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Original Article

Clinical observation of magnetic therapy on acupoints combined with infantile tuina in the treatment of neonatal intestinal spasms

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Abstract: Objective: To analyse the effect of magnetic therapy at acupoints combined with infantile tuina in the treatment of neonatal intestinal spasms. Methods: A total of 120 neonates with intestinal spasms in our hospital were enrolled and divided into four groups of 30 by a random number table: group A (magnetic therapy at acupoints combined with infantile tuina), group B (magnetic therapy at acupoints), group C (infantile tuina), and control group (psychological comfort). The results of the corresponding treatment were compared. Results: At 1 week after treatment, group A exhibited a significantly higher rate of abdominal pain relief and a lower degree and the remission time of abdominal pain than the other three groups ($P < 0.05$). The total effective rate at 1 week after treatment in group A was 93.33%, higher than 73.33% in group B, 70.00% in group C, and 26.67% in the control group ($P < 0.05$). The score of sleep quality and milk intake in group A were higher than those in the other three groups at 1 d, 3 d, 5 d, and 7 d after treatment ($P < 0.05$). The score of sleep quality and milk intake in groups B and C were higher than those in the control group at 3 d, 5 d, and 7 d after treatment ($P < 0.05$). The HAMA scores of mothers in group A were lower than those in the other 3 groups after 3 d and 1 week of treatment, and the scores in groups B and C were lower than those in the control group at 3 d and 1 week after treatment ($P < 0.05$). Conclusion: Magnetic therapy on acupoints combined with infantile tuina for the treatment of neonatal intestinal spasms can effectively and quickly relieve abdominal pain, improve neonatal sleep quality, increase neonatal milk intake, and obtain an overall satisfactory treatment efficacy.

Keywords: Neonatal intestinal spasm, magnetic therapy through acupoints, infantile tuina, treatment, sleep quality, milk intake

Introduction

Neonatal intestinal spasm is a common disease in neonatal outpatient or emergency department. Parents are often helpless because of continuous neonatal crying and lack of comfort. The medical burden will increase due to poor curative effect and repeated visits. Western medicine is the main method to treat neonatal intestinal spasm, but because the intestinal spasms cannot be effectively controlled, and the recurrence rate after stopping treatment is relatively high, and thus the clinical effect is not satisfactory [1]. Novel non-invasive and effective treatment methods with fewer side effects have become the research focus for treatment of neonatal intestinal spasms [2].

Both magnetic therapy and tuina are non-invasive and safe treatment methods. Magnetic therapy can generate micro-currents, which affect the metabolism and function of various tissues. Magnetic therapy can act on meridian acupoints, which is similar to acupuncture [3]. Studies have shown that magnetic therapy can improve the function of gastrointestinal autonomic nerves and gastrointestinal blood circulation, enhance gastrointestinal immune function, and also have a sedative and analgesic effect [4]. Tuina is a commonly used treatment method in traditional Chinese medicine. It emphasizes the use of “person” to cure “person” and the application of various techniques such as pushing, gripping, pressing, rubbing, kneading, pinching, poking, and patting *etc*., so as to play a role in eliminating pathogenic fac-

tors, strengthening the resistance, dredging the meridians, helping injuries and relieving pain, harmonizing yin and yang, and promoting qi and blood [5].

Both magnetic therapy and tuina are commonly used methods in the clinic. Studies have shown that tuina can effectively improve blood circulation, accelerate pain relief, and reduce the discomfort caused by disease in neonatal treatment [6]. There have been no research reports on the treatment of neonatal intestinal spasm by magnetic therapy on certain acupoints combined with tuina. This study shows that the combination of magnetic therapy on certain acupoints and tuina for the treatment of neonatal intestinal spasms can improve many treatment aspects including parents' compliance with doctor's orders, reduce doctor-patient conflicts, and improve neonates' sleep quality and feeding status. Thus giving Parents a greater confidence in neonatal feeding, and reducing family conflicts as well as the risk of postpartum depression. In this study, 120 neonates with intestinal spasm were enrolled and divided into four groups to explore the therapeutic value of magnetic therapy upon acupoints combined with infantile tuina.

