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Maternal positioning to correct occiput posterior fetal position during the first stage of labour: a randomised controlled trial

MJ Guittier,[a,b] V Othenin-Girard,[b] B de Gasquet,[c] O Irion,[b] M Boulvain[b]

[a] University of Applied Sciences and Arts Western Switzerland, Geneva, Switzerland [b] Department of Gynaecology and Obstetrics, Geneva University Hospitals, Geneva, Switzerland [c] de Gasquet Institute, Paris, France
Correspondence: M-J Guittier, University of Applied Sciences and Arts Western Switzerland, Geneva and Geneva University Hospitals (Department of Gynaecology and Obstetrics), 47 Avenue de Champel, 1206 Geneva, Switzerland. Email marie-julia.guittier@hesge.ch

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Objective To evaluate the efficacy of the hands and knees position during the first stage of labour to facilitate the rotation of the fetal head to the occiput anterior position.

Design Randomised controlled trial.

Setting Geneva University Hospitals, Switzerland.

Population A total of 439 women with a fetus in the occiput posterior position during the first stage of labour.

Methods The women in the intervention group were invited to take a hands and knees position for at least for 10 minutes. Women allocated to the control group received the usual care. For both groups, 15 minutes after randomisation, women completed a short questionnaire to report their perceived pain and the comfort of their position.

Main outcome measures The rotation of the fetal head in occiput anterior position confirmed by ultrasonography 1 hour after randomisation.

Results One hour after the randomisation, 35 of 203 (17%) fetuses were diagnosed as being in the occiput anterior position in the intervention group compared with 24 of 209 (12%) in the control group. This difference was not statistically significant (relative risk 1.50; 95% CI 0.93–2.43; $P = 0.13$). The change in the evaluation of comfort between the randomisation and 15 minutes after showed an improvement in 70 and 39 women, no change in 82 and 78 women and a decrease in 56 and 86 women in the intervention and control groups, respectively ($P = 0.02$).

Conclusions This study could not demonstrate a benefit of the hands and knees position to correct the occiput posterior position of the fetus during the first stage of labour, but the women reported an increase in their comfort level.

Keywords Fetal head position, first stage of labour, maternal comfort, maternal position, occiput posterior, randomised controlled trial.

Tweetable abstract Hands and knees position does not facilitate rotation into occiput anterior but increases the comfort level of women.

Linked article This article is commented on by KS Khan. To view this mini commentary visit http://dx.doi.org/10.1111/1471-0528.13872.

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Introduction

At the onset of labour, an occiput posterior (OP) position occurs in approximately 25% of fetuses in the cephalic position.[1–4] Persistent OP at delivery occurs in approximately 10% of fetuses.[5,6] Previous studies have shown an increase in short-term and long-term maternal and fetal complications that are associated with the OP position, such as prolonged labour, maternal exhaustion, fetal distress, instrumental delivery, caesarean delivery and severe perineal tears.[7–11] The aetiology of persistent fetal OP presentation is poorly known. The shape of the pelvis, epidural analgesia, or parity may increase the risk of persistent OP for the delivery.[12] Currently, medical and midwife teams have limited interventions to correct fetal head malposition and believe that the hands and knees position of women in labour facilitates the rotation of the fetus.[13]

Trial registration: ClinicalTrials.gov, www.clinicaltrials.gov (no. NCT01291355).

Diagnosis of the OP position during vaginal examination is difficult because it is often associated with a deflection of the fetal head and fetal head oedema.[14,15] Several studies recommend verifying the position by ultrasonography to improve the reliability of the diagnosis of the OP position.[16,17]

A Cochrane review on the effects of the hands and knees posture in late pregnancy or labour concluded that this intervention does not improve delivery outcomes.[18] However, only one randomised controlled trial, including 147 participants during the first stage of labour, was included in the review. It reported a significant decrease of back pain in the hands and knees group ($P = 0.008$). Fetal head rotation to the occiput anterior (OA) position after the 1-hour study period was observed in 11 of the 70 women (16%) allocated to the hands and knees group compared with five of 77 (7%) in the control group [relative risk (RR) 2.42, 95% confidence interval (95% CI) 0.88–6.62]. The authors concluded that the sample size of the study had an insufficient power to demonstrate the efficacy of the intervention.[19]

de Gasquet described several variations of the hands and knees position to facilitate the rotation of the fetal head to the OA position (Figure 1).[20,21] According to her hypotheses, maternal positions that are described as resting on the knees, with the chest leaning forward and back stretching, increased maternal comfort and encouraged the rotation of the fetal head almost immediately.

