in the test group versus the control group. Moreover, the PRL at 3 days postpartum in the test group was statistically higher than that prenatal and at 1 day postpartum and the control group; markedly elevated WBC and reduced ACTH were observed at 1 d and 3 d postpartum compared with the prenatal, but no significant differences were identified between the test and control groups. According to the Logistic regression analysis, breast tenderness (P=0.009) was an independent risk factor for low lactation in mothers at 48 hours after CS. Conclusion: Lactation prescription plus acupoint stimulation has a positive effect on improving the breastfeeding quality of parturients after CS and relieving breast tenderness, which is worth promoting clinically.

Keywords: Lactation prescription, acupoint stimulation, cesarean section, breastfeeding quality, breast tenderness

Introduction

Breastfeeding is crucial to neonatal growth and development, with the quality of maternal lactation directly related to the health of newborns [1]. Cesarean section (CS) has been shown to adversely affect breastfeeding, which may be mediated by delaying the onset of lactation and breast tenderness that discourages infant sucking [2]. After CS, mothers are often affected by general anesthesia and experience obstetric health problems, all of which have an inverse impact on breastfeeding quality [3]. In addition, mothers may be more sensitive to breast tenderness during breastfeeding when they suffer from stress, anxiety and fatigue [4]. How to best help parturients be relieved of clinical symptoms after CS to improve maternal breastfeeding quality and neonatal outcomes is therefore the focus of clinical obstetrics [5]. Therefore, this study starts from the postpartum management of CS patients, aiming at finding treatment methods to improve the clinical symptoms of parturients and the quality of breastfeeding.

At present, intervention methods such as lactation prescription, lactation care, and pumping

pressure are the major interventions for maternal lactation disorders and breast tenderness after CS. However, the role of routine lactation nursing is limited, which is difficult to meet the health needs of mothers after surgery [6]. In addition, although pumping pressure can effectively increase the milk production of mothers who have undergone CS, it may lead to breast tenderness, nipple damage and other adverse events [7]. The lactation prescription used in this study is to decoct Semen Vaccariae with water to obtain decoction for oral administration, which has been clinically confirmed to promote postpartum lactation and increase milk yield [8]. Semen Vaccariae is an annual herb grown in cold temperature zones that not only has anti-angiogenic and antioxidant activities, but also possesses prolactin (PRL)-like properties [9]. Therefore, it is often used as traditional Chinese medicine (TCM) for the treatment of conditions such as amenorrhea, dysmenorrhea, and lactation disorders [10]. However, the use of lactation prescription alone is far from enough to improve the clinical symptoms of puerperae after CS, so it is necessary to introduce acupoint stimulation methods in combination with a lactation prescription. Breast tenderness is a common clinical symptom among breast cancer survivors. The research on acupoint stimulation and massage therapy by Lee et al. confirmed the efficacy of acupoint stimulation in breast cancer, which gives us important hints for maternal pain management [11, 12]. TCM believes that based on differences in maternal physique, parturient women after CS can be either qi and blood deficiency or have liver Qi stagnation, and the acupoints used by different types are also slightly different [13, 14].

Despite multiple studies investigating postpartum management of parturients, there is scant research on postpartum breastfeeding quality. Consequently, this study mainly compares and analyzes maternal breastfeeding status, 48 h postpartum lactation, and breast tenderness after CS and neonatal weight, hoping to provide new clinical references for the clinical management of mothers after CS.

Data and methods

Information of research participants

This study retrospectively analyzed the clinical data of 149 parturients undergoing CS in the Affiliated Hospital of Hangzhou Normal University between July 2018 and July 2021. The test group (n=74) received lactation prescription plus acupoint stimulation intervention, while the control group (n=75) received routine western medicine nursing intervention. Clinical comparability was observed in the two cohorts in terms of general data (P>0.05). The Ethics Committee at Affiliated Hospital of Hangzhou Normal University approved this research without reservations.

Inclusion and exclusion criteria

The participants were uniparae or multiparae who had regular obstetric examination and delivery in the Obstetrics Department of Affiliated Hospital of Hangzhou Normal University, and met the indications for CS, with singleton pregnancy, willingness to breastfeed, complete information and no infectious diseases.

Pregnant women with any of the following conditions were excluded: abnormal breast development and other diseases such as; serious heart, lung, kidney, endocrine system diseases; pregnancy hypertension, anemia, polyhydramnios and other complications; psychological illness, mental illness and communication disorders.