Materials and methods

General information

A total of 120 neonates with intestinal spasms in our hospital from January 2019 to March 2020 were enrolled and divided into four groups by a random number table. Each group consisted of 30 neonates with a gestational age of 37-41 weeks and a birth mass of 2.7-4.1 kg. Inclusion criteria: neonates who were born in the obstetric department of our hospital; who were consistent with the diagnostic criteria for intestinal colic in the Rome IV standard for children with functional gastrointestinal disease [7]; those with a healthy mother; those who were exclusively breastfed; those with manifestations such as sudden crying, abdominal distension, and refusal of the breast. Parents voluntarily signed the informed consent, and this study obtained the approval by the hospital ethics society. Exclusion criteria: neonates who were artificially fed; mothers with comorbidities; history of intrauterine distress; combined with acute abdomen; combined with other diseases; or with an Apgar Score [8] less than 8 points 1 minute after birth.

Methods

All neonates received routine nursing care. The neonates in the group A additionally received magnetic therapy at acupoints and infantile tuina. (1) Magnetic beads for auricular acupoints (produced by Suzhou Medical Products Co., Ltd., Huatuo brand, magnetic therapy patch for auricular acupoints): 1 bead per acupoint was placed on bilateral Tianshu acupoints and bilateral Zusanli acupoints, and fixed with adhesive tape or paper tape for 2 hours each time, twice a day. The magnetic beads were pressed appropriately when the neonate cried with abdominal pain. (2) Invigorating spleen: to push clockwise from the tip to the base of the thumb via the radial side of the thumb of the neonate by the thumb, 300 times. (3) Clockwise abdominal massage for 3 minutes, umbilical massage for 2 minutes, and pushing three upper passes for 1 minute (pushing from the radial side of forearm, via the transverse stripes of wrist to the transverse stripes of elbow to form a straight line, known as the pushing three upper passes).

The neonates in the group B received magnetic therapy at acupoints, and were treated with magnetic therapy on bilateral Tianshu acupoints and bilateral Zusanli acupoints, with the same method as that in the group A.

The neonates in the group C received infantile tuina and were given tuina operations such as invigorating spleen, abdominal massage, umbilical massage, and pushing three upper passes, with the same methods as those in the group A.

The neonates in the control group received such interventions as cuddling, comforting, and abdominal hot compress, without any substantive treatment.

All the interventions lasted for 1 week in all four groups, and the efficacy was compared after 1 week.

Outcome measurement

The degree of abdominal pain was evaluated by 0-3 scoring method [9]. A score of 0 indicates

Table 1. Comparison of general information ($\bar{x}$ ± s)/[n (%)]

Data		Group A (n=30)	Group B (n=30)	Group C (n=30)	Control group (n=30)	F/X^2	P
Gender	Male	18 (60.00)	17 (56.67)	19 (63.33)	17 (56.67)	0.857	0.163
	Female	12 (40.00)	13 (43.33)	11 (36.67)	13 (43.33)		
Average gestational age (week)		39.52±1.13	39.47±1.08	39.50±1.14	39.49±1.21	0.637	0.184
Apgar score 1 minute after birth		9.08±0.46	9.23±0.61	9.18±0.57	9.21±0.53	0.492	0.321
Birth mass (kg)		3.42±0.63	3.45±0.59	3.44±0.57	3.46±0.61	0.928	0.416

that the neonate is not crying and remains quiet. A score of 1 indicates that the crying of neonate is caused by abdominal pain, which is mild with short duration and few frequencies. A score of 2 indicates that neonate has obvious crying due to abdominal pain, and the duration of crying is significantly prolonged. A score of 3 indicates that neonate continues crying because of abdominal pain, with cold hands and feet.

Abdominal pain relief: After treatment, the abdominal pain score drops to 0, indicating successful abdominal pain relief.

The remission time of abdominal pain is the interval from admission until the score of abdominal pain drops to 0.

Standards of efficacy [10]: Recovery: Abdominal pain disappeared completely after one week without recurrence, and breastfeeding and defecation returned to normal. Improvement: The frequency of abdominal pain was reduced after one week, the duration of each episode of abdominal pain was shortened, and breastfeeding and defecation were acceptable. Invalidation: the manifestation of abdominal pain appeared after one week, was unchanged or was even worse than before treatment.

Sleep quality was evaluated by 1-3 scoring method [11]. A score of 3 indicates that the neonate can sleep for about 4 hours after feeding, and wakes up without crying and seems full of energy. A score of 2 indicates that neonate can sleep 2-3 hours after feeding, but he/she needs to sleep next to the mother, or he/she will wake up when held away from the mother. A score of 1 indicates that neonate can sleep no more than 2 hours after feeding, and he/she often wakes up even sleeping beside the mother and cries after waking up. Evaluations were performed before treatment and at 1 d, 3 d, 5 d, and 7 d after treatment.

