

# Efficiency of the modified Sims maternal position in the rotation of persistent occiput posterior position during labor: A randomized clinical trial

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University Hospital Vall d'Hebron. Barcelona's largest general hospital. Third level hospital treating complex patients and with 2800 births per year. Recruitment was performed in the delivery room of the maternal hospital.

## Abstract

**Background:** Fetal occiput posterior position in labor is associated with more painful and prolonged labor, and an increase in both maternal and fetal morbidity. The aim of this study is to assess whether the modified Sims position on the side of the fetal spine increases the rotation to occiput anterior position in women with epidural analgesia and a fetus in persistent occiput posterior (POP) position.

**Methods:** This is an open, randomized controlled, clinical trial. One hundred and twenty women in labor with fetuses in POP position were included. The diagnosis was performed through digital vaginal examination and confirmed with an ultrasound scan. Women were randomized into the free position group or the modified Sims on the side of the fetal spine. The primary outcome was rotation to occiput anterior, and secondary outcomes were type of delivery, postpartum perineal condition, perinatal results, and maternal satisfaction.

**Results:** In pregnant women undergoing labor in the Sims position, fetuses in POP rotated to occiput anterior in 50.8% of cases, whilst in the free position group, the rotation occurred in 21.7% ( $P = .001$ ). The rate of vaginal deliveries was higher in the Sims group compared with the free position group (84.7% vs 68.3%,  $P = .035$ ).

**Discussion:** The modified Sims position is a maternal posture intervention efficient in POP rotation, which decreases cesarean delivery rate. It is a simple and noninvasive intervention, reproducible, and well tolerated by pregnant women.

## KEYWORDS

delivery, fetal occiput posterior position, labor, maternal postures

The study was conducted in Barcelona, Spain.

Trial registration: ClinicalTrials.gov NCT02209090

## 1 | INTRODUCTION

One of the most frequently diagnosed fetal-origin dystocias is fetal position alteration. To ensure a normal delivery it is necessary that the fetus's lower fontanelle is situated in the anterior half of the pelvis, and in this case, the position of the fetal head is occiput anterior. When the head rotates to a posterior position, the occiput is situated toward the posterior region of the maternal pelvis, establishing an occiput posterior position. These positions, when maintained during labor, are linked to a more painful, prolonged, and difficult delivery and are also related to greater maternal-fetal morbidity.<sup>1-3</sup>

The occiput posterior position of the fetal head occurs in 40% of labors. The majority rotate spontaneously to occiput anterior positions, with the occiput posterior maintained in the final phase of dilation and in the expulsion period in only 1.8%-6% of births.<sup>4</sup> When this occurs, the occiput posterior position is called persistent occiput posterior (POP).<sup>5</sup> This is suspected when labor is prolonged or arrested during any of its phases.<sup>2,6-9</sup>

POP positions are associated with a low level of spontaneous birth (26% in primiparous and 57% in multiparous),<sup>10</sup> a greater number of instrumentation and emergency cesarean deliveries,<sup>8,11-16</sup> greater maternal blood loss,<sup>5,9,17,18</sup> higher episiotomy rates,<sup>4,19</sup> and third and fourth degree lacerations.<sup>8,9,17</sup> However, the literature is unclear about the possible impact of POP for the fetus.<sup>3,5,18,20</sup>

Bearing in mind the theory of fetal floatability in amniotic fluid and the effect of gravity, different maternal positions can be considered to favor spontaneous rotation of the fetal head during labor. Maternal postural interventions are risk-free for both mother and fetus.<sup>4</sup>

Several studies have been carried out to discover the best maternal posture for rotation of occiput posterior fetal positions. The maternal hands-knees position has not been proved to be of use in rotating the fetal head.<sup>16,19,20</sup>

Lateral maternal positions have been studied in 2 papers published in China with positive results.<sup>21,22</sup> However, these were not included in the systematic review of the Cochrane Library, which concluded that there were no significant differences in the rotation of POP positions when comparing lateral or vertical maternal positions with recumbent positions or with the lithotomy position during labor.<sup>23</sup>