Intervention methods

The control group was treated with routine western medicine nursing, mainly including the following measures: 1) instructing parturients to breastfeed; 2) letting the baby contact and suck early after delivery to promote early secretion of colostrums; 3) diet guidance and psychological intervention; and 4) instructing mothers to get more exercise after operation to accelerate postoperative rehabilitation.

On the basis of the above measures, mothers in the test group were given lactation prescription and massage intervention one day after CS. Lactation prescription: 15 g of Semen Vaccariae was decocted in 400 mL water for oral administration. Acupoint massage: acupoints were selected according to TCM syndrome differentiation. Acupoints of Zhongfu, Yunmen, Danzhong, Ruzhong, Rugen, Shaoze, Zusanli, Weishu and Pishu were selected for those with qi and blood deficiency; for those with liver-qi stagnation, Zhongfu, Yunmen,

Table 1. Baseline data of two groups [n (%), mean ± SEM]

Factors	Test group (n=74)	Control group (n=75)	χ^2/t	P
Age (years old)	28.36±3.51	28.16±2.95	0.377	0.707
Parity (primipara/multipara)	43/31	52/23	2.031	0.154
Gestational age (weeks)	39.20±0.84	39.06±1.06	0.893	0.374
Birth weight (g)	3322.30±339.05	3391.87±414.16	1.121	0.264
WBC on admission (10^9/L)	8.70±2.40	8.82±2.32	0.310	0.757
ACTH on admission (pmol/L)	7.24±2.69	7.28±2.66	0.091	0.927
PRL on admission (ng/mL)	174.54±22.54	176.01±20.28	0.419	0.676

Note: WBC, white blood cell count; ACTH, adrenocorticotropin; PRL, prolactin.

Danzhong, Ruzhong, Rugen, Neiguan, Taichong, Zusanli and Ganshu acupoints were selected. During the massage, the mother was instructed to take a side-lying position. The massotherapist massaged the acupoints clockwise with the thumbs of both hands, using pressure that the mother can tolerate, until the acupuncture points appear sore, numb and have pain. Each acupoint was massaged for 2 minutes at a time. Breast massage: the puerpera was placed in a side-lying position, and a warm towel was used to wet her breast for 5 minutes. First, the spiral technique was used to massage the breast wall of the puerpera with gentle force for 10 minutes each time. Then, the massage was performed from the root of the breast to the breast along the direction of the mammary ducts, 10 minutes each time, until the puerpera felt warm. All the above treatments were given twice a day for 7 days.

Outcome measures

The breastfeeding status, milk yield at 48 hours postpartum, breast tenderness, neonatal body weight at 42 days postpartum, and laboratory indicators were observed and recorded in both groups. Among them, milk yield is evaluated as either low, medium, or high [15]. Low milk yield means that the lactation yield is so low that the newborn is mainly fed with milk powder; medium milk yield means that milk production can meet part of the newborn's needs, and milk powder is needed; if the lactation amount is at least enough for newborns to eat 8 times within 24 h, it will be regarded as high milk yield. The breast tenderness of puerperae was graded by the Visual Analogue Scale (VAS) score as grade 0 (0 points), 1 (1-3 points), 2 (4-6 points), or 3 (7-10 points), with the score in direct proportional to the degree of pain [16]. The main laboratory indexes were white blood cell count (WBC), adrenocorticotropin (ACTH), and PRL. Peripheral venous blood was collected on the 1st and 3th day after delivery, and centrifuged (1500×g, 4°C) for 10 min to collect the upper serum for radioimmunoassay [17].

Statistics and methods

This study used SPSS 20.0 for statistical analysis and Graphpad Prism 7.0 for figure plotting. The number of cases/percentage (n/%) and mean ± SEM were used to represent counting data and measurement data, respectively. For inter-group comparisons, χ^2 test was used for counting data and t test for measurement data. Multivariate analysis was carried out using the logistic regression model to identify factors leading to low milk production in mothers 48 hours after CS. Data analysis at multiple time points was performed by the paired t-test. $P<0.05$ indicates the presence of statistical significance.

Results

Baseline data

As shown in **Table 1**, the test group and control group were non-significantly different in age, parity, gestational age, neonatal birth weight, as well as WBC, ACTH and PRL on admission ($P>0.05$).

