

Original Article

The significance of positional care combined with doula delivery during childbirth in the correction of abnormal fetal position

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Abstract: Objective: To explore the effects of positional care combined with doula delivery during childbirth in the correction of abnormal fetal position. Methods: In this retrospective study, a total 108 pregnant women with abnormal fetal orientation were included from February 2018 to February 2021 in the Jinan City People's Hospital. Among them, 54 patients who received positional care combined with doula delivery were included in the intervention group (IG), while the other 54 patients who received routine nursing were included in the control group (CG). The data of the fetal orientation correction, delivery method and the pain score of puerpera of two groups were collected. The length of delivery, delivery fear score, the degree of neonatal asphyxia and nursing satisfaction were observed as the secondary outcomes. Results: Compared with the CG, puerpera in the IG had more occipital anterior position, less occipital transverse and posterior position, higher eutocia rate, lower pain and fear scores and shorter length of delivery; the Apgar score and nursing satisfaction were higher in the IG (all $P < 0.05$). Conclusion: Positional care combined with doula delivery can effectively correct abnormal fetal orientation, improve the rate of eutocia, reduce puerpera's pain and fear, shorten the length of delivery, and improve the quality of neonatal outcome and patients' satisfaction.

Keywords: Positional care, doula delivery, childbirth, abnormal fetal position

Introduction

Natural childbirth is a complex physiological process, in which the mother can experience severe pain. The size and position of the fetus and the speed of delivery progress can affect the mother's mood and have a serious impact on the normal delivery [1]. How to alleviate the pain of the puerpera during childbirth and reduce the rate of cesarean section are currently the main concerns of the medical staff in obstetrics and gynecology [2]. Fetal orientation is key to a smooth delivery. Unfortunately, approximately 20-25% cases experience abnormal fetal positions during labor [3, 4]. Abnormal fetal positions not only lead to difficult labor, but also result in vaginal lacerations and post-partum wound infections in severe cases, significantly increasing the mother's suffering [5]. In order to better promote vaginal births, reduce pain in women during childbirth, and enhance birth outcomes, there is growing con-

cern about timely recognition and effective correction of abnormal fetal positions [6].

Positional care during delivery is a method of correcting abnormal fetal orientation based on the changes in fetal position during different stages of labor, by guiding the mother to adopt correct positions to promote smooth labor [7]. Compared to the other two methods of promoting fetal head rotation, instrumental rotation and manual rotation, positional care, may be associated with less fetal and maternal complications, making it more popular for the midwife [8, 9]. Doulas were first mentioned in a study about the effect of a supportive companion of perinatal women published in 1980 [10]. Doula delivery is a comprehensive and proactive care provided by a trained practitioner, medical and nursing staff, with attention to the psychological and spiritual needs of the mother, in order to relieve her psychological state and reduce the pain and stress during childbirth

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[11]. Nowadays, doula delivery has received increasing attention as a promising, yet underutilized, strategy for advancing maternal health equity [12].

Currently, the care of abnormal fetal orientation during delivery is dominated by a single approach. Neither positional care alone nor doula delivery alone have been found to have sustained and significant labor analgesia effect in the process of parturient delivery [12, 13]. However, positional care alone has limitations and can easily overlook the psychological state of postpartum women. For delivery women who use epidural analgesia, it may be difficult to coordinate posture placement; some postures, such as hands and knees, may be uncomfortable for the mother, especially for prolonged delivery time [14]. Therefore, according to the current situation, this study analyzed the effects of postural nursing combined with doula delivery management on fetal orientation correction and pain relief in women giving birth. This is the first study to combine the two methods in delivery, aimed to explore better nursing methods for women during laboring to achieve better birth outcomes.

Material and methods

Clinical data

In this retrospective study, a total 108 pregnant women with abnormal fetal orientation were included from the Jinan City People's Hospital from February 2018 to February 2021. Among them, 54 participants who received positional care combined with doula delivery were included in the intervention group (IG), while the other 54 who received routine nursing were included in the control group (CG). This study was approved by the ethics committee Jinan City People's Hospital. All the mothers and their family members signed an informed consent form.

Inclusion criteria: (1) parturient with no contraindications for natural labor during prenatal examination; (2) parturient with fetus in occipital transverse or occipital posterior position indicated by abdominal palpation combined with fetal heart auscultation location, vaginal examination, B-ultrasound, and other examination methods; (3) parturient with mature placenta and fetus indicated by B-ultrasound

examination; (4) parturient with single pregnancy, normal fetal heart rate, and no fetal distress; (5) parturient with complete maternity records including corresponding treatments and outcomes evaluation after surgery.