Milk intake: The daily milk intake of neonates before treatment and at 1 d, 3 d, 5 d, and 7 d after treatment were measured and recorded.

Maternal anxious emotions: The degree of the mothers' anxiety was evaluated before treatment, and at 3 d and 1 week after treatment by the Hamilton Anxiety Scale (HAMA) [12]. A score of 29 or above indicates severe anxiety. A score of 21-28 indicates obvious anxiety. A score of 14-20 indicates mild anxiety, a score of 7-13 indicates possibly anxious, and a score of 0-7 indicates no anxiety.

Statistical analysis

SPSS 23.0 software was used for data processing. Count data were expressed as n (%) and analysed by chi-squared test. Measurement data were expressed as ($\bar{x}$ ± SD) and analysed by t test. Multi-point comparison was analysed by ANVOA and F test. Graphs were made by Graphpad Prism 8. ($P < 0.05$) was considered statistically significant.

Results

General information

There was no statistical difference in male-female ratio, average gestational age, Apgar score at 1 minute after birth, and birth mass between the four groups ($P > 0.05$) (**Table 1**).

The rate of abdominal pain relief and total effective rate

The rate of abdominal pain relief in group A was significantly higher than those in the other three groups at 1 week after treatment ($P < 0.05$), and the rate of abdominal pain relief in groups B and C was significantly higher than that in the control group ($P < 0.05$) (**Table 2**). The total effective rate in group A was 93.33% after 1 week of treatment, which was higher

Table 2. Comparison of the rate of abdominal pain relief at 1 week after treatment [n (%)]

Group	Cases	Remission	Non-remission
Group A	30	28 (93.33)	2 (6.67)
Group B	30	19 (63.33)	11 (36.67)
Group C	30	17 (56.67)	13 (43.33)
Control group	30	4 (13.33)	26 (86.67)
X^2		4.857	
P		0.038	

Table 3. Comparison of the total effective rate [n (%)]

Group	Cases	Recovery	Improvement	Invalidation	Total effective rate
Group A	30	10 (33.33)	18 (60.00)	2 (6.67)	28 (93.33)
Group B	30	5 (16.67)	17 (56.67)	8 (26.67)	22 (73.33)
Group C	30	7 (23.33)	14 (46.67)	9 (30.00)	21 (70.00)
Control group	30	1 (3.33)	7 (23.33)	22 (73.33)	8 (26.67)
X^2					5.827
P					0.019

than those in the other three groups ($P < 0.05$), and the total effective rate was 73.33% in group B and 70.00% in group C, which were higher than 26.67% in the control group at 1 week after treatment ($P < 0.05$). There was no significant difference in the total effective rate between groups B and C at 1 week after treatment ($P > 0.05$) (**Table 3**).

The degree and the remission time of abdominal pain

There was no significant difference in the degree of abdominal pain between the four groups before treatment ($P > 0.05$). At 1 week after treatment, the degree and the remission time of abdominal pain in group A were lower than those in the other three groups ($P < 0.05$), and the degree and remission time of abdominal pain in groups B and C were lower than those in the control group ($P < 0.05$) (**Figure 1**).

Sleep quality

There was no significant difference in the scores of sleep quality between the four groups before treatment ($P > 0.05$). The scores of sleep quality in group A at 1 d, 3 d, 5 d, and 7 d after treatment were higher than that before treatment ($P < 0.05$). The scores of sleep quality in groups B and C at 3 d, 5 d, and 7 d after treatment were higher than those before treatment ($P < 0.05$), and the scores of sleep quality in the control group at 5 d and 7 d after treatment were higher than that before treatment ($P < 0.05$). The scores of sleep quality in group A were higher than those in the other three groups at 1 d, 3 d, 5 d, and 7 d after treatment ($P < 0.05$). There was little difference in the scores of sleep quality between group B and group C at 1 d, 3 d, 5 d, and 7 d after treatment ($P > 0.05$). The scores of sleep quality in groups B and C were higher than those in the control group at 3 d, 5 d and 7 d after treatment ($P < 0.05$) (**Figure 2**).