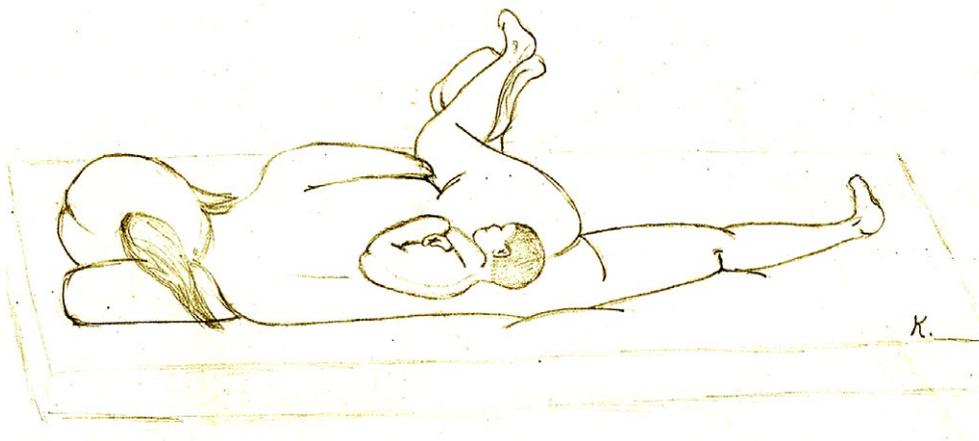
The Sims position is a variation in the lateral position (Figure 1). In 2016, Le Ray et al evaluated the modified Sims maternal position on the opposite side of the fetal spine (termed by the author lateral decubitus posture). This study did not establish this position as an effective postural intervention in POP rotation.<sup>24</sup>

Bearing in mind the results of a study published by Wu et al<sup>22</sup> which advised women reclining on the fetal spine, our study was proposed with the objective of assessing whether the modified Sims position on the side of the fetal spine increases the rotation to occiput anterior position in women with epidural analgesia and a fetus in POP position. Secondary objectives were to assess the type of delivery, postpartum perineal condition, neonatal results, and level of maternal satisfaction.

## 2 | METHODS

This clinical trial was an open, randomized controlled trial with 2 parallel groups, conducted in a level 3 hospital (Barcelona, Spain), between March 2014 and October 2016. Before the trial began, all participating midwives and obstetricians received specific training about the study protocol and the modified Sims position.

Participants were pregnant women in active labor who were recruited at Hospital Materno-Infantil Vall d'Hebron. Inclusion criteria were adult pregnant women with a singleton term fetus, with epidural analgesia and POP



**FIGURE 1** Maternal-modified Sims position

position during active phase of labor which had been diagnosed through 2 vaginal examinations with a minimum interval of 2 hours. When a second vaginal examination confirmed the POP, a transabdominal ultrasound was performed to confirm the position of the fetal head. Exclusion criteria were previous diagnosis of severe fetal abnormality, fetal weight above 95th percentile or below 10th percentile, morbid maternal obesity body mass index (BMI) above 40 kg/m<sup>2</sup>, pregnant women with contraindicated vaginal delivery, or pregnancies with associated maternal pathology.

Once the transabdominal ultrasound confirmed the diagnosis, pregnant women were asked to participate in the study and signed the consent form. After inclusion, they were randomly assigned to the intervention or the control group, using a computer-generated sequence.

## 2.1 | Intervention

In the experimental group (Sims group), pregnant women assumed the modified Sims position on the side of the fetal spine. This posture was adopted for at least 40 uninterrupted minutes within an hour. Pregnant women could use other positions for up to 20 minutes each hour, but were not allowed to use the opposite position to the fetal spine. The postural intervention was maintained until either fetal head rotation or the delivery took place.

Description of the modified Sims position: Pregnant women assumed the lateral decubitus position on the same side as the fetal spine. The upper leg leant on the stirrup, the knee hyperflexed at 90° and a slight internal rotation was performed, whilst the lower leg was out-stretched (Figure 1). This way an asymmetric pelvic position was achieved, increasing the diameter of the middle and lower pelvis. Moreover, the sacrum had freedom of movement.