Exclusion criteria: (1) parturient with combined gestational diseases; (2) parturient with severe liver, kidney, cardiovascular or cerebrovascular system disease; (3) parturient with infectious diseases; (4) parturient with a history of caesarean section or uterine surgery, or with indications for caesarean section; (5) parturient with primary or secondary uterine atony and slow progression of labor; (6) parturient with mental illness or those with unwillingness to participate; (7) parturient with incomplete records.

Intervention methods

In the CG, parturients were given routine care during childbirth. The specific methods as follows. (1) Give maternal care and considerate care, observe uterine contraction and uterine orifice expansion, and report to the doctor in time if any abnormality is found. (2) Puerpera can rest in bed or take a free position. (3) Timely remind puerpera to drink water, carefully observe uterine contraction and vaginal bleeding, encourage patients to get out of bed and urinate, and maintain personal hygiene. (4) After the full opening, guide the puerpera to push correctly to protect the perineum. After the fetal head is delivered, cooperate with the doctor to deliver the fetus. During the delivery process, a midwife nurse observed puerpera's facial expressions, heart rate, blood pressure and other situations. (5) Placental delivery and bleeding were examined carefully, and the mother and child can be returned to the ward if there were no abnormalities.

In the IG, patients were given positional care combined with doula delivery during the childbirth. The specific methods as follows.

(1) Positional care. ① During the first stage of labor. A professional midwife served as a doula to explain and demonstrate the delivery process, as well as the mechanism of using posture intervention to promote the fetus to shift to the occipital anterior position and facilitate smooth delivery. Allow puerpera to urinate before position intervention to prevent swollen bladder from affecting fetal head alignment.

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For the occipital transverse position and occipital posterior position, assist the puerpera in adopting a lateral prone position on the back of the tire, with the puerpera's waist slightly bent, the upper leg bent to make the spine and thighs forming 90°, the lower leg extended, and the anterior abdominal wall pressed against the bed surface. Adjust the lateral prone position angle according to the comfort of the puerpera for 30-60 minutes. During the whole process, the uterine contraction was closely observed. Every 15 minutes, listen to the fetal heart rate for 1 minute immediately after uterine contractions. If there is any abnormal fetal heart rate during the observation period, immediately administer oxygen inhalation, change body position, and monitor fetal heart rate. If frequent late deceleration occurs during fetal heart monitoring, caesarean section should be performed immediately. During the period of posture change, pay attention to whether there is any involuntary downward force to defecate. If so, a vaginal examination is performed to determine whether the initial exposure has been reduced, the cervix fully opened, and the position of the fetal head corrected. ② During the second stage of labor. In the second stage of labor, puerpera were allowed to choose lateral or sitting positions based on their own situation, knee chest or kneeling positions were all acceptable. From the first stage of labor to the second stage of labor, there is no need to rush to the delivery bed. Before transferring to delivery bed, the pregnant woman were allowed to hold her breath and push, and choose a comfortable position until the delivery of fetal head.

(2) Doula delivery. ① Psychological intervention. Throughout the delivery process, doula provided personalized psychological counseling based on puerpera's family situation, personality and education level. To alleviate puerpera's tension, doula actively told the mother about successful treatment cases in the past, enhance the willingness and confidence in smooth delivery, and build a harmonious and good nurse-patient relationship. During the delivery, doula properly communicated with puerpera using eye contact and language and alleviated their pain during childbirth through physical contact, language, attention diversion and other means. ② Guidance and education. Before delivery begins, doula carefully informs puerpera of the precautions during delivery and informs puerpera to empty the bladder before

entering the delivery room. Instruct puerpera to actively cooperate and follow the doctor's instructions during the delivery process. During different stages of labor, doula guides puerpera to carefully adjust the frequency of exhalation and inhalation, pay attention to muscle relaxation and contraction, strengthen monitoring of anal dilation and labor progress, and strengthen nursing care for puerpera with fully opened cervix, and gently massage or compress puerpera's abdomen to ensure comfortable production. After delivery, inform puerpera to adopt a semi recumbent position, encourage puerpera to have out of bed activities as soon as possible. ③ Close observation. At the beginning of delivery, doula carefully observed various signs of puerpera (such as heart rate and blood pressure), and if necessary, inhale oxygen. Carefully check the dilatation of the uterus until entering in the waiting room. For puerpera with prolonged labor process and physical exhaustion, it is necessary to replenish energy to restore physical strength. ④ Emotional support. Timely contact with puerpera's family, especially the spouse, to inform them of the importance of family support for smooth delivery and encourage them to provide sincere care to puerpera, giving them a sense of being valued and cared for.