Breastfeeding quality of two groups

We analyzed the influence of the two interventions on maternal breastfeeding quality by assessing the breastfeeding status and milk yield at 48 hours postpartum (**Table 2**). The data showed an exclusive breastfeeding rate of 86.49% in the test group, significantly higher

Table 2. Breastfeeding quality of two groups [n (%), mean ± SEM]

Factors		Test group (n=74)	Control group (n=75)	χ^2	P
Breastfeeding status	Exclusive breastfeeding	64 (86.49)	50 (66.67)	8.142	0.004
	Non-breastfeeding	10 (13.51)	25 (33.33)		
Milk yield at 48 hours postpartum	Low	9 (12.16)	14 (18.67)	4.749	0.029
	Medium	33 (44.59)	33 (44.00)		
	High	32 (43.24)	28 (37.33)		

Table 3. Breast tenderness in two groups [n (%), mean ± SEM]

Factors	Test group (n=74)	Control group (n=75)	χ^2	P
Grade 0	19 (25.68)	9 (12.00)	4.565	0.033
Grade 1	28 (37.84)	29 (38.67)		
Grade 2	17 (22.97)	22 (29.33)		
Grade 3	10 (13.51)	15 (20.00)		

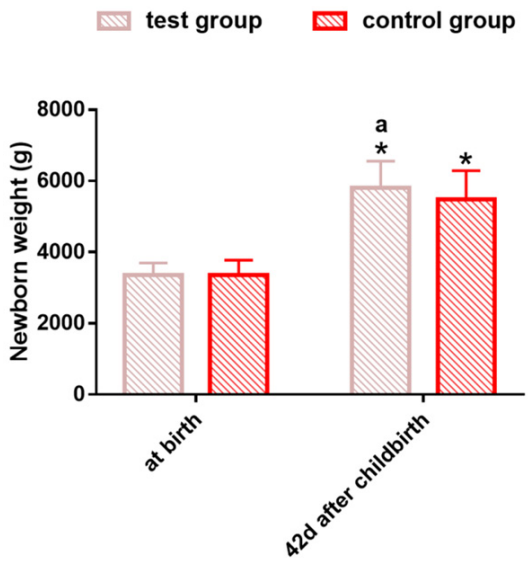

Figure 1. Neonatal weight at 42 days after delivery in the two groups. *P<0.05 *vs.* at birth; [a]P<0.05 *vs.* control group.

than that of 66.67% in the control group (P<0.05). In addition, the number of cases with medium/high milk yield at 48 h postpartum was also obviously higher in the test group (P<0.05).

Breast tenderness in the two groups

We compared and analyzed the degree of breast tenderness of both groups of mothers using the VAS (**Table 3**). It was obvious that the test group had statistically more of cases of grade 0 breast tenderness than the control group (P<0.05).

Neonatal weight at 42 days postpartum in both groups

The 42-day postpartum neonatal weight of both groups was measured (**Figure 1**); the results showed that the 42-day postpartum neonatal weight was significantly higher in the test group than in the control group, with statistical significance (P<0.05).

Laboratory indexes of two groups

We tested WBC, ACTH and PRL of both groups to evaluate the influence of the two intervention methods on the laboratory indexes of parturients (**Figure 2**). WBC, ACTH and PRL were not statistically between groups before delivery (P>0.05); in both groups, each of the above indexes showed significant changes on postpartum day 1 and 3, that is, WBC and PRL elevated significantly, while ACTH reduced markedly (P<0.05). Compared with postpartum day 1, WBC and ACTH had no significant changes on postpartum day 3 in both cohorts (P>0.05), but PRL increased obviously (P<0.05), with a higher PRL in the test group compared with the control group (P<0.05).

Multivariate analysis of factors affecting low maternal lactation yield at 48 hours after CS

First, we took whether it affects low maternal milk production at 48 h after CS as the dependent variable, and age, parity, gestational age, neonatal birth weight, WBC on admission, ACTH on admission, PRL on admission, breastfeeding status, VAS, and intervention mode as dependents variable for assignment. Then, multivariate analysis was carried out using the Logistic regression model; the results identified that VAS (P=0.009) was an independent risk

