

Maternal position during the second stage of labor and maternal-neonatal outcomes in nulliparous women: a retrospective cohort study



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BACKGROUND: The existing evidence is insufficient to draw conclusions about the association between maternal position in labor and obstetrical outcomes.

OBJECTIVE: This study aimed to evaluate the effects of different maternal positions during the second stage of labor among women with and those without epidural analgesia on important obstetrical outcomes including perineal damage.

STUDY DESIGN: In this retrospective cohort study, we collected data of women who delivered vaginally over a 2-year period. The associations between maternal and gestational characteristics and several obstetrical outcomes were analyzed. We considered perineal damage as the primary outcome. Secondary outcomes were the incidence of operative vaginal births, duration of fetal descent, intrapartum blood loss, and 1-minute and 5-minutes Apgar scores.

RESULTS: A total of 2240 nulliparous, at-term pregnancies were included. Of those, 76.9% gave birth in a supine position and 23.1% gave birth in alternative positions. The results showed that regardless of the use of epidural analgesia, nonsupine positions in the second stage of labor are associated with a significant reduction in the risk of both episiotomy and perineal damage to any degree ($P < .0001$) and to a reduction in the duration of fetal descent (Spearman rho, 9.17; confidence interval, 3.07–15.32; $P = .003$). No statistically significant differences were found in the 1-minute and 5-minutes Apgar score between the 2 groups.

CONCLUSION: Our results show that nonsupine positions in the second stage of labor and at the time of birth are associated with a significant increase in having an intact perineum and a reduction in any perineal trauma and in the need for an episiotomy regardless of the use of epidural analgesia.

Key words: epidural analgesia, free birthing position, maternal position, perineal damage, second stage of labor

Introduction

For centuries, there has been controversy around whether being upright (sitting, birthing stools, chairs, squatting, kneeling) or lying down (lateral, semirecumbent, lithotomy) has the most advantages for women during delivery.^{1–4}

The birthing positions that women assume in the delivery room are in fact largely influenced by constraints related

to the monitoring and intervention during labor.⁵

Many authors suggested that upright positions have several obstetrical advantages in terms of the duration of labor,⁶ the need for operative delivery,⁷ the grade of perineal lacerations,^{8–10} and the severity of postpartum bleeding and pain^{11,12} when compared with horizontal positions. In addition to this, previous studies reported no statistically

significant differences in the neonatal outcomes when an upright position was assumed during delivery, concluding that mothers should be given a choice of the posture to be assumed.^{13,14}

In this field of research, the most common bias encountered is the use of epidural analgesia for pain relief during labor, which frequently leads to maternal motor block. For obvious safety reasons—to minimize the risk for falls—epidural

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This study was performed in line with the principles of the Declaration of Helsinki. Ethics approval was obtained from the ethics committee of the Catholic University of Sacred Heart in January 2022 (ET 0000667/22).

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Why was this study conducted?

This study was conducted to elucidate if a nonsupine birthing position can be a strategy to improve obstetrical outcomes.

Key findings

This study showed that, regardless of the use of epidural anesthesia, allowing free maternal positioning during labor positively affects the possibility of giving birth with an intact perineum. Alternative birthing positions are associated with a reduction in the duration of fetal descent with no differences in operative vaginal birth rates, intrapartum blood loss, and neonatal Apgar scores.

What does this add to what is known?

A nonsupine birthing position can be associated with a reduction in the risk of perineal damage and should be offered to women when feasible. Epidural analgesia should not prevent the use of a nonsupine position during labor if no intrapartum risk factors require the use of a supine position.

analgesia is often associated with a horizontal delivery position. Controversial data in the literature suggest that epidural analgesia during labor can prolong the second stage of labor and increase the instrumental delivery rate¹⁵; this can be related to the analgesia itself or to a reduction in sensation in the patient, which leads to a less powerful push. A multicenter randomized controlled trial on the position during the late stages of labor of 3236 nulliparous women with an epidural reported a statistically significant difference in the incidence of spontaneous vaginal delivery (SVD) between the groups with 35.2% of women achieving an SVD in the upright group compared with 41.1% of women in the lying-down group with no evidence of between-group differences in most of the secondary maternal or neonatal outcomes. No differences in the long-term outcomes were noted at the 12-month follow-up for the women in terms of urinary or fecal incontinence, dyspareunia, and health-related quality of life or for the infants.¹⁶ However, a Cochrane systematic review highlighted that in this field of research the studies are extremely heterogeneous, probably because of different study designs and interventions, and no conclusive results have emerged from the analysis of the best position to offer to women during delivery.¹⁷