Outcome measures

Main outcome measures: (1) Correction of fetal orientation by comparing the number of puerperas in the anterior, transverse, and posterior occipital positions of IG and CG. (2) Delivery method. The number of puerpera in spontaneous delivery, caesarean section and vaginal assisted delivery of IG and CG was compared. (3) Puerpera's pain score. The visual analogue scale (VAS) was used to compare the pain level between the two groups during the three labor stages, with a total of 10 points; the higher the score, the more severe the pain level [15].

Secondary outcome measures: (1) Length of delivery. The length for delivery in the first, second, and third stages of labor was compared between IG and CG. (2) Delivery fear score. Wijma Delivery Expectancy/Experience Questionnaire version A (W-DEQ-A) was used to assesses the intensity of emotions related to childbirth expectations of the two groups. The questionnaire encompasses 33 items with a total score of 165. Higher scores reflect higher

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Table 1. Comparison of general information between the two groups [n (%), $\bar{x} \pm \text{sd}$]

Characteristic	IG ^a (n=54)	CG ^b (n=54)	χ^2/t	P
Age (years)	30.11±3.52	30.25±3.47	0.493	0.537
Gestation (weeks)	40.17±1.33	40.23±1.28	0.585	0.661
Body mass index (kg/m ²)	29.12±1.13	29.44±3.27	0.798	0.828
Parity			0.533	0.881
Primiparous	39 (72.22)	38 (70.37)		
Multiparous	15 (27.78)	16 (29.63)		
Pubic arch angle			0.277	0.465
90°	44 (81.48)	41 (75.93)		
<90°	10 (18.52)	13 (24.07)		
Ischial spines			0.357	0.566
Very prominent	0 (0)	1 (1.85)		
Prominent	7 (12.96)	8 (14.81)		
Not perceptible	47 (87.04)	45 (83.33)		
Coccyx			0.412	0.987
Prominent	1 (1.85)	2 (3.70)		
Not prominent	53 (98.15)	52 (96.30)		
Fetal position at inclusion			0.545	0.284
Occiput posterior position	45 (83.33)	41 (75.93)		
Occipital transverse position	9 (16.67)	13 (24.07)		

Note: ^aIG: intervention group; ^bCG: control group.

level of childbirth fear. A score ≥ 66 reflects severe childbirth fear [16]. (3) The degree of neonatal asphyxia. Apgar score was used to access the degree of neonatal asphyxia. The neonates were assessed at 1 minute and 5 minutes after birth, including appearance, pulse, grimace, activity and respiration, with a total score of 10 points. A total of 8-10 points indicate normal, 4-7 points indicate mild asphyxia, and 0-3 points indicate severe asphyxia. (4) Nursing satisfaction. A self-designed inpatient satisfaction questionnaire based on our hospital and relevant literature was used to assess the status of maternal satisfaction with care [17, 18]. The scale includes 9 dimensions, specifically medical technology, hospital environment, waiting time, medical cost, doctor-patient communication, operation technology, service quality, humanistic care and overall satisfaction, with 20 items, each of which is scored on a 5-point Likert scale, ranging from "very dissatisfied (1)" to "very satisfied (5)". The higher the score, the higher the patient satisfaction. The scale was found to have good reliability, with an overall Cronbach's alpha coefficient of 0.912 and Cronbach's alpha coefficients ranging from 0.891 to 0.924 for each dimension. The corresponding scores are

80-100 points, 60-79 points, and 0-59 points, respectively.

Statistical methods

IBM SPSS Statistics 26.0 and GraphPad 9 were used for the statistical analyses. Measurement data were expressed as mean \pm standard deviation ($\bar{x} \pm \text{sd}$). Independent t test was carried out for comparison between groups. Comparison of data before and after treatment within the group was performed using paired-sample t test. Count data were expressed by number/percentage (n/%) and compared by the chi-square test. ANOVA followed by post-hoc Bonferroni test was conducted to compare the difference among repeated measurements of pain scores. Statistical significance was set at $P < 0.05$.