Given the complications that are associated with a persistent OP position, it is important to evaluate interventions that may help fetuses to rotate to the OA position. According to previous studies, the hands and knees posture appears to be easy to implement, safe for the mother and fetus, and acceptable to women,[18,22] but their effectiveness on rotation and delivery outcomes remains to be evaluated. The aim of our study was to evaluate the efficacy of the hands and knees position to correct fetal head position from the OP position during the first stage of labour.

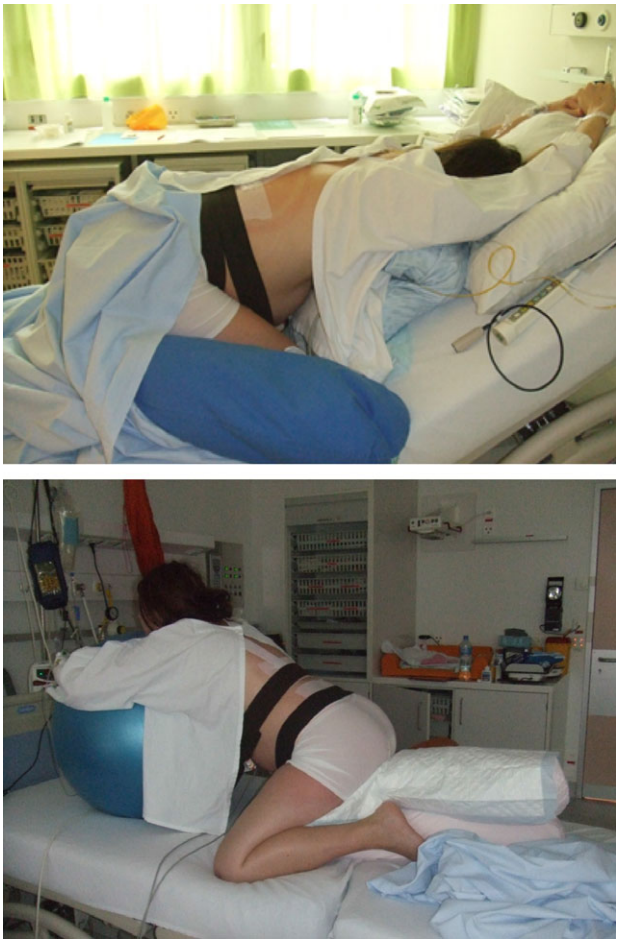

Figure 1. Two examples of hands and knees positions.

Methods

Trial design and participants

We conducted a randomised clinical trial comparing the hands and knees position with expectant management (no intervention). The study took place in the maternity unit of Geneva University Hospitals (4000 births/year). Before and during the trial, all midwives working in the delivery room were trained to help women to assume the evaluated positions during labour and delivery during a 4-day workshop conducted by Dr de Gasquet.

The recruitment of women took place in the delivery room. In the trial, we included nulliparous and multiparous women during the first stage of labour with a cervical dilatation between 2 and 9 cm and with a singleton pregnancy at term (≥37 weeks of gestation). We performed a transabdominal ultrasonography to reliably diagnose the fetal head position during the first stage of labour. The operator could be a doctor, a midwife or a research assistant. Each had personal skills in ultrasonography. In case of doubt, there was a double check. The position of the head was determined according to the position of the usual features of the face or the orientation of the midline and the position of the intracranial landmarks. After confirming the fetal head position, all women presenting a fetus in the OP position (including both left and right OP) were invited to participate in the trial. Women <18 years old, with a limited understanding of French or who had attempted the hands and knees position previously during the first stage of labour were not enrolled in the study.

After obtaining written consent for participation and before randomisation, women completed a questionnaire including: sociodemographic data, perceived pain measured by a visual analogue scale (0 cm = no pain to 10 cm = the worst possible pain), and comfort level of their position using a Likert scale (very comfortable, comfortable, neutral, uncomfortable, very uncomfortable).

Randomisation

Randomisation was performed using randomly permuted blocks of varying sizes (4, 6 and 8), stratified by parity (nulliparous/multiparous) and epidural analgesia (yes/no). The ratio for hands and knees versus expectant management was 1:1. A research midwife or the attending midwife opened a web-based system developed by the informatics department of the Geneva University Hospitals. After inclusion of the woman, the system returned the allocation.