Milk intake

There was no significant difference in the milk intake of neonates between the four groups before treatment ($P > 0.05$). The milk intake in group A at 1 d, 3 d, 5 d, and 7 d after treatment was higher than that before treatment ($P < 0.05$). The milk intake in groups B and C at 3 d, 5 d, and 7 d after treatment was higher than that before treatment ($P < 0.05$). The milk intake in group A was higher than that in the other three groups at 1 d, 3 d, 5 d, and 7 d after treatment ($P < 0.05$). There was little difference in milk intake between group B and group C at 1 d, 3 d, 5 d, and 7 d after treatment ($P > 0.05$). The milk intake in groups B and C was higher than that in the control group at 3 d, 5 d and 7 d after treatment ($P < 0.05$) (**Figure 3**).

The degree of anxious maternal emotions

There was no significant difference in the HAMA scores of mothers between the four groups before treatment ($P > 0.05$). The HAMA scores in the three treatment groups at 3 d and 1 week after treatment were all lower than those before treatment ($P < 0.05$). There was little difference in the control group before and after treatment ($P > 0.05$). The HAMA scores in group A were lower than those in the other three groups at 3 d and 1 week after treatment ($P < 0.05$). The HAMA scores in groups B and C were lower than those in the control group at 3 d and 1 week after treatment ($P < 0.05$) (**Figure 4**).

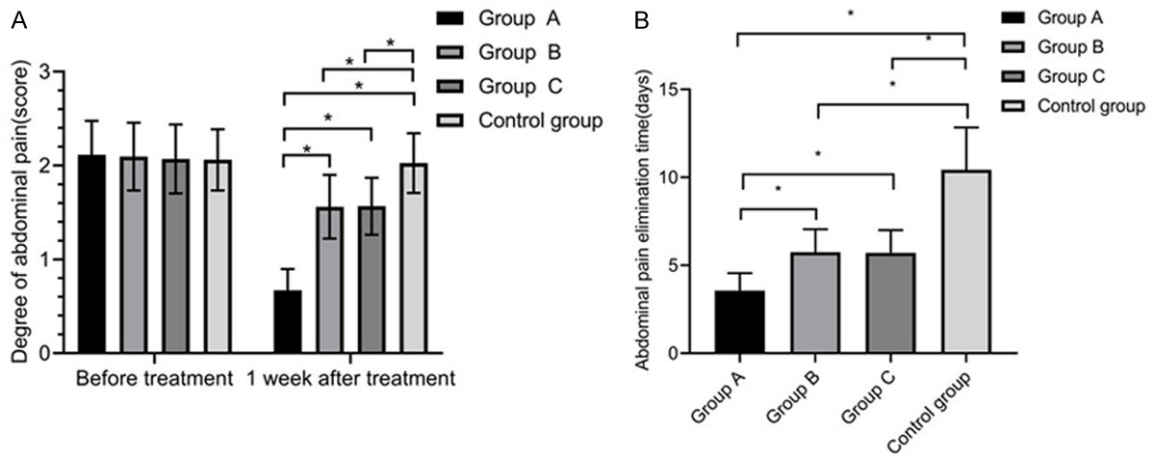

Figure 1. Comparison of abdominal pain. Compared with the other three groups, the degree of abdominal pain was lower in group A at 1 week after treatment ($P < 0.05$). The degree of abdominal pain in groups B and C was lower than that in the control group at 1 week after treatment ($P < 0.05$) (A). At 1 week after treatment, the remission time in group A was shorter than that in the other three groups ($P < 0.05$), and the remission time in group B and C was shorter than that in the control group ($P < 0.05$) (B). * Indicates that the difference between two groups is statistically significant.

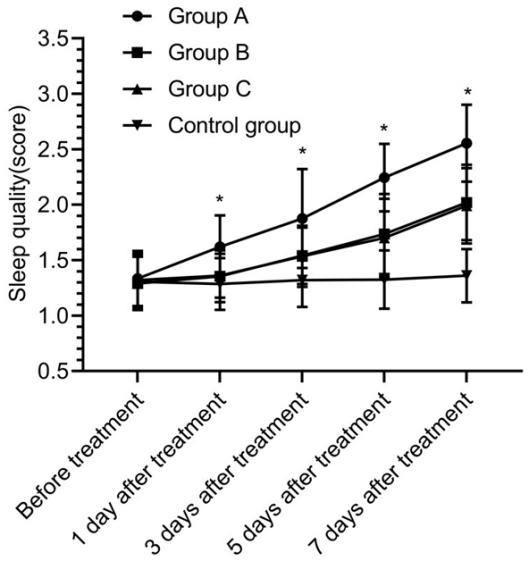

Figure 2. Comparison of sleep quality. The scores of sleep quality in group A were higher than those in the other three groups at 1 d, 3 d, 5 d, and 7 d after treatment ($P < 0.05$). The scores of sleep quality in groups B and C were higher than those in the control group at 3 d, 5 d, and 7 d after treatment ($P < 0.05$). * indicates that the difference between group A and the other groups is statistically significant.