Results

Comparison of clinical data

In term of the basic clinical data of the two groups, there were no statistical differences in age, gestation, body mass index, parity, pubic arch angle, ischial spines, coccyx and fetal position at inclusion between the two groups (all $P > 0.05$), as shown in **Table 1**.

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Table 2. Comparison of correction of fetal orientation between the two groups [n (%)]

Item	IG ^a (n=54)	CG ^b (n=54)	χ^2	P
Occipital anterior position	51 (94.44)	40 (74.07)	6.356	0.012
Occipital transverse position	1 (1.85)	6 (11.11)	7.013	0.013
Occipital posterior position	2 (3.70)	8 (14.81)	5.186	0.023

Note: ^aIG: intervention group; ^bCG: control group.

Table 3. Comparison of delivery method between the two groups [n (%)]

Item	IG ^a (n=54)	CG ^b (n=54)	χ^2	P
Eutocia	47 (87.04)	34 (62.96)	7.221	0.009
Cesarean section	4 (7.41)	11 (20.37)	5.140	0.026
Vaginal assisted delivery	3 (5.56)	9 (16.67)	3.743	0.031

Note: ^aIG: intervention group; ^bCG: control group.

Table 4. Comparison of pain scores between the two groups during the three labor stages ($\bar{x} \pm sd$)

Group	n	First stage of labor	Second stage of labor	Third stage of labor	F	P _f
IG ^a	54	6.98±0.89	5.16±0.54	4.59±0.54	3.132	0.036
CG ^b	54	8.89±0.56	7.04±0.11	6.26±0.30	4.003	0.022
t		11.121	10.299	26.389		
P		<0.001	<0.001	<0.001		

Note: ^aIG: intervention group; ^bCG: control group.

Table 5. Comparison of length of delivery between the two groups during the three labor stages ($\bar{x} \pm sd$)

Group	n	First stage of labor	Second stage of labor	Third stage of labor	F	P
IG ^a	54	231.26±12.14	38.16±3.25	6.06±0.52	5.515	0.024
CG ^b	54	356.28±18.66	59.66±4.52	7.16±0.99	6.779	0.011
t		40.372	27.849	7.093		
P		<0.001	<0.001	<0.001		

Note: ^aIG: intervention group; ^bCG: control group.

Comparison of correction of fetal orientation

A comparison of correction of fetal orientation between the two groups revealed that the number of puerpera with occipital anterior position was significantly higher in the IG than that in the CG, while the numbers of puerpera with both occipital transverse and occipital posterior position were significantly lower in the IG than that in the CG (all $P < 0.05$), as shown in **Table 2**.

Comparison of delivery method

A comparison of the delivery methods in the two groups revealed that compared with the CG, the puerpera in the IG had a significantly higher rate of eutocia and a significantly lower

rate of cesarean section and vaginal assisted delivery ($P < 0.05$), as shown in **Table 3**.

Comparison of pain score

A comparison of the pain scores in the two groups during the three labor stages revealed that compared with the CG, the pain scores in the IG were lower in all the three stages (all $P < 0.05$), as shown in **Table 4**.

Comparison of the length of delivery

A comparison of the length of delivery during three stages between the two groups revealed that compared with the CG, the length of delivery in the IG was shorter in all the three stages (all $P < 0.05$), as shown in **Table 5**.

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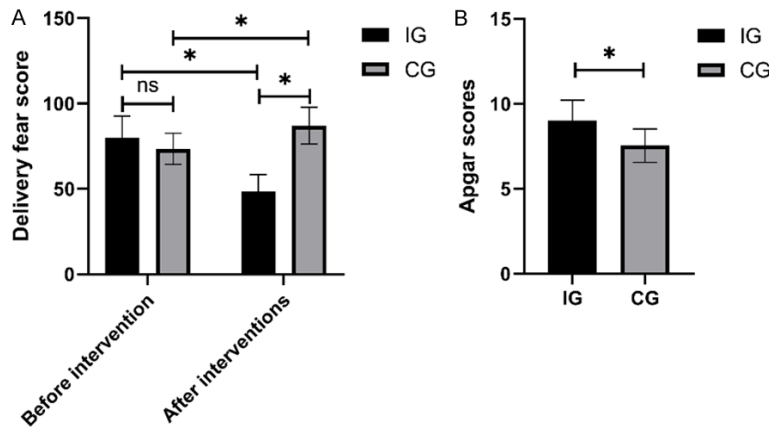


Figure 1. Comparison of delivery fear score and degree of neonatal asphyxia in the two groups. Note: (A) Comparison of delivery fear score between the two groups. (B) Comparison of Apgar score between the two groups. *, $P < 0.05$. IG: intervention group; CG: control group.