Nowadays, there is no clear scientific evidence on if alternative maternal positions during labor, regardless of the use

of an epidural, are related to different obstetrical outcomes when compared with the classical lying-down position in terms of the fetal-descent interval, the rate of episiotomies and perineal damage of any degree, the amount of postpartum bleeding, or the neonatal Apgar score.

In this scenario, the purpose of our study was to investigate the possible benefits and risks of different birthing positions during the second stage of labor, with or without an epidural, in terms of maternal and neonatal outcomes.

Materials and Methods

This was a retrospective cohort study in which women who gave birth at the “Fondazione Policlinico Universitario A. Gemelli (FPG) IRCCS” in the period between January 2017 and December 2019 were recruited. The Strengthening the Reporting of Observational Studies in Epidemiology guidelines for cohort studies were followed. Inclusion criteria were women in their first pregnancy who were aged between 18 and 40 years old, gave birth at a gestational age >37 weeks to singletons in cephalic presentation with an estimated fetal weight and neonatal weight that were appropriate for the gestational age.

According to hospital policy, all the patients had the opportunity to choose the position they felt most comfortable with during the second stage of labor while taking into account the

cardiotocography trace and the progress of labor. None of the patients involved in this study were asked to assume a determined position for the purpose of the study. We documented the position the patient chose for pushing, and if more than 1 position was assumed—for a comparable time among them—we evaluated the last position assumed during delivery, namely the 1 which the child was born. If a patient who spent her second stage of a labor in a nonsupine position was asked to assume a supine position for the need of obstetrical maneuvers, the patient was still classified as assuming a nonsupine position.

We investigated the association between selected maternal and gestational characteristics and several categorical and continuous outcomes. The primary outcome was the onset of perineal trauma during delivery, defined by 3 stages of increasing perineal damage according to the classification of Sultan et al¹⁸ vs women with intact perineum. Secondary outcomes were (1) assisted vaginal delivery (AVD) rates vs SVD rates; (2) estimated blood loss (EBL) during delivery; (3) duration of fetal descent during labor; and (4) 1-minute and (5) 5-minutes Apgar scores.

The potential associations between the recorded parameters and the 2 categorical outcomes, namely (1) all types of perineal trauma onset vs no trauma and (2) type of vaginal delivery, were first evaluated using standard univariate analyses. Chi-squared tests were used to evaluate categorical variables; *t* tests and Kruskal-Wallis tests were used to evaluate normally distributed and non-normally distributed continuous variables, respectively (distribution assessed using the Shapiro-Wilk test). The potential independent predictors for each categorical outcome were then evaluated using a multivariate logistic regression. In all models, covariates were included in a stepwise forward process using the following criteria: clinical relevance; $P < .2$ at univariate analysis; age, gestational age, body mass index (BMI), maternal position at delivery, and type of anesthesia used. Anesthesia and, when included as a covariate in the multivariate models, perineal trauma

were treated either as dichotomous variables (epidural vs no or local anesthesia; episiotomy vs no episiotomy, respectively) and ordinal, including the different types of anesthesia (none, local, epidural) and the 4 previously mentioned levels of perineal trauma as dummy variables. The goodness-of-fit was checked using Hosmer-Lemeshow test, and the predictive power was assessed through C-statistics (area under the receiving operator characteristic curve). We found very few variables that were colinear but the 1-minute and 5-minutes Apgar scores were colinear and we chose to include only the first of these in the final models. In addition, <10% of the observations were found to influence each model, and when analyses were repeated with exclusion of the outliers, no relevant changes were observed and no observation was thus excluded. Missing values were <5% of all variables, therefore no missing imputation technique was adopted.