In the control group (free position group), women assumed the position in which they were most comfortable during labor, with the exception of lateral positions, which could only be assumed for <20 min/h, to avoid factors of confusion with the proposed intervention. The postural intervention was maintained until fetal head rotation or the delivery took place.

In the 2 study groups, when the fetal head did not rotate spontaneously and the pregnant woman was completely dilated for at least 2 hours, manual rotation of the fetal head was initiated. If after 10 minutes' maneuver, the fetal head did not rotate or there was an abnormal fetal heart rate, the manual rotation was considered a failure.

The epidural analgesia protocol consists of an infusion pump that administers every hour a bolus of 10 mL of the combination of bupivacaine and fentanyl diluted in saline solution. The active phase of labor was considered when there were regular contractions, at least 2 contractions every

10 minutes, and a minimum dilation of 4 cm. Labor management protocol consists of assessment of the labor progression by a digital examination every 2 hours, and assessment of fetal wellbeing by intermittent or continuous fetal heart rate monitoring. In case of no progression of labor first, an artificial rupture of membranes (in case they were intact) was performed, and if necessary an intravenous oxytocin continuous perfusion was administered (dilution of 1 mU of oxytocin per mL of saline solution administered in infusion pump). The initial dose of oxytocin was 1 mL/h, and was increased 1 mL/h every 20 minutes until appropriate contractions were achieved.

Once the delivery was completed, the midwife provided the woman with the Spanish version Mackey satisfaction scale,<sup>25</sup> to evaluate her level of satisfaction with the dilation process (Factor III) and perceived level of satisfaction about the support and comfort (Factor VI).

## 2.2 | Outcomes

The primary outcome was the percentage of POP rotating to occiput anterior positions assessed as the capacity of the fetal head to perform a rotation of 145° to place the lower fontanelle below the pubic area. This was expressed as “yes” or “no,” according to whether or not the rotation occurred. When rotation occurs after the postural intervention it is called spontaneous rotation. Manual rotation is the term applied to the rotation maneuver performed by a professional and total rotation is the total number of rotations (sum of spontaneous rotation and manual rotation).

The main secondary outcome was the type of delivery classified as spontaneous, instrumental, or cesarean delivery, and as vaginal (spontaneous plus instrumental) or cesarean delivery. Other secondary outcomes included maternal postpartum perineal condition: episiotomy, perineal laceration grade I, II, III, IV, or intact.

Maternal demographic variables were analyzed, including maternal age, weight, height, and BMI (weight [kg]/height<sup>2</sup> [m<sup>2</sup>]). The obstetric variables examined included pubic arch angle (90° or <90°), ischial spines (very prominent, prominent or not perceptible), coccyx (prominent or not prominent), and type of fetal position diagnosed (left occiput posterior position or right occiput posterior position). The neonatal outcomes examined were Apgar score (at birth, 5, and 10 minutes) and results of the umbilical cord pH.

The pregnant woman's comfort and level of satisfaction during labor was assessed using the Spanish version Mackey Satisfaction Childbirth Rating Scale,<sup>25</sup> using the following factors: Dilation (Factor III) and Support and Comfort (Factor VI). This scale is measured on a Likert-type scale from 0 to 5, where 0 equals very dissatisfied and 5 very satisfied.

## 2.3 | Sample size and sampling technique

To calculate the sample size the Granmo 7.12 program was used. Accepting an alpha risk of 0.05 and a beta risk of 0.2 in a two-sided test, 60 subjects were placed in each of the groups to detect a statistically significant difference between the 2 groups, which for the intervention group was expected to be 0.55 and for the control group 0.3. A lost-to-follow-up percentage of 20% was assumed. A consecutive non-probability sampling was performed. Women were included in the study when they were in active labor and fulfilled the selection criteria.

