Original Article

The Impact of Maternal Position in Labor on Occiput-Posterior Position of Fetus and Pregnancy Outcomes in Pregnant Women Without Epidural Analgesia

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Abstract

Objective: Fetal occiput posterior (OP) position is associated with more maternal and neonatal complications. This study aimed to investigate the effect of maternal position during labor on fetal OP position and pregnancy outcomes.

Materials and methods: This randomized clinical trial study included 180 primigravida women in labor with a single fetus and approved OP position. Participants were randomly allocated into three groups: semi-prone position (n=45), knee-chest position (n=45), and supine position (n=90). All participants were placed in the defined positions 15-30 min in labor until delivery. Data collected using Visual Analogue Scale and researcher made checklist. The ANOVA, Tukey post hoc, and the chi-square test were used to analyze.

Results: Among all participants who had OP, after intervention 16.3% in the semi-prone position, 14/3 % in the knee-chest position, and 33.7% of the control groups remained with OP at birth (X^3=7/87, P=0.019). The rate of natural delivery was significantly higher in the semi-prone position and knee-chest position. The duration of active phase of labor and low back pain were significantly reduced in the semi-prone and knee-chest position compared to the control groups (P<0.05). There were no differences in the duration of the third stage of labor, APGAR score, and the rate of neonatal addition to neonatal intensive care unit, using oxytocin, and perineal tears (P>0.05).

Conclusion: The semi-prone and knee-chest positions increase the spontaneous rotation of occiput to the anterior position, vaginal delivery rates as well as a reduction in duration of active phase of labor and low back pain after delivery.

Keywords: Fetal Occiput Posterior; Maternal Position; Labor; Epidural Analgesia; Pregnancy Outcomes

Introduction

The fetal occiput posterior (OP) position account for around 30% in the oncet of labor and 5-7% at delivery time (1).The factors that may contribute to this OP position are nulliparity, age above 35 years, African and American races, familial history of delivery with OP position, limited pelvic capacity,

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gestational age ≥41 weeks, fetal birth weight ≥4000 gr, anterior placenta position, and epidural anesthesia. Short maternal height is also another risk factor (2). Persistent occiput posterior position (POP) is associated with more complications during labor including prolonged labor, postpartum hemorrhage, low back pain, dystocia, maternal fatigue, chorioamnionitis, fourth-degree perineal lacerations, instrumental delivery, increased cesarean section rates, neonatal morbidities such as low APGAR score, newborn encephalopathy, and admission to neonatal intensive care unit (NICU) (2). The OP position can be diagnosed by Leopold maneuver and vaginal examination by palpation of the anterior fontanel position relative to the mother's pelvis. Sonography can be used to confirm the diagnosis (3).

Methods have been considered to correct an OP position as follows: manual rotation, use of oxytocin, maternal posturing before or during labor, and operative delivery (4). The Posture of the mother is noninvasive and theoretically harmless for the fetus (5). To facilitate rotation of the fetal head, maternal active participation with the change of position during the first and second stages is necessary (2). Use of lying, standing, sitting, on all-fours, and squatting positions by mother during labor shortens the first and the second stages of labor, reduces the rate of Cesarean-section and instrumental delivery, and corrects the OP position (6). Research has shown that the knee-chest position several times a day helps to rotate the fetal head from OP to occiput anterior (OA), though this rotation is short-term (3). On all-fours position during the first stage of labor cannot be proposed as a useful method for correcting the fetal occiput posterior position, but it is effective for the mother's comfort (7). In another study, using a hands-and-knees position during labor failed to demonstrate either any reduction of POP position at delivery and maternal or neonatal outcomes improvement (8). If a woman is in a semi-prone position and on the contralateral side to occiput posterior for 15-30 min, helps to rotate the fetal head from OP to occiput transverse (OT) or OA (9). In a study, using modified Sims position showed an increased rate OP to OA position (10). Whereas another study failed to show any maternal or neonatal benefit and OP to OA correction at birth (5). Our study aimed to evaluate the efficacy of knee-chest and semi-prone positions to correct fetal head position from the OP to OA position during the active phase of labor and the delivery outcomes for primiparous women without epidural analgesia.