To further explore the relationship between the recorded maternal and gestational characteristics and the incidence of perineal trauma at delivery, 6 additional univariate analyses were conducted using the same approach previously described. In each analysis, the recorded variables were compared between (1) women with an intact perineum and women with a first-degree vaginal tear; (2) women with an intact perineum and women with a second-degree vaginal tear; (3) women with an intact perineum and women who underwent an episiotomy; (4) women with a first-degree vaginal tear and women with a second-degree vaginal tear; (5) women with a first-degree vaginal tear and women who underwent an episiotomy; and (6) women with a second-degree vaginal tear and women who underwent an episiotomy. As a separate, additional analysis, a polytomous logistic model was used to test the independent association between all recorded covariates and perineal trauma. Three odds ratios (ORs) were therefore obtained for each predictor variable: using an intact perineum as the reference category, the first OR

referred to women with a first-degree vaginal tear; the second to women with a second-degree tear; the third to women with an episiotomy.

Finally, we evaluated the potential association between all recorded maternal and gestational characteristics and the 4 continuous outcomes. A Spearman correlation coefficient between the outcomes and each continuous parameter was first computed, and 4 multiple regression models were then fitted. Separate analyses were initially conducted for 1-minute and 5-minutes Apgar scores. However, the 2 outcomes showed collinearity (Spearman rho, 0.70), and the regression coefficients, both raw and adjusted, were almost equal. Thus, only the analyses related to the 1-minute score were reported to avoid redundancy. The same criteria specified previously were used to build the model, and the validity of the final regression models was assessed as follows: statistical significance was defined as a 2-sided *P* value <.05, and all analyses were carried out using Stata (version 13.1) (StataCorp LLC, College Station, TX).

Results

This study included 2240 women in their first pregnancy who gave birth beyond 37 weeks of gestation. The demographic characteristics of the study population are presented in Table 1. Nearly 80% of the sample delivered in a semirecumbent position (76.9%) and the remaining 23.1% gave birth in a free position. This difference might be because of the use of epidural analgesia, which often causes weakness in the legs in the very beginning, leading the patients to choose the semirecumbent position. A total of 68.7% of the patients chose to receive epidural anesthesia. Most of the patients (45.1%) had an episiotomy, whereas 28.7% and 16.9% had a first- and second-degree tear, respectively, and 9.2% had an intact perineum. No third- or fourth-degree tears were observed in our population. The mean blood loss was 302 mL, and the mean neonatal weight was 3100 g.

Spontaneous vaginal delivery vs assisted vaginal delivery

The results of the comparison of the maternal and gestational characteristics by mode of delivery is reported in Table 1. Patients who underwent AVD were more frequently under epidural anesthesia, they all had an episiotomy, experienced a greater blood loss, and a lower neonatal Apgar score when compared with those who had an SVD. The incidence of assuming a free birthing position was significantly higher in patients who achieving an SVD. None of the patients who gave birth through AVD spent their second stage of labor pushing in a free position.

Perineal damage

Table 2 and Table 3 show the results of the univariate and multivariate analyses in which the relationship between the recorded maternal and gestational characteristics and the presence of perineal trauma were evaluated. A free birthing position was significantly associated with an intact perineum and, in general, with a less severe degree of vaginal tearing. The use of an epidural was significantly higher in the group of patients who had an episiotomy, which was also the group with the highest degree of blood loss.

The analyses in which the potential predictors of each recorded outcome were evaluated confirmed that assuming a free birthing position was positively associated with an intact perineum when compared with any perineal damage with an OR of 0.41. Moreover, among patients with an intact perineum, the third stage was managed expectantly more frequently when compared with active management of the patients who underwent an episiotomy. The mean blood loss was significantly higher in patients with an episiotomy, and these data were also confirmed in the model with the intact perineum group as the reference (Tables 1 and 3). Our results showed an OR of 10.8 for women who gave birth with an epidural and who received an episiotomy, and the association with a semirecumbent position was also significant with an OR for episiotomy of 0.06.