Procedures

Immediately after obtaining the group allocation, the women in the intervention group were invited to choose one of the six positions described by Dr de Gasquet.[20] The midwife presented pictures of six variants of hands and knees positions, and the woman decided which position would be the best for her.[21] These positions have three common features: (1) resting on the knees and, if necessary, on the hands; (2) the abdomen is thrust forward; and (3) the back is stretched (Figure 1). A pillow should be placed between the legs of the woman in labour to limit discomfort. The woman decided if she wanted to place her abdomen on a cushion or leave it unsupported. We recommended that the participants maintained the position as long as they felt comfortable, but for at least 10 minutes. After this period of time, they could remain in the hands and knees position or change positions if they preferred. The time spent in the evaluated position was recorded.

Women allocated to the control group received the usual care, i.e. they stayed in the position that they chose before inclusion in the trial. It could be standing, sitting, semi-recumbent, lying on the back or on the side, but not a hands and knees position. After 1 hour and following ultrasonography verification of the fetal head position, they could adopt a hands and knee position if they chose to do so.

For both groups, 15 minutes after randomisation, women completed a short questionnaire to report their perceived pain, as measured by a visual analogue scale, and the comfort of their position, as evaluated by the Likert scale. One hour after randomisation, we performed a second ultrasound scan to diagnose the fetal head position. The fetal head position was also recorded at the full dilatation of the cervix (before starting pushing efforts) and at delivery. Obstetric and neonatal outcomes were collected from the medical record.

Outcomes

Our primary outcome measure was fetal head in the OA position 1 hour after randomisation or at delivery if delivery happened first. Secondary outcomes included an evaluation of the comfort of maternal positions, impact of the maternal position on perceived pain measured before the randomisation and 15 minutes after, duration of the first and second stages of labour, mode of delivery, perineal status and markers of neonatal asphyxia.

Statistical methods

Data analysis and reporting were performed according to the CONSORT guidelines for randomised controlled trials. A descriptive table of the baseline characteristics is reported for the participants for both groups. Primary and secondary outcomes were analysed on an intention-to-treat basis. Sub-group analyses for the variables used to stratify the randomisation (parity and epidural) were performed. The means and their standard deviations were calculated for continuous variables, and the statistical significance of differences between groups was tested using Student's *t*-test or the Mann–Whitney *U*-test. The mean duration of the first and second stages of labour was calculated, excluding women who had a caesarean section. Proportions were compared between groups, and differences were tested using the Fisher test. The effects of the intervention were estimated by relative risks and their 95% confidence interval. *P* values were calculated with Fisher's exact test to test the significance of the differences.

We calculated that a sample size of 438 women (219 per group) would be needed, with a risk of type I error of 5% and a power of 80%, to show a statistically significant difference in the incidence of the main outcome measure. We hypothesised that the clinically significant difference between groups in the proportion of fetuses rotating to the OA position 1 hour after randomisation would be 10% (10% in the control group versus 20% in the intervention group).

The women received written information, and they signed informed consent forms. The data were treated confidentially, and participants were identified in the computerised database by a number. Data monitoring and quality assurance for this study was performed by a research assistant independent of the research team.

The complete protocol of the study has been previously published.[21]

Results

Participants

Between March 2011 and December 2013, 1418 women with a fetus in cephalic presentation were approached during labour and provided consent for ultrasonography. Among them, 766 (44%) had a fetus that was diagnosed in the OP. Among the 484 women meeting the inclusion criteria, 439 consented to participate in the trial and were randomised into the intervention group or the control group, 220 (50%) and 219 (50%), respectively. Five women in the intervention group did not assume an evaluated

position, and three women in the control group adopted one of these positions during the first hour. All of the women were included in the analysis of their randomised group (Figure 2, flow chart). Overall, 289 of 439 participants (65%) were primiparous, and 412 of 439 participants (93%) had epidural analgesia at randomisation.

The baseline characteristics were comparable between groups, with the exception of the educational level, which was higher in the control group (Table 1).