Materials and methods

This randomized controlled trial was performed in a tertiary maternity unit (Mother Hospital, Ramhormoz, Khuzestan, Iran), between April to August 2017.

Inclusion criteria: primiparous women with singleton fetus, spontaneous onset of labor, intact membranes, gestational age≥ 37 weeks with cervical dilatation of 3-4 cm, maternal age range between 18-40 years, Body Mass Index (BMI) 18-30 kg/m^2 and fetal OP position confirmed by two midwives or OP position that was confirmed by transvaginal ultrasound. Exclusion criteria**:** premature delivery, induction of labor, women who wanted to receive epidural or spinal analgesia and Entonox gases, severe fetal abnormalities, fetal weight above 95th percentile or below 10th percentile, severe vaginal bleeding, contraindications to vaginal delivery and prohibition of active maternal movement during the labor. After explaining the objectives of the research and the information related to the present study, women were provided a written informed consent prior to data collection.

At first, qualified women completed a demographic questionnaire which included personal, social, and midwifery information. After inclusion, women were randomly assigned to the control or the intervention groups based on using a random number generating software.

All information was recorded by the researcher using a check-list as well as teaching the relevant position to the mothers in the intervention groups. Participants were divided into three groups. Intervention group I with semi-prone position, intervention group II with knee-chest position, and a control group with supine position. Pregnant women in group I intervention taught to get semi-prone position on the side opposite the fetal occiput, and participants in group II intervention taught to get knee-chest position. Participants in the control group adopted a supine position at least 15-30 minutes per hour in the first stage of labor. At the second stage of labor, to make the greater effect of gravity on the descent and rotation of the fetal head, the upper edge of the bed raised 30° until the time of delivery. In the knee-chest position, for mother comfort, a pillow was placed under the arms. At the second stage of labor, the knee-chest position was with the rocking movement of the pelvic to facilitate fetal head rotation. The duration of the intervention was

between 15- 30 minutes per hour in the first stage of labor. If the situation becomes boring for the mother, she was allowed to rest and lie in the supine position, but she had to be in a relevant position for at least 15 minutes per hour.

The primary outcome was the percentage of the fetal OA position at delivery. The secondary outcomes were type of delivery, duration of the first, second, and the third stages of labor, use of oxytocin, rate of perineal tears, labor pain intensity, low back pain intensity, mother's satisfaction, APGAR score at first and fifth minutes after birth and rate of neonatal admission to the neonatal intensive care unit (NICU). A checklist was used to record outcomes during labor and at birth for all participants. The information related to the labor pain and low back intensity was completed based on the Visual Analogue Scale (VAS) at 4, 6, 8, 10 cm dilatation of cervix and during the second stage of labor. In the case of an emergency C-section, the fetal occiput position was determined by the gynecologist.

For a 95% confidence interval and 90% power, the sample size was calculated to be 166 people, but this number was increased to 180 to compensate the attrition size. Eligible women were allocated randomly into three groups of intervention group I (semi-prone, n=45), intervention group II (knee-chest, n=45), and a control group. with supine position (n= 90). The data were analyzed by SPSS version 16. The ANOVA and Tukey post hoc test were used to analyze quantitative data and the chi-square test was used for categorical data analysis with a significance level of P<0.05 and 95% confidence interval. The qualitative variables were described using frequencies and percentages and the quantitative variables using mean and standard deviation.

Ethical considerations: At the beginning of the study, the purpose of the research was clearly explained to the participants and then a written consent form to participate in the study was obtained from the researcher. It was also emphasized that at any stage of the study, in case of cancellation to continue cooperation, it was excluded from the study with respect. This study is sponsored by Ahvaz Jundishapur University of Medical Science (Ref No: RHPRC-9601). Furthermore, this study was also submitted to the Iranian clinical trial center (IRCT) (Ref No: 3N 2017082111360). Before the trial began, all midwives received specific training about the study protocol and the semi-prone and the knee-chest positions.