TABLE 1
General characteristics of the sample overall and by maternal birthing position

Variables	Overall sample (n=2240)	Free position ^a (n=518)	Semirecumbent (n=1722)	P value ^b
Maternal age (y), mean (SD)	31.6 (4.7)	31.2 (4.9)	31.7 (4.6)	.013
Maternal BMI (kg/m ²), mean (SD)	26.8 (3.8)	26.5 (3.5)	26.9 (3.9)	.04
Gestational age (wk), mean (SD)	39.7 (1.2)	39.6 (1.2)	39.7 (1.2)	.4
Maternal birthing position, %				
- Semirecumbent	76.9	—	—	—
- Free ^a	23.1	—	—	—
Type of anesthesia, %				
- None	8.3	17.4	5.6	<.001
- Local	23.0	20.1	23.9	.14
- Epidural	68.7	62.6	70.5	<.001
Maternal and perinatal outcomes:				
Mode of delivery, %				<.001
- Spontaneous	88.7	100	85.4	
- Assisted	11.3	0.0	14.6	
Perineal status, %				
- Intact	9.2	19.1	6.3	<.001
- First-degree tear	28.7	48.6	22.7	<.001
- Second-degree tear	16.9	25.3	14.4	<.001
- Episiotomy	45.1	7.0	56.6	<.001
Third stage of labor, %				.14
- Expectant management	99.0	99.6	98.9	
- Active management	1.0	0.4	1.1	
Blood loss				
Blood loss (mL), mean (SD)	302 (239)	260 (205)	314 (246)	<.001
>500 mL, %	10.5			
Neonatal weight (g), mean (SD)	3100 (250)	3100 (250)	3100 (250)	.9
Duration of fetal descent (min), mean (SD)	66.7 (62.0)	72.9 (50.0)	65.0 (65.0)	.012
1-minute Apgar score				
Mean score (SD)	8.8 (0.7)	8.9 (0.7)	8.7 (0.7)	.003
Score <5, %	0.4	0.6	0.3	.9
5-minutes Apgar score				
Mean score (SD)	9.7 (0.6)	9.8 (0.6)	9.7 (0.6)	.006
Score <7, %	0.2	0.4	0.1	.2

BMI, body mass index; SD, standard deviation.

^a Including (1) side-lying (n=259), (2) hands-and-knees (n=81), (3) squatting (n=70), (4) upright (n=47), (5) sitting (n=34), and (6) kneeling (n=27).; ^b Chi-square tests were used for categorical variables and *t* tests and Kruskal-Wallis tests were used for normally distributed and non-normally distributed continuous variables, respectively.

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Estimated blood loss

The relationship between EBL during delivery and selected maternal and gestational characteristics is showed in [Supplemental Table S3](#). The factors significantly associated with a higher blood loss in our population were an increased maternal BMI ($P=.03$), assisted vaginal delivery ($P=.02$), giving birth in a semirecumbent position ($P=.03$), the presence of a second-degree vaginal tear ($P=.01$) or episiotomy, and active management of the second stage of labor ($P<.001$). An increasing neonatal weight and duration of fetal descent showed a strong linear correlation with the amount of blood loss ($P<.001$).

Duration of fetal descent

[Supplemental Table S4](#) shows the relationship between the duration of fetal descent during labor and selected maternal and gestational characteristics. A free birthing position was positively associated with a reduction in fetal descent length when compared with a semirecumbent maternal position ($P=.003$), whereas EBL and increasing neonatal birthweight were inversely correlated with the duration of fetal descent ($P<.001$). Finally, the presence of epidural anesthesia does not seem to significantly affect the duration of fetal descent ($P=.1$).

Apgar score

The relationship between the recorded Apgar score (at 1 minute) and selected maternal and gestational characteristics is show in [Supplemental Table S5](#). For the 5-minutes Apgar score, the coefficients (both raw and adjusted) almost coincided with those of the 1-minute score, and thus only the latter was reported to avoid redundancy. Maternal position did not affect the neonatal Apgar score in our series, which in turn was strongly related to the mode of delivery—being significantly lower in cases of AVD ($P<.001$)—and to the presence of a second-degree vaginal tear ($P=.04$) or an episiotomy ($P=.015$).