Primary and secondary outcomes

One hour after the randomisation, 35 of 203 (17.2%) fetuses were diagnosed as being in the OA position by ultrasonography in the intervention group compared with 24 of 209 (11.5%) in the control group (Table 2). This difference was not statistically significant (RR 1.50, 95% CI 0.93–2.43, $P = 0.13$, risk difference 5.7%). In the intervention group, 60 of 199 (30%) of the women maintained their chosen position for ≤15 minutes, 103 of 199 (52%) for 16–30 minutes and 36 of 199 (18%) for >30 minutes. Rotation after 1 hour occurred in 10 of 60 (17%), 18 of 103 (18%) and six of 36 (18%) fetuses when the evaluated posture was maintained for 0–15, 16–30 and >30 minutes, respectively ($P = 0.99$). In the control group, 59 of 190 (31%) mothers were in vertical positions (sitting, semi-recumbent, standing) and 131 of 190 (69%) were in the

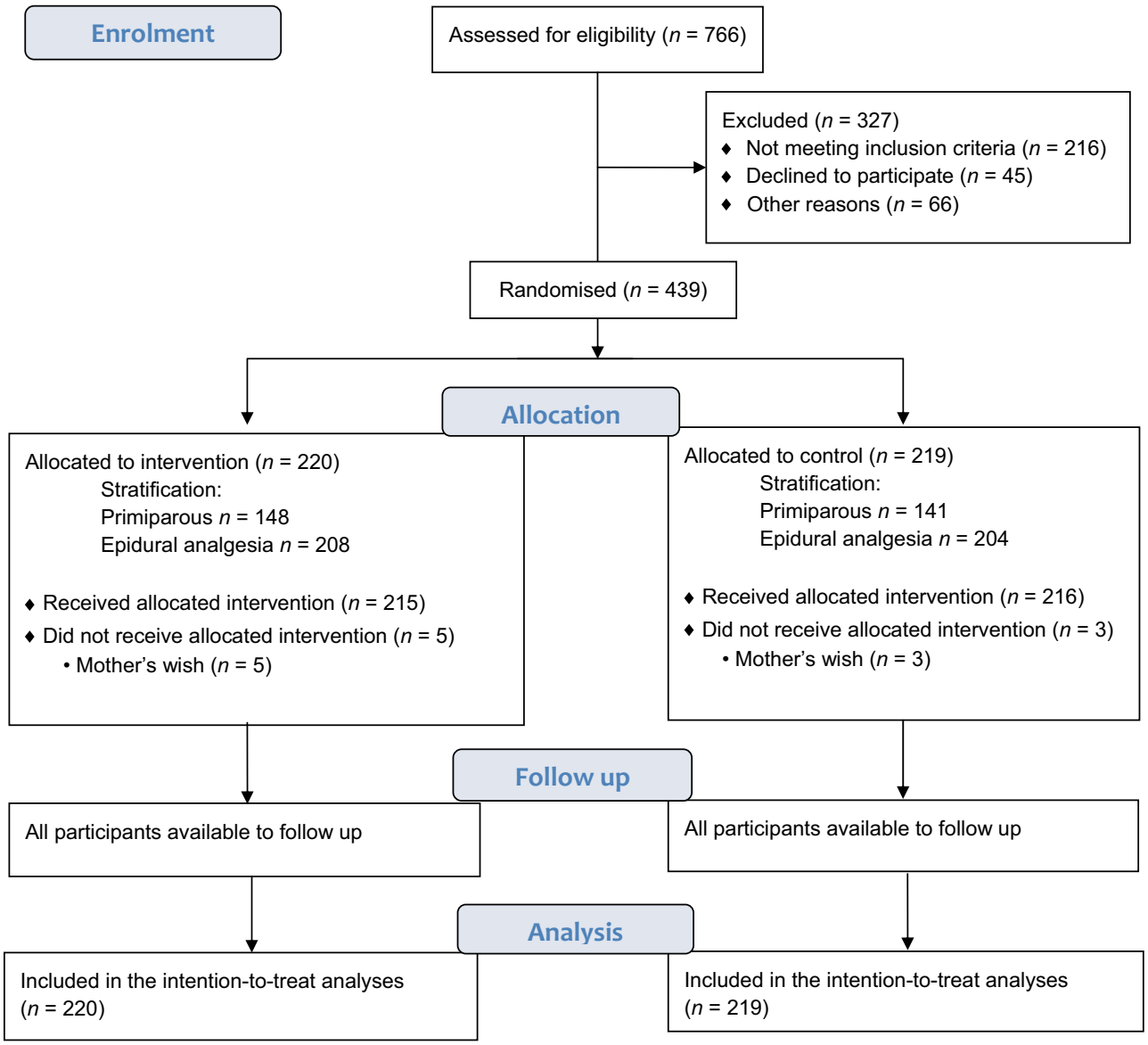

Figure 2. CONSORT 2010 flow diagram.