Results

Primary and secondary outcomes were analyzed using an intention-to-treat method. A total of 180 women were included in the study and nine women were dropped-out from the study. Two women from the semi-prone group, three women from the knee-chest group, and four women from the control group dropped-out due to the mother's desire for analgesia or discomfort with the position.

Baseline characteristics of participants: There were no significant differences in demographic characteristics including age, body mass index, gestational age, pubic arch angle, ischial spines, coccyx, placenta position, and type of fetal OP position between the groups (P>0.05) (Table 1). There were not any significant differences in neonate characteristic including weight, head circumference, and infant gender (Table 1).

Primary outcome: Thirty-eight (83.7%) women in the semi-prone group and thirty-nine (85.7 %) women in the knee-chest group rotated to OA position at birth compared to sixty-one (66.3%) women in the control group (χ3=7/87, P=0.019). Also, there was a significant difference between the semi-prone group and the control group (χ2=4/335, P=0.037), as well as between knee-chest and control groups (χ2=5/365, P=0.021). However, the semi-prone and knee-chest groups did not have any significant difference with each other (χ2=0/065, P=0.799) (Table 2).

Secondary outcomes: Duration of the first and the second stages in the intervention groups showed a significant difference with the control group (P=0.023, P=0.003 respectively). Also, there was a significant difference between semi-prone and the control groups (P=0.046, P=0.032) as well as between knee-chest and the control groups (P=0.017, P=0.002). However, the semi-prone and knee-chest groups did not have any significant differences in the first and second stages of labor with each other (P=0.731, P=0.334). Three groups did not show any significant difference between the duration of the third stage of labor (P=0.878) (Table 2).

The rate of vaginal delivery was higher in the intervention groups compared to the control group (χ3=8.29, P=0.016) as well as the detailed type of delivery (χ3=10.36, P=0.035). There were significant differences between knee-chest and control groups (P=.018, P=.032 respectively). Also, the type of delivery was a significant difference between semi-prone and control groups (P=0.037) but the detailed type of delivery was no significant differences (P=0.059).

Table 1: Participant characteristics

Variable		Semi prone group (n=45)	Knee-chest group (n=45)	control group (n=90)	P-value
Age		24/04±5/38	24/08 ±4/21	24/56±4/18	0/759
Gestatinal age		269/26 ±5/44	264± 37/8	267± 17/6	0/601
BMI	Initial	22/83± 3/35	22/86 ± 5/66	22/71 ±3/05	0/973
	At delivery	29/76 ± 5/38	28/9 ± 8/2	29/39 ± 8/08	0/9
Pubic arch angle	≥90°	42(93/3)	43(95/5)	79(87/7)	0/272
	<90°	3(6/7)	2(4/5)	11(12/3)	
Ischial spines	Very prominent	2(4/5)	2(4/5)	8(8/9)	0/57
	Prominent	5(11/1)	5(11/1)	15(16/7)	
	Not perceptible	38(84/4)	38(84/4)	67(74/4)	
Coccyx	Prominent	4(8/9)	6(13/3)	6(6/7)	0/439
	Not prominent	41(91/1)	39(86/7)	84(93/3)	
Placenta	Anterior	28(62/2)	26(57/9)	52(57/7)	0/215
	Posterior	8(17/8)	7(15/5)	18(20)	
	Fundal	6(13/3)	7(15/5)	4(4/5)	
	Lateral	3(6/7)	5(11/1)	16(17/8)	
Type of fetal OP position	Right	24(53/3)	27(60)	61(67/8)	0/387
	Left	18(40)	14(31/1)	21(23/3)	
	OP	3(7)	4(8/9)	8(8/9)	
Neonate characteristics	Female	19(44/2)	18(42/9)	39(45/3)	0/964
	male	24(55/8)	24(57/1)	47(54/7)	
Birthweight(g)		3183/72 ± 310/66	3247/61 ± 281/10	3188/70 ±3409/5	0/635
Head circumference(cm)		33/8 ± 1/29	33/9 ± 1/24	33/93± 0/979	0/975

But the type of delivery and detailed type of delivery was no significant difference among intervention groups (P=0.753, P=0.952 respectively) (Table 2).