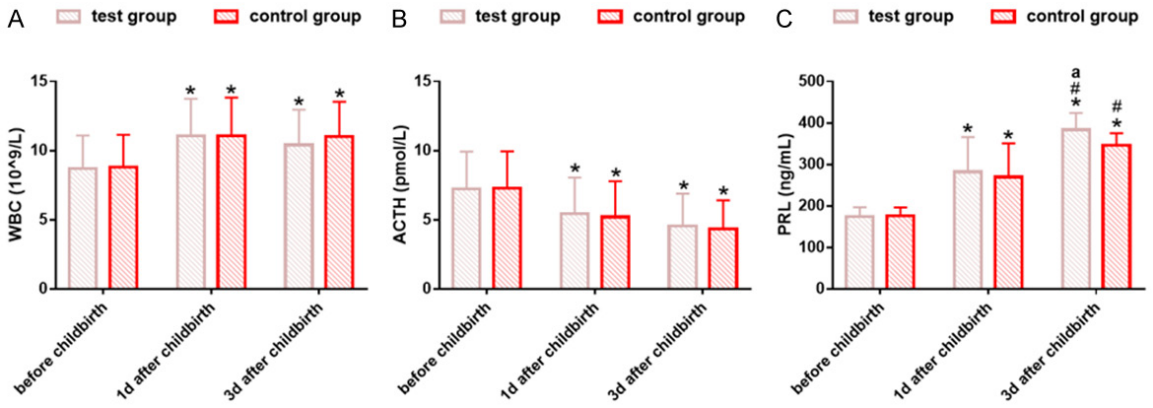

Figure 2. Laboratory indicators of the two groups. A. WBC was not statistically different between the test group and the control group on the 1st day and 3rd day after delivery; however, WBC in the test group was significantly higher at 1 and 3 days postpartum compared with prenatal. B. ACTH showed no statistical difference between the test group and the control group on postpartum day 1 and 3; however, ACTH in the test group was significantly lower at 1 and 3 days postpartum compared with prenatal. C. The PRL of the test group on postpartum day 3 was significantly higher than that of the control group, prenatal and on postpartum day 1. Note: $^{*}P<0.05$ *vs.* at birth; $^{a}P<0.05$ *vs.* control group. Note: WBC, white blood cell count; ACTH, adrenocorticotropin; PRL, prolactin.

Table 4. Assignments

Variables	Assignments
Age (years old)	Continuous variable
Parity	Unipara =0, multipara =1
Gestational age (weeks)	Continuous variable
Neonatal birth weight (g)	Continuous variable
WBC on admission (10^9/L)	Continuous variable
ACTH on admission (pmol/L)	Continuous variable
PRL on admission (ng/mL)	Continuous variable
Breastfeeding status	Exclusive breastfeeding =0, non-exclusive breastfeeding =1
VAS	Grade 0-1=0, grade 2-3=1
Intervention mode	Lactation prescription plus acupoint stimulation =0, routine western medicine nursing =1

Note: WBC, white blood cell count; ACTH, adrenocorticotropin; PRL, prolactin; VAS, Visual Analogue Scale.

factor for low lactation yield in mothers at 48 hours after CS. See **Tables 4**, **5** for details.

Discussion

CS is a common surgical procedure that can save the lives of mothers and newborns when it is timely, appropriate and follows precise medical indications [18]. The use of CS has steadily increased in recent years, with Latin America being the region with the highest frequency [19]. However, some negative effects of CS have also been exposed with its widespread clinical application [20]. In a research survey, it was pointed out that almost only a third of women who delivered by CS breastfed their newborns in a timely manner [21]. This is because CS will have a negative impact on maternal physiological and psychological reactions, thus delaying the onset of breastfeeding and lowering breastfeeding quality [22]. Both WHO and the United Nations International Children's Emergency Fund have indicated the importance of breast milk for babies. Numerous clinical evidence shows that breast-fed infants have significantly lower overall rates in terms of hospitalization, acute illness and mortality than non-breast-fed infants [23, 24]. Therefore, this study on breastfeeding quality and breast tenderness of mothers undergoing CS is of great significance for improving maternal postpartum symptoms and neonatal outcomes.

This study retrospectively selected 149 women undergoing CS and divided them into a control group (routine western medicine nursing) and a

Table 5. Multivariate analysis of factors affecting low maternal lactation yield at 48 hours after cesarean section [n (%), mean ± SEM]

Variables	B	SE	Wald	P	OR (95% CI)
Age (years old)	-0.073	0.077	0.901	0.343	0.930 (0.800-1.081)
Parity	0.367	0.550	0.445	0.505	1.443 (0.491-4.243)
Gestational age (weeks)	0.027	0.125	0.045	0.832	1.027 (0.803-1.313)
Neonatal birth weight (g)	0.001	0.001	2.162	0.141	1.001 (1.000-1.002)
WBC on admission (10^9/L)	0.053	0.109	0.239	0.625	1.055 (0.852-1.306)
ACTH on admission (pmol/L)	-0.042	0.090	0.216	0.642	0.959 (0.805-1.144)
PRL on admission (ng/mL)	0.008	0.012	0.508	0.476	1.008 (0.986-1.032)
Breastfeeding status	0.378	0.570	0.440	0.507	1.459 (0.478-4.459)
VAS	1.402	0.535	6.857	0.009	4.063 (1.423-11.605)
Intervention mode	0.231	0.525	0.194	0.660	1.260 (0.450-3.525)