## 2.4 | Data analysis

The analysis was performed on intention to treat. A descriptive analysis of all the variables was carried out. The qualitative variables were described using frequencies and percentages of, the quantitative variables through the mean and standard deviation (SD) if the variable followed a normal distribution or median and interquartile range (IQR) if the distribution was not normal.

Comparisons between the experimental and control group were tested through Mann-Whitney *U* test for continuous variables and using the Fisher test or chi square test for categorical variables. The statistical analysis was carried out using Stata version 1.1 software.

The study was approved by our local Ethics Committee (CEIC Vall d'Hebron Institute of Research), and all patients gave their written consent for the study.

## 3 | RESULTS

Of the 120 pregnant women who agreed to participate, 1 patient was removed from the study after the information was lost. Twelve patients did not complete the assigned protocol (10.0%): 8 due to an abnormal fetal heart rate, 2 due to maternal discomfort in the Sims position, and in 2 cases the assigned intervention protocol was not correctly performed, 1 in each group.

Mean maternal age was 29.4 years (SD 5.7), mean maternal weight was 74.6 kg (SD 10.4), mean height 159.9 (SD 6.1), and mean BMI 29.2 kg/m<sup>2</sup> (SD 3.9). There were no significant differences in maternal age, weight, height, or BMI between the intervention and the control group (Table 1). Eighty-six (72.3%) women were primiparous, the pubic arch angle was <90° in 26 (22.2%) women, the ischial spines were very prominent in 1 woman (0.9%), prominent in 16 (13.7%), and not perceptible in 100 (85.5%), the coccyx was prominent in 3 (2.6%) patients. The position was right occiput posterior in 94 (79%) fetuses and left occiput posterior in 25 (21%). No significant differences were

**TABLE 1** Demographic characteristics of pregnant women with POP, using the Sims or free position during labor, Barcelona, Spain, 2014-2016

Variable	Type of intervention		P
	Sims position n = 59 Mean ± SD	Free position n = 60 Mean ± SD	
Age (y)	29.1 ± 5.8	29.7 ± 5.7	.53
Weight (kg)	75.5 ± 10.3	73.8 ± 10.5	.43
Height (cm)	161.0 ± 5.9	158.8 ± 6.2	.05
BMI (kg/m <sup>2</sup> )	29.1 ± 3.7	29.4 ± 4.2	.82

BMI, body mass index; SD, standard deviation.

found between the 2 groups with regard to parity, pubic arch angle, ischial spines, coccyx, or type of fetal position (Table 2).

Spontaneous rotation of the fetal head to occiput anterior occurred in 50.8% of the Sims position group and in 21.7% of the free position group (*P* < .01; Table 3). In those patients who did not achieve a spontaneous rotation a manual rotation was attempted, achieving a rotation to occiput anterior in 41.4% of patients of the Sims position group and

**TABLE 2** Obstetric characteristics of pregnant women with POP using the Sims or free position during labor, Barcelona, Spain, 2014-2016

Variable	Type of intervention		P
	Sims position n = 59 n (%)	Free position n = 60 n (%)	
Parity			
Primiparous	43 (72.9)	43 (71.7)	.88
Multiparous	16 (27.1)	17 (28.3)	
Pubic arch angle			
90°	46 (80.7)	45 (75.0)	.46
<90°	11 (19.3)	15 (25.0)	
Ischial spines			
Very prominent	0 (0)	1 (1.7)	.56
Prominent	7 (12.3)	9 (15.0)	
Not perceptible	50 (87.7)	50 (83.3)	
Coccyx			
Prominent	1 (1.8)	2 (3.3)	1.00
Not prominent	56 (98.2)	58 (96.7)	
Type of fetal position			
Left occiput posterior position	10 (16.9)	15 (25.0)	.28
Right occiput posterior position	49 (83.1%)	45 (75.0)	

**TABLE 3** Type of fetal head rotation to occiput anterior among women using the Sims or free position during labor, Barcelona, Spain, 2014-2016 [Corrections added on 26 March 2018, after first online publication: The format has been corrected from “Mean+-SD” to “n (%)” in table header and for all numbers in the Table 3.]