TABLE 2
Potential predictors of perineal trauma during delivery

Variables	Perineal trauma (n=2033)	Intact perineum (n=207)	P value ^a	Adjusted OR (95% CI)	P value ^b
Birth position, %			<.001		
- Semirecumbent	79.4	52.2		1 (ref. cat.)	—
- Free ^c	20.6	47.8		0.41 (0.30–0.57)	<.001
Maternal age (y), mean (SD)	31.8 (4.6)	30.0 (5.4)	<.001	1.07 (1.03–1.10)	<.001
Maternal BMI (kg/m ²), mean (SD)	26.9 (3.8)	26.4 (3.8)	.11	1.02 (0.98–1.06)	.4
Gestational age (wk), mean (SD)	39.6 (1.2)	39.7 (1.3)	.6	0.93 (0.82–1.07)	.3
Mode of delivery, %			<.001		
- Spontaneous vaginal delivery	87.7	99.5		1 (ref. cat.)	—
- Assisted vaginal delivery	12.3	0.5		19.9 (2.75–144)	.003
Type of anesthesia, % ^d					
- None	6.3	28.5	<.001	1 (ref. cat.)	—
- Local	24.8	5.3	<.001	14.5 (7.28–28.7)	<.001
- Epidural	68.9	66.2	.4	2.79 (1.90–4.09)	<.001
Epidural (vs no or local anesthesia), %	69.0	66.2	.4	0.85 (0.62–1.18)	.3
Blood loss ^e					
Blood loss (mL), mean (SD)	309 (237)	233 (243)	<.001	—	—
>500mL, %	10.9	7.3	.11	—	—
Neonatal weight (g), mean (SD)	3100 (247)	3074 (254)	.03	1.01 (1.00–1.01)	.04
Duration of fetal descent (min), mean (SD)	67 (63)	69 (52)	.6	—	—
Apgar score, mean (SD)					
- 1-min	8.8 (0.7)	8.8 (0.8)	.8	—	—
- 5-min	9.7 (0.6)	9.7 (0.8)	.8	—	—

Perineal trauma was defined as the occurrence of either a first- or second-degree vaginal tear or an episiotomy.

BMI, body mass index; CI, confidence interval; OR, odds ratio; ref. cat., reference category; SD, standard deviation.

^a Chi-square tests were used for categorical variables and *t* tests and Kruskal-Wallis tests were used for normally distributed and non-normally distributed continuous variables, respectively; ^b Final model included 2204 observations. Area under the receiver operating characteristic curve, 0.79; ^c Including side-lying, hands-and-knees, squatting, upright, sitting, or a kneeling position; ^d Anesthesia was included either as a dichotomous variable (epidural vs no or local anesthesia) or as dummy variable with no anesthesia as the reference category; ^e Not included in the final model as a consequence but rather as a predictor of perineal trauma.

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Discussion

Principal findings

The most important finding of this study is the impact that alternative birthing positions has on perineal damage among women in their first pregnancy regardless of the use of an epidural. The included population of women who gave birth in a nonsupine position (including side-lying, hands-and-knees, squatting, upright, sitting, or kneeling positions) had a reduction of 0.41 in the risk of having perineal damage when compared with patients

who assumed a semirecumbent position. This result gains importance in light of the evidence that factors such as an epidural and a lithotomic position can significantly raise the risk of requiring an episiotomy ($P<.05$). It is also important to point out that the decision to perform an episiotomy is made by the delivery attendant who would probably feel more comfortable to perform it when the patient is in a semirecumbent position. Although the neonatal outcomes do not seem to be significantly affected by the maternal

position in the second stage of labor, the EBL and the length of fetal descent are significantly lower in women who push in an alternative position.

We need to highlight that our population had a relatively high rate of patients who gave birth in a semirecumbent position, probably because of the widespread use of epidural anesthesia. Indeed, especially in the very beginning after the procedure, the patients might feel weakness in their legs leading to the choice of lying down.