Table 1. Comparison of the general and obstetric characteristics between women in both groups

	Postures group (*n* = 220)	Control group (*n* = 219)
General characteristics at randomisation		
Educational level, *n* (%)		
Education ≥15 years	149/198 (75.3)	132/202 (65.3)
Education <15 years	49/198 (24.7)	70/202 (34.7)
Ethnic origin, *n*/total (%)		
Caucasian	145 (65.9)	141 (64.7)
Other	75 (34.1)	77 (35.3)
Maternal age in years, mean (SD)	30.5 (4.8)	30.0 (4.8)
Height in cm, mean (SD)	164.8 (6.6)	164.6 (6.3)
Maternal weight gain during pregnancy in kg, mean (SD)	15.7 (4.9)	15.8 (5.2)
Physical activity last trimester of pregnancy, *n* (%)*	136/211 (64.5)	142/214 (66.4)
Obstetric characteristics at randomisation		
Nulliparity, *n* (%)	148 (67.3)	141 (64.4)
Gestational age at randomisation, mean (SD)	39.6 (1.0)	39.4 (1.3)
Pain (VAS, in cm), median (range)	0.3 (0–10)	0.4 (0–10)
Comfort of position at randomisation, *n* (%)		
From comfortable to very comfortable	167/213 (78.4)	183/212 (86.3)
Neither comfortable nor uncomfortable to very uncomfortable	46/213 (21.6)	29/212 (13.7)
Analgesia local/regional, *n* (%)	208 (94.5)	204 (93.1)
Spontaneous labour, *n* (%)	81 (36.8)	78 (35.8)
Cervical dilatation** in mm, mean (SD)	45.4 (21.1)	44.9 (18.6)
Intact amniotic sac, *n* (%)	25 (11.4)	32 (14.6)
Station of the presenting part, *n* (%)		
Above ischial spines	216 (98.6)	218 (99.5)
At ischial spines or below	3 (1.4)	1 (0.5)
Fetal back position, *n* (%)		
Left	119 (54.6)	121 (55.3)
Right	13 (6.0)	11 (5.0)
Posterior	86 (39.4)	87 (39.7)
Placental location, *n* (%)		
Anterior	101/215 (47.0)	100/215 (46.5)
Posterior	75/215 (34.9)	84/215 (39.1)
Fundal	16/215 (7.4)	16/215 (7.4)
Lateral	23/215 (10.7)	15/215 (7.0)

VAS, visual analogue scale.
Denominators are displayed when there are missing values.
*Have you practiced physical activity corresponding to approximately 30 minutes of walking per day or more during the last trimester of pregnancy?
**Cervical dilatation was assessed digitally.

lateral decubitus position. Rotation occurred in four of 59 (7%) and 17 of 131 (13%) fetuses when the women were in vertical and horizontal positions, respectively ($P = 0.16$). After the 1-hour period of evaluation, the women were free to adopt a position of their choice. In the intervention group, 20 of 220 women (9%) repeated the hands and knees postures compared with 116 of 219 (56%) in the control group.

A caesarean section was performed during the first stage of labour in 38 and 27 women in the intervention and control groups, respectively. At full dilatation, 82 of 182 (45%) fetuses were in the OA position in the intervention group and 99 of 192 (52%) in the control group ($P = 0.25$). The duration of the first and second stages of labour was not significantly different between groups. There were more caesarean sections in the intervention group [54 of 220 (25%) and 35 of 219 (16%) in the intervention and control groups, respectively]. Globally, the mode of delivery did not differ significantly between the intervention and control groups ($P = 0.08$).