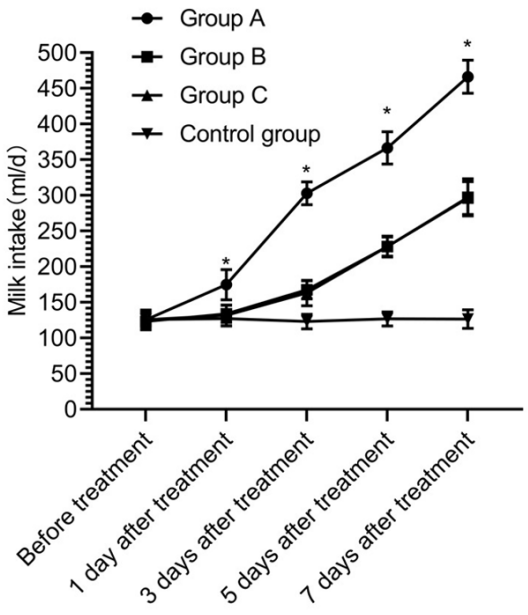

Figure 3. Comparison of milk intake. The milk intake in group A was greater than that in the other three groups at 1 d, 3 d, 5 d, and 7 d after treatment ($P < 0.05$). The milk intake in groups B and C was greater than that in the control group at 3 d, 5 d, and 7 d after treatment ($P < 0.05$). * indicates that the difference between group A and the other groups is statistically significant.

Discussion

Neonatal intestinal spasm is a type of acute abdominal pain frequently experienced by neonates. The symptoms mainly include continuous crying, which cannot be relieved by soothing, and some may also have such manifestations as upward flexion of legs, vomiting,

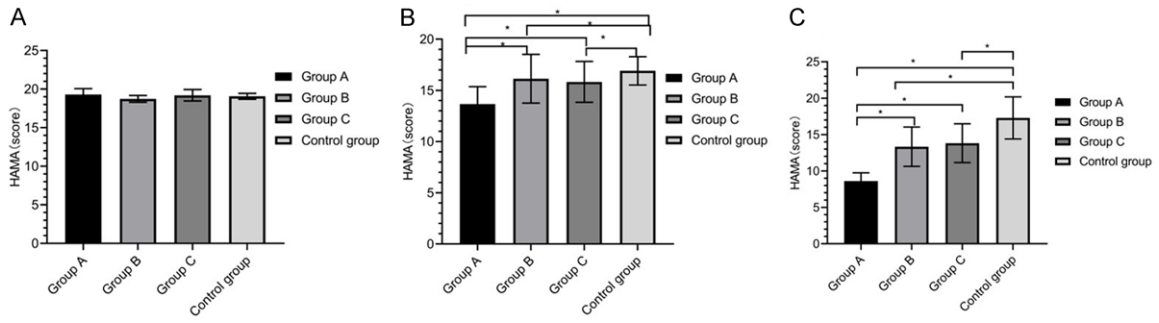

Figure 4. Comparison of maternal anxiety emotion. There was no significant difference in HAMA scores between the four groups before treatment ($P > 0.05$) (A). At 3 d after treatment, the score in group A was significantly lower than those in the other three groups ($P < 0.05$) (B), and the score in groups B and C was significantly lower than that in the control group ($P < 0.05$) (B). At 7 d after treatment, the score in group A was significantly lower than those in the other three groups ($P < 0.05$) (C), and the score in group B and C was significantly lower than that in the control group ($P < 0.05$) (C). * Indicates that the difference between two groups is statistically significant.

tension of abdominals, and complexion flushing [13]. At present, clinical treatments mainly include cuddling and comforting, abdominal hot compress and massage, oral administration or intramuscular injection of drugs, but the effect is not satisfactory in practice. Drug treatment is difficult to implement for neonates because of low drug tolerance. Some antispasmodic drugs can easily cause apnea, and most drugs taste bad, making it difficult to administer neonates [14, 15]. A safe, effective, and non-invasive treatment method for neonatal intestinal spasm has been studied.