Variable	Type of intervention		P
	Sims position n = 59 n (%)	Free position n = 60 n (%)	
Spontaneous rotation to occiput anterior	30 (50.8)	13 (21.7)	<.01
Manual rotation to occiput anterior	12/29 (41.4)	19/47 (40.4)	.93
Total rotation to occiput anterior	42 (71.2)	32 (53.3)	.05

**TABLE 4** Type of delivery and perineal postpartum condition of women with POP using the Sims or free position during labor, Barcelona, Spain, 2014-2016

Variable	Type of intervention		P
	Sims position n = 59 n (%)	Free position n = 60 n (%)	
Type of delivery			
Vaginal	50 (84.7)	41 (68.3)	.04
Cesarean delivery	9 (15.3)	19 (31.7)	
Detailed type of delivery			
Spontaneous	35 (59.3)	27 (45.0)	.10
Instrumental delivery	15 (25.4)	14 (23.3)	
Cesarean delivery	9 (15.3)	19 (31.7)	
	<b>n = 50</b> n (%)	<b>n = 41</b> n (%)	
Postpartum perineal condition			
Lacerations grade I	9 (18.0)	5 (12.2)	.87
Lacerations grade II	3 (6.0)	4 (9.8)	
Lacerations grade III	1 (2.0)	1 (2.4)	
Episiotomy	29 (58.0)	26 (63.4)	
Intact	8 (16.0)	5 (12.2)	

in 40.4% of patients in the free position group ( $P = .93$ ). Total rotation to occiput anterior (spontaneous plus manual rotation) occurred in 71.2% of patients in the Sims position group, and in 53.3% of patients in the free position group ( $P = .05$ ; Table 3).

When we compared vaginal vs cesarean birth between both groups, the rate of vaginal deliveries was higher in the Sims group compared with the free position group (84.7% vs 68.3%,  $P = .04$ ). There were no significant differences in the detailed type of delivery among both groups ( $P = .10$ ): in the Sims position group there were 59.3% of spontaneous deliveries, 25.4% of instrumental deliveries, and 15.3% of cesarean, while in the free position group 45.0% had a spontaneous delivery, 23.3% an instrumental delivery and 31.7% a cesarean (Table 4). Regarding postpartum perineal condition, no statistically significant

differences were found according to the assigned group ( $P = .87$ ; Table 4).

No statistically significant differences were found according to the type of intervention with regard to perinatal outcomes such as Apgar at the first minute ( $P = .38$ ), Apgar at minute 5 ( $P = .90$ ), arterial pH ( $P = .28$ ), and venous umbilical cord pH ( $P = .66$ ) or birthweight ( $P = .58$ ).

Maternal satisfaction was assessed using the Spanish version Mackey scale of satisfaction.<sup>25</sup> Upon measuring the association between the type of intervention and the results of the satisfaction scale, no statistically significant differences were found, with the exception of the questions: “the capacity to deal with your emotions during dilation” ( $P = .04$ ) and “the help and support of your partner or companion during dilation” ( $P = .02$ ), which received a higher mark in the free position group.

## 4 | DISCUSSION

In this study, we found that the maternal-modified Sims position on the side of the fetal spine increases the spontaneous rotation to occiput anterior position in women with epidural analgesia and a fetus in POP position. Total rotation to occiput anterior, including those with spontaneous and manual rotation, remained higher in the Sims group compared with the free position group. In our study, the Sims position also increased the number of vaginal deliveries, although when analyzing by type of delivery (spontaneous, instrumental, or cesarean) the differences did not reach statistical significance. The Sims maternal position is safe for the newborn as there are no differences in the Apgar test nor in the umbilical cord pH results between the 2 intervention groups. Moreover, there are no differences in satisfaction and comfort among women undergoing labor between the 2 intervention groups, showing that the Sims position is well tolerated by pregnant women.