Moreover, no significant differences were observed between the semi-prone group and knee-chest group compared with the supine position group regarding the APGAR score at 1 or 5 minutes after birth as well as the rate of neonatal admission to NICU (P>0/05), the rate of oxytocin use (P>0/05), perineal tears (P>0/05) and lacerations (P>0/05) (Table 2).

There was no significant difference regarding the low-back pain before the intervention and at 3-4cm of cervical dilation between the semi prone (4.36±1.55) and knee chest (3.76±1.49) with the control (4.2±1.58) groups (P=0.108). But, the low-back pain at cervical dilatation of 6cm (4.02±1.27, 2.48±0.64 vs. 6.51±1.68, P<.001), 8cm (4.37±1.19, 2.33±0.9 vs. 7.07±1.6, P<.001), and 10 cm (4.6±1.3, 2.31±0.87, P<.001) and during the second stage of labor in the intervention groups (4.87±1.31, 2.56±1.18) were significantly lower than that in the control group (7.96±1.41) (P<.001). Also, the low-back pain in the knee-chest position was significantly lower than that in the semi-prone position (P<0.05).

Discussion

This study aimed to evaluate the efficacy of knee-chest and semi-prone positions to correct fetal head position from the OP to OA position during the active phase of labor and the delivery outcomes for primiparous women without epidural analgesia. The results of our study showed that maternal position during labor has an undeniable role in improving fetal OP position and maternal or neonatal complications. In this study, we found that the maternal semi-prone position and knee-chest position increased the spontaneous rotation to occiput anterior position in women with the fetus in OP position. Also, these positions were accompanied by an increase in the rate of natural delivery and reduction of low back pain during labor. But the duration of the third stage of labor, the first and fifth minute APGAR score and the rate of admission to NICU, oxytocin usage, perineal tears were not significant compared to the supine position.

Pain during labor, it reduces the tone and relaxes the pelvic floor muscle and this makes the fetal head susceptible to the incomplete rotation. The use of epidural analgesia has been associated with higher POP position rates at birth and as a result, cesarean delivery and instrumental delivery may increase (11).

Table 2: Obstetric and neonatal outcomes

Variable		Semi prone group (n=43)	Knee-chest group (n=42)	Control group (n=86)	P-value
Fetal head position at birth (primary outcome)	O A	36(83/7)	36(85/7)	57(66/3)	0/019
	O P	7(16/3)	6(14/3)	29(33/7)	
Duration of labor(min)	First stage	255/8±68	250±63/5	282±73/5	0/023
	Second stage	47/6 ±19/7	43/5 ± 17/7	57/4± 24/6	0/003
	Third stage	6/20 ± 2/74	6/04 ± 1/68	6/04 ±1/16	0/878
Type of delivery	Vaginal	39(90/7)	39(92/8)	62(72/1)	0/004
	Cesarean	4(9/3)	3(7/2)	24(27/9)	
Detailed type of delivery	Natural delivery	38(88/4)	38(90/5)	57(66/3)	0/01
	Vacuum	1(2/3)	1(2/4)	5(5/8)	
	Cesarean	4(9/3)	3(7/1)	24(29/7)	
Apgar score	1 min	8/88 ± 1/31	8/79 ± 1/26	9/02 ± 0/854	0/487
	5 min	9/12 ± 0/905	9/24 ± 0/431	9/23 ± 0/425	0/519
Hospitalization in NICU	Yes	1(2/3)	2(4/8)	4(4/7)	0/795
	No	42(97/7)	40(95/2)	82(95/3)	
Oxytocin usage	Yes	30(69/8)	27(64/3)	59(68/6)	0/84
	No	13(30/2)	15(35/7)	27(31/4)	
Perineal tears	Episiotomy	34(87/2)	33(84/6)	54(87/1)	0/995
	Laceration	3(7/7)	4(10/3)	5(8/1)	
	No tears	2(5/1)	2(5/1)	3(4/8)	
Laceration	First degree	1(33/3)	2(50)	0	0/559
	Second degree	0	0	2(40)	
	Third degree	1(33/3)	2(50)	2(40)	
	Fourth degree	1(33/3)	0	1(20)	