Table 6. Comparison of nursing satisfaction between the two groups [n (%)]

Satisfaction	IG ^a (n=54)	CG ^b (n=54)	t	P
Very satisfied	35 (64.81)	32 (59.26)		
Satisfied	17 (31.48)	14 (25.93)		
Dissatisfied	2 (3.71)	8 (14.81)		
Score	90.74±3.26	80.19±9.97	1.926	0.003

Note: ^aIG: intervention group; ^bCG: control group.

Comparison of delivery fear score

A comparison of the changes in delivery fear scores in the two groups before and after interventions revealed that the delivery fear scores of puerpera in the IG were lower after intervention than that before intervention ($P < 0.05$). Whereas, for puerpera in the CG, the delivery fear scores were higher after intervention than that before intervention ($P < 0.05$). There was no significant difference between the two groups before the intervention ($P > 0.05$), while after the intervention, the score of the IG was significantly lower than that in the CG ($P < 0.05$), as shown in **Figure 1A**.

Comparison of the degree of neonatal asphyxia

A comparison of the degree of neonatal asphyxia in the two groups revealed that the Apgar score was higher in neonates of the IG compared to that in the CG ($P < 0.05$), as shown in **Figure 1B**.

Comparison of nursing satisfaction

A comparison of the nursing satisfaction between the two groups revealed that nursing satisfaction was higher in the IG compared to that in the CG ($P < 0.05$), as shown in **Table 6**.

Discussion

The rate of cesarean section has increased significantly in China, and head position dystocia is one of the main reasons [19]. The common abnormal fetal positions during cephalic delivery include occipital transverse position and occipital posterior position [20]. It is generally believed that fetuses in the posterior or transverse occipital position cannot correct themselves, which often leads to prolonged labor and fetal distress [21]. At this time, if assisted delivery is performed, it is likely to increase the incidence of postpartum bleeding and puerperal infection, thus increasing maternal suffering [22]. Therefore, it is particularly important to correct the fetal position through intervention in the labor process to reduce the pain, the risk of postpartum bleeding and infection and ensure the safety of puerpera. Although traditional midwifery care intervenes from clinical and biological perspectives, it often overlooks puerpera's inner feelings [23]. Positional care combined with doula delivery not only helps puerpera choose the correct position and effectively correct the fetal position, but also provide companionship during the correction of fetal position until the end of the entire delivery process [24].

Our results revealed that the correction of fetal position in the IG was significantly better than that in the CG, and the rate of spontaneous labor was significantly higher than that in the CG. All these results suggested that the positional care combined with doula delivery, with explaining the occurrence mechanism, out-

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come and correction methods of fetal position, provided scientific guidance for puerpera and effectively corrected fetal position. The study of Barrowclough et al. [25] supported this idea that improving puerpera's understanding of fetal position abnormalities can enhance enthusiasm and autonomy in participating in positional care. At the same time, positional care combined with doula delivery avoided the passivity of the traditional position for labor, reduced the incidence of caesarean section and dystocia, and greatly improved the rate of natural childbirth. The study of Bueno-Lopez et al. held the same viewpoints [14]. There is a certain relationship between the puerpera horizontal position and the occipital posterior position. As the fetal center of gravity is on the back, when puerpera lying on the back, the fetal back would move towards the rear of the uterus under the influence of gravity, resulting in occipital posterior position [26]. Therefore, based on the principle of gravity, assisting puerpera in adopting the lateral lying position can promote the fetal center of gravity to move forward, thereby correcting the fetal orientation and maintaining the occipital anterior position. However, the study of Le et al. [27] displayed the negative results, which might be related to different populations and intervention methods. Further research is needed for validation.