The median perception of pain at randomisation was 0.3 cm in the intervention group and 0.4 cm in the control

Table 2. Comparison of maternal, obstetrical and fetal outcomes

	Postures group (*n* = 220)	Control group (*n* = 219)	RR (95% CI)	*P* value
15 minutes after randomisation				
Comfort of position, *n* (%)*				
Improvement	70/208 (33.6)	39/203 (19.2)		0.02
No change	82/208 (39.4)	78/203 (38.4)		
Decrease	56/208 (27.0)	86/203 (42.3)		
Pain (VAS, in cm), median (range)	0.8 (0–10)	0.7 (0–10)		0.72
One hour after randomisation (Ultrasonography diagnosis)				
Occiput anterior position	35/203 (17.2)	24/209 (11.5)	1.50 (0.93–2.43)	0.13
Occiput posterior or lateral position	168/203 (82.8)	185/209 (88.5)		
Fetal back position, *n* (%)				
Left	79/198 (39.9)	83/204 (40.7)		0.79
Right	105/198 (53.0)	110/204 (54.4)		
Anterior	3/198 (1.5)	3/204 (1.5)		
Posterior	11/198 (5.6)	7/204 (3.4)		
Fetal position at complete dilatation (Ultrasonography or clinical diagnosis)				
Occiput anterior position	82/182 (45.1)	99/192 (51.6)	0.87 (0.71–1.08)	0.25
Occiput posterior or lateral position	100/182 (54.9)	93/192 (48.4)		
Outcomes at delivery				
Duration of first stage labour in minutes, mean (SD)	354 (195)	369 (158)		0.39
Duration of second stage labour in minutes, mean (SD)	48 (31)	43 (31)		0.17
Analgesia local/regional, *n* (%)	211 (96.3)	211 (96.8)	1 (0.96–1.03)	>0.99
Mode of delivery, *n* (%)				
Caesarean	54 (24.5)	35 (16.0)		0.08
Normal vaginal delivery	118 (53.6)	134 (61.2)		
Instrumental delivery	48 (21.8)	50 (22.8)		
Perineal status, *n* (%)				
Intact or first-degree perineal tear	151 (68.6)	130 (59.4)		0.05
Second-degree perineal tear or episiotomy	68 (30.9)	84 (38.4)		
Third-degree perineal tear	1 (0.5)	5 (2.3)		
Blood loss in ml, mean (±SD)	409.6 (239.0)	378.4 (218.3)		0.16
Maternal complication,** *n* (%)	42 (19.1)	31 (14.2)	1.35 (0.88–2.06)	0.21
Duration of hospital stay, mean (SD)	3.5 (1.4)	3.3 (1.2)		0.03
Neonatal outcomes				
Weight in grams, mean (SD)	3422 (401)	3411 (406)		0.77
APGAR score <7 at 5 minutes, *n* (%)	4 (1.8)	4 (1.8)	0.96 (0.24–3.78)	>0.99
Umbilical artery pH, mean (SD)	7.22 (0.07)	7.22 (0.06)		0.32
Neonatal resuscitation, *n* (%)	10 (4.5)	10 (4.6)	1.00 (0.42–2.34)	>0.99

VAS, visual analogue scale.
Denominators are displayed when there are missing or non applicable values.
*Change in the evaluation of comfort between the randomisation and after 15 minutes.
**Haemorrhage, fever, retained placenta.

group. After 15 minutes, the medians were 0.8 cm and 0.7 cm, respectively. The median difference in the perception of pain between randomisation and after 15 minutes was similar between groups (0 cm in the two groups, $P = 0.76$).

The proportions of women reporting that they were comfortable or very comfortable at randomisation were 78% and 86% in the intervention and control groups, respectively. After 15 minutes, these proportions were 82% in the intervention group and 75% in the control group. The change in the evaluation of comfort between the randomisation and after 15 minutes showed an improvement in 70 and 39 women, no change in 82 and 78 women and a decrease in 56 and 86 women in the intervention and control groups, respectively ($P = 0.02$).

Subgroup analysis

Among the 59 fetuses in OA position after 1 hour, 45 of 336 (13.4%) were randomised when the women were at a dilatation of the cervix between two and 6 cm, compared

with 14 of 76 (18.4%) when dilatation was >6 cm ($P = 0.28$). The effect of the intervention was similar in the two subgroups (RR 1.30, 95% CI 0.75–2.24, in women randomised between two and 6 cm; RR 2.50, 95% CI 0.86–7.28, in women randomised after 6 cm; P value for interaction 0.28; adjusted RR 1.50, 95% CI 0.92–2.43). In the intervention group, there were 10 of 60 (16.7%) fetuses in OA position when women were kept in the hands and knees position for 0–15 minutes, 18 of 103 (17.5%) if 16–30 minutes and 6 of 36 (16.7%) if >30 minutes ($P = 0.99$). We did not observe a significant difference in rotation 1 hour after the randomisation between the six positions ($P = 0.28$).