The semi-prone on the side opposite the fetal occiput causes more rotation of the anterior side of the mother's pelvis towards the bed which alters the forces of gravity on the fetus and encourages OP to OT to OA rotation (2). Other studies showed that the use of modified Sims-position led to rotation of OP to OA and the rate of vaginal delivery is higher than that in other position. But did not show a positive effect on the rate of laceration or episiotomy, instrumental delivery, and neonate APGAR score (10). These results are in line with our study. On contrary, there were no positive effects on the fetal head correction from OP to OA, maternal and neonatal outcomes when the mother was in a lateral recumbent position (the fetal head station between -2 and 0). Also, a maternal lateral recumbent position with the inferior leg lying in the axis of the body and the other leg folded at an approximately 90-degree angle with the use of leg support at the time the fetal head station was station>0, did not show positive effects (5). In the study by Lee Ray et al. lateral asymmetric decubitus position of mother could not change the rotation of fetal head to OA, and the type of delivery compared to the dorsal recumbent posture (12). In our study, contrary to the mentioned studies, regional anesthesia was not used and the intervention continued periodically until delivery. Also, women with the left occiput posterior position were asked to lie in a right semi-prone position, while women with the right occiput posterior position were asked to lie in a left semi-prone position. According to the results of the present study, the maternal knee-chest position was also effective in correcting the fetal OP position. Knee-chest position and keeping the thighs up lead to ischium movement toward the sides, which results in increased pelvic input diameter. This situation leads to fetal head rotation from OP to OA.

The knee-chest position helps the fetal head rotation by reducing cervical pressure (9). knee-chest position provides for the release of pressure between the head of the fetus and the cervix. Therefore, flexion and rotation of the fetal head happened more easily (9). In our study, the knee-chest position was associated with pelvic rocking movements. The pelvic rocking is known as a

method for the greater match between the fetal head with the cervix and to help facilitate fetal head rotation to OA (13).In the study by Gizzo et al. knee-chest position during labor was able to improve the fetal head rotation from OP to OA, significant reduction in the duration of first and the second stages of labor, episiotomy reduction and increase the rate of natural delivery (6). In a study by Desbrière et al. using the knee-chest position at the time the fetal head station between -5 and -3 could not make a significant change in rotation of OP to OA position (5). In our study, the knee-chest position was associated with pelvic rocking movements. The pelvic rocking is known as a method for a greater match between the fetal head with the cervix and to help facilitate fetal head rotation to OA (13). In the present study, being in a knee-chest position was associated with less back pain for the mother than a semi-prone position. The knee-chest position leads to diminished back pain, whereby the mother felt more comfortable (14).

One of the strengths of the present study is the lack of use of regional anesthesia during labor and also the periodicity and length of the intervention until delivery.

Conclusion

The maternal semi-prone position and knee-chest position lead to an increase in the spontaneous rotation to occiput anterior position at birth, the higher rate of vaginal deliveries, and reduce the low back pain and duration of active labor. These positions are non-invasive, reproducible, cost-effective, and tolerable for the mother and without causing any harm to the fetus.

Conflict of Interests

Authors declare no conflict of interests.

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