Note: WBC, white blood cell count; ACTH, adrenocorticotropin; PRL, prolactin; VAS, Visual Analogue Scale.

test group (lactation prescription plus acupoint stimulation intervention) according to different treatment methods. The test group showed a statistically higher exclusive breastfeeding rate than the control group (86.49% vs. 66.67%), with notably increased milk yield at 48 h postpartum. It suggests that lactation prescription plus acupoint stimulation intervention can significantly improve the breastfeeding quality of CS women, which may be related to the pharmacological effect of Semen Vaccariae in lactation prescription. Relevant research shows that Semen Vaccariae mainly contains chemical components such as flavonoid glycosides, alkaloids, and triterpenoid saponins, which can promote the mammary gland development and lactation ability of animals and increase milk yield while improving the active ingredients in milk and preventing and treating mastitis [25]. In the "Compendium of Materia Medica" by St. Li Shizhen, there are also relevant records on the effect of Semen Vaccariae on promoting lactation [26]. The acupoint massage used in the test group can not only induce the release of PRL by stimulating the nerve around the maternal breast, but also improve the blood circulation of the maternal breast, soften the breast and make the nipple and breast neck easy to bend, thus improving the sucking effect of the newborn and the maternal breast tenderness [27]. Moreover, the massage stimulation of Zhongfu, Yunmen, Shaoze and other acupoints can promote the local blood circulation of the maternal breast, thus improving lactation to a certain extent [28]. In this study, WBC and ACTH were not statistically different between groups on postpartum day 1 and 3. However, compared with the prenatal, both groups had significantly higher WBC and notably lower ACTH, and the PRL of the test group on postpartum day 3 was markedly higher than that of the control group, prenatal and postpartum day 1. White blood cells are the main immune system cells, and an increase in WBC reflects the presence of inflammation [29]. ACTH is a polypeptide hormone associated with the maintenance of normal morphology and function of the adrenal gland, while acupoint massage can reduce the level of ACTH, which has a certain positive effect on reducing maternal anxiety and regulating lactation [27, 30, 31]. The absence of statistical significance in WBC and ACTH between the two cohorts in this study suggests that the combined intervention has the same regulation effects on WBC and ACTH levels as the conventional western medicine nursing. Relevant research has shown that PRL cooperates with ovarian steroids and estrogens to coordinate the development and differentiation of mammary glands, thus realizing successfully breastfeeding and providing nutrition for offspring [32]. The higher PRL level in the test group suggests that the combination of lactation prescription and acupoint stimulation has a positive effect on the lactation of CS women. In addition, we recorded the neonatal weight of both groups at 42 days postpartum, and found significantly higher neonatal weight in the test group, which is due to the timely intervention of the puerperae in this group. The use of lactation prescription plus acupoint stimulation enables the CS women to recover their lactation ability as soon as possible, allowing for earlier breastfeeding. In a

study by Ericson et al. [33] on neonatal breastfeeding, the benefits of breastfeeding for babies are not only reflected in weight gain, but also in the relatively low incidence of diseases among newborns who are exclusively breastfed. Later, we recorded and compared the degree of breast tenderness and found significantly milder breast tenderness in parturients in the test group, indicating that the combination therapy can significantly reduce the degree of breast tenderness. This is consistent with the description of pain in the study of acupoint massage and hyperplasia of mammary glands by Li et al. [34]. It is suggested that breast tenderness is mainly related to maternal internal meridian stasis. The lactation prescription combined with acupoint stimulation used in this study can promote blood circulation, remove blood stasis, and dredge meridians, with a synergistic improvement on the relief of breast tenderness [27, 35]. Finally, Logistic regression analysis identified that breast tenderness was an independent risk factor for low lactation yield at 48 hours after CS.

Although this study has confirmed that lactation prescription plus acupoint stimulation can help improve breastfeeding status, increase milk yield, alleviate breast tenderness, and improve laboratory indicators in mothers undergoing CS, it still has several limitations. First, it is a single-center study. If multi-center data can be included for analysis, it may help to avoid the bias of information collection. Second, we had not investigated the degree of cooperation and satisfaction of patients. We will continue to improve the research based on the above two points in the future.

Conclusion

To sum up, lactation prescription plus acupoint stimulation can validly improve the breastfeeding quality of parturients undergoing CS and relieve breast tenderness, with a certain positive impact on newborns, which is an effective treatment scheme for postpartum management of mothers with CS and their newborns and is worth promoting clinically.

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Disclosure of conflict of interest

None.

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