In studies assessing maternal postural interventions for the correction of posterior positions, in particular those referring to the lateral decubitus position, it is common to observe that pregnant women are reclined on the opposite side to the fetal spine with no benefits on the fetal rotation (83.1% in the intervention group vs 86.4% in the nonintervention group,  $P = .44$ ).<sup>24</sup> The intervention of this study was based on a published trial, where the decubitus on the same side as the fetal spine proved to be more efficient in the rotation of posterior positions than the decubitus opposite to the fetal spine<sup>22</sup> (54% in the intervention group vs 24% in the control group,  $P < .01$ ). These results are very similar to our study, where a spontaneous rotation to occiput anterior was achieved in 51% of the intervention group and 22% of the free position group.

Manual rotation is considered an efficient maneuver in the rotation of POP positions.<sup>7-9,26,27</sup> Therefore, we decided to carry out this procedure in all the pregnant women in our study who did not present spontaneous rotation of the fetal head, obtaining a far greater percentage of total rotation (spontaneous rotation plus manual rotation) in the Sims group compared with the free position group.

Several authors have noted that POP is more common in primiparous than in multiparous women.<sup>5,10,17,28,29</sup> The reason could be that the greater laxity of the pelvis seen in multiparous women favors occiput posterior rotation. In this study similar data are obtained, as POP are observed more frequently in primiparous women.

With respect to fetal head posterior positions, the right positions are more frequent than left positions as a result of the dextrorotation of the uterus and the presence of sigma in the left side. The sample selected in this study quantified a greater frequency of right occiput posterior than left occiput

posterior position, with similar results to those obtained by Barth, who described 60% of right positions, 30% of left positions, and 10% of sacrum positions.<sup>2</sup>

POPs are linked to a low percentage of normal deliveries<sup>3</sup> and with an increased risk of cesarean and instrumental deliveries.<sup>2,4,14,19,28,29</sup> Similar findings were obtained in our study, where a higher number of vaginal deliveries were observed in the Sims position group than in the free position group. However, we could not show differences in the number of instrumental deliveries, probably because the study was underpowered to detect these differences.

Sizer states that women with fetuses in POP only achieve a spontaneous delivery in 14.6% of cases.<sup>19</sup> In our sample, the percentage is higher, 59%, probably because in the case of failed spontaneous rotation, a manual rotation was attempted, increasing the total number of occiput anterior rotation.

No differences were found between the Apgar test values and the umbilical cord pH among the newborns in the 2 study groups. Our results align with those of Sizer and Senécal who found that POP did not increase neonatal morbidity.<sup>6,19</sup>

Increasingly, assessment of the pregnant woman's satisfaction and that of her companion is an element considered when evaluating health care, as care cannot be considered as being of a high quality unless the person receiving it is satisfied.<sup>30</sup> On analyzing the results of the satisfaction survey in this study, it was noted that there was no association between the assigned intervention and the results measured on the Mackey scale, with the exception of 2 questions, which obtained higher marks in the free position group than in the Sims group. Assessing the other items, it can be concluded that women were not uncomfortable in the Sims position and expressed themselves as being satisfied or very satisfied in the majority of cases, similarly to those in the free position group. It should be taken into account that pregnant women participating had received epidural analgesia and it is possible that if this study was performed on women without anesthesia the maternal satisfaction results might be different.

This study has some limitations. Although the sample size was sufficient to reach statistical significance in the primary outcome, it is very likely that the study is underpowered to show differences in secondary outcomes like the detailed type of delivery. Future studies should include a larger sample size to replicate our results and to further detect significant differences in the secondary outcomes. Despite our positive results, more studies are needed, especially in populations with different labor management protocols, to generalize these results.

This is the third intervention study that demonstrates the effectiveness of maternal postural intervention in the correction of occiput posterior fetal position. Moreover, this intervention is noninvasive, well tolerated, easily

reproducible, and has no additional cost on the routine care.

## 4.1 | Conclusions

The modified Sims maternal position on the fetal spine side is an efficient intervention to achieve rotation of persistent fetal occiput posterior position. Moreover, the Sims position contributes to a greater number of vaginal deliveries as safe for the newborns and is well tolerated by pregnant women.

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