With the deepening of research, the application value of traditional Chinese medicine methods are gradually being discovered. Traditional Chinese medicine has included neonatal colic in the categories of “intestinal gas disease” and “intestinal pain”. Traditional Chinese medicine indicates that the pathogeny is the invasion of wind and cold to the abdomen and umbilicus, which stay in the tract, leading to stagnation of intestinal qi and blood flow and pain [16]. Traditional Chinese medicine indicates that treatment should eliminate the retention of food, guide stagnation, regulate qi, dispel cold and warm internal body, and dredge meridians [17]. In this study, neonates in group C were treated by infantile tuina, neonates in group B were treated by magnetic therapy through certain acupoints, and neonates in group A were treated by magnetic therapy combined with infantile tuina. There was no statistical difference in the rate of abdominal pain relief, the score of abdominal pain degree, the remission time of abdominal pain, and total effective rate between groups B and C at 1 week after treatment. There was no statistical difference in the scores of sleep quality and milk intake at 1 d, 3 d, 5 d and 7 d after treatment and the scores of HAMA at 3 d and 1 week after treatment between groups B and C, which indicates that the effect of single application of magnetic therapy or infantile tuina on neonatal intestinal spasm is similar. However, compared with the other three groups, all the results in group A were better. Group A showed higher rate of abdominal pain relief and total effective rate and lower degree and the remission time of abdominal pain than the other three groups. The milk intake was greater due to better sleep quality, and the score of HAMA was also lower, indicating that the combined application of two methods can more effectively control pain, accelerate the elimination of abdominal pain, and help neonates have better sleep quality and greater milk intake, thereby promoting the growth and development of neonates. The anxiety of mothers in caring for neonates can also be significantly reduced, and stronger confidence in nursing can reduce the anxiety-related conflicts between medical care and parents. Studies have found that the combined application of infantile tuina can shorten the remission time of abdominal pain in neonates [18]. It is also found that magnetic therapy at acupoints has a more prominent effect on pain relief than acupuncture [19]. Studies have shown that the effective rate of magnetic therapy on acupoints in the treatment of neonatal abdominal pain is higher than that of western medicine alone (87.50% VS 67.50%) ($P < 0.05$) [20].

The mechanism of tuina on pain control is mainly as follows. Tuina can form a non-noxious stimulation, which can be conducted by thick nerve fibres to enhance the excitability of SG cells and weaken the intensity of stimulus on T cells, thereby achieving an analgesic effect [21]. Peripheral biologically active substances such as norepinephrine (NA), dopamine (DA), and serotonin (5-HT) are all typical pain-causing substances. The patients receiving tuina had lower NA, DA and 5-HT, so it was speculated that tuina can exert analgesic effects by controlling the release of pain-causing active substances [22]. The function of endogenous opioid peptides in regulating pain is one of the many physiological regulating functions involved. CCK-8 is the strongest endogenous anti-opioid. Tuina can increase the level of CCK-8 in the body, suggesting that tuina can exert analgesic effects by increasing the release of analgesic neurotransmitters [23]. Magnetic therapy on acupoints is based on the theory of meridians, and uses magnetic fields instead of acupuncture to act on acupoints and pain spots, so as to achieve the purpose of disease treatment [20]. Magnetic beads produce physical stimulation to acupoints and form a physiological effect, which can play the role of channelling and regulating meridians, qi and blood, improving immune function, and stimulating the inner potential, thus having a therapeutic effect [24]. The magnetic field formed by magnetic therapy can reduce the excitability and nociceptive transmission of nerve endings, dilate blood vessels, accelerate blood circulation, promote the dissipation of inflammatory substances, and reduce the degree of exudative stimulation of nerve endings, thus reducing the pain of patients [25, 26]. In this study, the two methods were combined to give full play to their respective effects through synergistic effect, so as to achieve the effect of 1+1>2 and obtain a more satisfactory overall efficacy.

In summary, magnetic therapy on acupoints combined with infantile tuina for the treatment of neonatal intestinal spasm can more effectively and quickly relieve abdominal pain, improve neonatal sleep quality, increase neonatal milk intake, and obtain a more satisfactory overall efficacy. In this study, due to the small number of neonates and the lack of research on other age groups, the application value of magnetic therapy on acupoints combined with tuina in the treatment of patients in other age groups has not been confirmed. A comprehensive and in-depth research with larger sample size should be taken in the future to comprehensively clarify the application value of magnetic therapy on acupoints and infantile tuina.

Disclosure of conflict of interest

None.

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