For most women, the delivery pain is the most severe pain in their lives. Excessive pain will lead to the increase of adrenaline in puerpera, which inhibits the uterine contraction to a certain extent, thus prolonging the labor process and preventing smooth delivery [28]. Therefore, reducing delivery pain is an urgent clinical issue that needs to be addressed. Our research revealed that the pain score in the IG was significantly lower than that in the CG, indicating that the pain of puerpera with abnormal fetal position can be reduced by positional care combined with doula delivery. A qualitative evidence synthesis of perceptions and experiences of doula companionship also support this result, which is that doula can facilitate non-pharmacological pain relief for the women during childbirth [29]. Delivery requires the effective coordination of multiple factors, such as the birth canal, labor force, fetus, and psychology. However, during the delivery process, the fetus and birth canal remain relatively unchanged. In order to further shorten the deliv-

ery process, it is necessary to intervene in both psychology and labor forces. Positional care can help puerpera adopt different postures, effectively reducing pain and fatigue, and reducing labor loss. Doula delivery provides psychological counseling to puerpera through multiple channels and methods, fully mobilizing enthusiasm for delivery and alleviating psychological burden. Positional care combined with doula delivery significantly increases puerpera's productivity and self-confidence, effectively alleviating anxiety [30].

Our research revealed that, the length of delivery in all three production process in the IG was shorter than that in the CG, indicating that the length of delivery of puerpera with abnormal fetal position can be reduced by positional care combined with doula delivery. Doula delivery is a systematic, organized and planned nursing to motivate puerpera to consciously adopt behaviors that contribute to the health. So that it can lower sympathetic excitability, inhibit cortisol and catecholamine release, as a result, the physiological and psychological stress reactions could be reduced. The study of Bohren et al. [31] found the same facts that with the company of others (possibly professional doula), puerpera could experience shorter delivery duration. Similarly, positional care guided puerpera in adopting a comfortable position during the production process, alleviating uterine contractions, accelerating labor progress, and promoting fetal delivery. The results are similar to Shi's study [32]. Analyzing the reasons, positional care ensures maternal comfort and increases physical and mental pleasure, which further inhibits the release of cortisol and catecholamines and reduces maternal stress in multiple ways [13].

We found that positional care combined with doula delivery was significantly effective in decreasing the delivery fear of puerpera with abnormal fetal position. However, compared to pre-intervention, puerpera in the CG showed a higher level of fear for childbirth after the intervention. These results indicate that without positional care combined with doula delivery, fear of childbirth could even be intensified. Doula delivery includes psychological care, which can effectively reduce negative perinatal emotions such as fear of childbirth, depressive symptoms, and delivery anxiety, and improve

women's confidence in childbirth [33, 34]. Additionally, for a considerable portion of puerpera, a lack of knowledge about childbirth is one of the main reasons for the increased fear during childbirth [35]. In our study, with our intervention of positional care combined with doula delivery, the knowledge of puerpera was improved after being explained of the delivery process, so that their fear was decreased.

We also compared the neonatal condition of the two groups, and the results revealed that the degree of neonatal asphyxia in the IG was significantly lower than that in the CG, indicating that positional care combined with doula delivery can improve the condition of newborns. A Cochrane review mentioned that, puerpera with doula assisted delivery was more likely to experience fewer negative childbirth experiences, such as a low Apgar score [36]. Doula delivery provides companion support care to reduce pain levels, promote faster cervical dilation, accelerate fetal head descent and prevent complications during delivery [37]. At the same time, positional care focuses on adjusting the position according to the actual situation of puerpera, which can reduce the restriction of the birth canal to the fetus and further promote vaginal delivery, thus avoiding asphyxia and choking of the newborn [38]. Therefore, positional care combined with doula delivery could promote the rate of eutocia, reduced cesarean delivery, and improved neonatal Apgar score of newborns. In addition, nursing satisfaction was higher in the IG than in the CG, suggesting that positional care combined with doula delivery can promote the establishment of a harmonious nurse-patient relationship and improve nursing satisfaction.

However, this study still has certain limitations. First, as a retrospective study, long-term follow-up was not conducted on patients, and the data we obtained were all from electronic medical records. Second, non-random samples and limited sample size may lead to bias in the results. Therefore, we hope to refine our conclusions by conducting randomized controlled trials and long-term follow-up of patients in the future.

In conclusion, positional care combined with doula delivery can effectively correct abnormal fetal orientation, improve the rate of eutocia, reduce puerpera's pain and fear, as well as

shorten the time of the birth process. In terms of neonatal outcome, positional care combined with doula delivery can effectively improve the quality of neonatal outcome and the satisfaction of the mother, which is worthy of clinical application and promotion.

Disclosure of conflict of interest

None.

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