Discussion

Main findings

In cases of the fetal head being in an OP position during the first stage of labour, we observed no efficacy of the hands and knees position for women to promote the rotation to an OA position.

The hands and knees postures were, however, associated with an increase in maternal comfort.

Strengths and limitations

There was a small but not statistically significant increase in the number of fetuses in the OA position after 1 hour in our study. Stremler et al. conducted a similar trial, including 147 women with a fetus in the OP position.[19] They found a nonsignificant difference in rotation of 11% between the hands and knees group and the control group after 1 hour. Hence, we based our sample size calculation on a difference of 10% between the groups, giving us limited power to show smaller differences. This suggests that there may be a benefit from this intervention, but the benefit is much smaller than was expected.

To explore the reasons for a reduced benefit, we hypothesise that the duration of the intervention was too short. The hypothesis of de Gasquet was that the fetus should rotate within 10 minutes after women adopt a hands and knees position. We observed in a sub-groups analysis that an increased duration in the position was not associated with an increase in success. To maximise the opportunity to show a benefit of the evaluated positions, all of the research assistants and most of the midwives in the delivery unit were trained by Dr de Gasquet to correctly position the women who were allocated to the intervention group.

Among women screened with ultrasonography during labour, we identified that 44% of the fetuses were OP. This prevalence may be overestimated because of a preferential selection for screening women with a clinical suspicion of OP. Because labour is prolonged in the OP position, the probability of being screened may also be higher in this condition. However, this important prevalence was found in other studies.[23]

The randomisation was stratified by parity and epidural analgesia because these variables are important predictors of the outcome; hence, we wanted to insure a good balance between the groups. We observed that a large majority of the participants had epidural analgesia before the randomisation. This could be explained by the fact that the staff members were more motivated to propose the study and the women were more likely to participate when pain was controlled. It is possible that the effect of hands and knees positions is different in women without epidural analgesia.

Interpretation

We observed a good compliance of the women to the interventions related to their randomised group. This is in contrast with the results of the study by Hodnett et al.[24] However, only a small proportion of women in the intervention group wished to adopt the hands and knees position again later in labour, and only half of the women who were included in the control group decided to take the hands and knees position after the evaluation 1 hour after randomisation. This suggests that, in our context, these positions are not very attractive for women in labour.

Women in the intervention group were significantly more comfortable compared with the control group, but we did not observe a benefit in the perception of pain. This can be explained by the high proportion of epidural analgesia in the included women.

We observed an increase in the risk of caesarean sections in the intervention group. This was not our primary outcome, and this difference may be a chance finding. The intervention was provided for a limited duration during the first stage of labour, and women in both groups were free to adopt any posture they chose after 1 hour. Half of the women in the control group assumed the evaluated posture after the evaluation period. This reduced the contrast between groups for the interpretation of the data at full dilatation and for the delivery. In addition, the percentage of fetuses in the OA position was similar between groups during the second stage of labour. These factors, and potentially other factors, should be taken into account when interpreting the increased risk for caesarean sections in the intervention group.

We did not observe an influence on the results of the stage of the dilatation at randomisation, of the duration of the hands and knees position, or the hands and knees position chosen by women. These results must be interpreted with caution as they result from unplanned sub-groups analysis.

During our trial, a randomised trial including 220 women in labour with a fetus documented to be in an OP position reported no benefit from a sequence of three maternal positions, including hands and knees, during labour depending on the height of the fetal head. They also reported that the OP position in the second stage of labour is strongly associated with operative delivery.[23]

Conclusions

Our study could not demonstrate a benefit of the hands and knees position to correct the OP position of the fetus during the first stage of labour. However, women reported that they were more comfortable in these positions. Given the consequences of the persistent OP position during labour, further evaluation of interventions to promote the rotation of the fetal head is needed.

Disclosure of interests

Full disclosure of interests available to view online as supporting information.

Contribution to authorship

MJG and BdG conceptualised the trial. MJG, BdG, MB and OI drafted the protocol; the protocol was revised by all of the authors. MJG, VOG and MB performed the statistical analysis. BdG trained the delivery room midwives to correctly position women in cases with an OP presentation. All of the authors read and approved the final manuscript.

Details of ethics approval

The study protocol was approved by the institutional ethics committee of the University of Geneva Hospitals (n° CER10-182) the 1 September 2010.

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