TABLE 3

Comparison of selected maternal and gestational characteristics between (1) women with an intact perineum and women with a first-degree vaginal tear; (2) women with an intact perineum and women with a second-degree vaginal tear; (3) women with an intact perineum and women who underwent an episiotomy; (4) women with a first-degree vaginal tear and women with a second-degree vaginal tear; (5) women with a first-degree vaginal tear and women who underwent an episiotomy; and (6) women with a second-degree vaginal tear and women who underwent an episiotomy

Variables	Intact perineum (n=207)	First-degree vaginal tear (n=643)	Second-degree vaginal tear (n=379)	Episiotomy (n=1011)	P value ^a
Birthing position, %					b,c,d,e,f
- Semirecumbent	52.2	60.8	65.4	96.4	
- Free ^g	47.8	39.2	34.6	3.6	
Maternal age (y), mean (SD)	29.9 (5.4)	31.0 (4.7)	32.2 (4.3)	32.1 (4.5)	b,c,d,e,h
Maternal BMI (kg/m ²), mean (SD)	26.4 (3.8)	27.0 (4.0)	27.1 (3.9)	26.7 (3.6)	
Gestational age (wk), mean (SD)	39.7 (1.3)	39.5 (1.2)	39.7 (1.2)	39.7 (1.2)	e,h
Mode of delivery, %					d,e,f
- Spontaneous vaginal delivery	99.5	99.7	99.5	75.6	
- Assisted vaginal delivery	0.5	0.3	0.5	24.4	
Type of anesthesia, %					
- None	28.5	13.5	7.1	1.3	b,c,d
- Local	5.3	20.8	27.5	26.3	
- Epidural	66.2	65.7	65.4	72.4	e,f
Blood loss					
Blood loss (mL), mean (SD)	233 (243)	231 (170)	297 (211)	363 (267)	c,d,e,f,h
>500 mL, %	7.3	4.4	9.2	15.6	d,e,f,h
Neonatal weight (g), mean (SD)	3070 (250)	3090 (260)	3100 (230)	3100 (240)	c,d,e,h
Duration of fetal descent (min), mean (SD)	69 (52)	66 (49)	68 (76)	66 (65)	
1-min Apgar score					
Mean score (SD)	8.8 (0.8)	8.9 (0.6)	8.9 (0.6)	8.7 (0.8)	c,e,f
Score <5, %	0.48	0.31	0.26	0.40	
5-min Apgar score					
Mean score (SD)	9.7 (0.8)	9.8 (0.4)	9.8 (0.7)	9.6 (0.6)	b,e,f
Score <7, %	0.48	0.16	0.26	0.10	

All P values that are not reported were >.05.

BMI, body mass index; SD, standard deviation.

^a Chi-square tests were used for categorical variables and *t* tests were used for continuous variables with parametric distribution and Kruskal-Wallis tests were used for continuous variables with non-parametric distribution; ^b Indicates a P value <.05 for comparisons between women with an intact perineum and women with a first-degree vaginal tear; ^c Indicates a P value <.05 for comparisons between women with an intact perineum and women with a second-degree vaginal tear; ^d Indicates a P value <.05 for comparisons between women with an intact perineum and women who underwent an episiotomy; ^e Indicates a P value <.05 for comparison between women with a first-degree vaginal tear and women who underwent an episiotomy; ^f Indicates a P value <.05 for comparison between women with a second-degree vaginal tear and women who underwent an episiotomy; ^g Including side-lying, hands-and-knees, squatting, upright, sitting, or kneeling position; ^h Indicates a P value <.05 for comparison between women with a first-degree vaginal tear and women with a second-degree vaginal tear.

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The latest Cochrane Review¹⁷ reports no significant differences between an upright and a recumbent position on the rate of operative birth (risk ratio [RR], 0.97), duration of the second stage of labor, and any other important

maternal or fetal outcomes, including trauma to the birth canal requiring suturing (average RR, 0.95), abnormal fetal heart patterns requiring intervention (RR, 1.69), low umbilical cord pH (RR, 0.61), or admission to the neonatal

intensive care unit (RR, 0.54), among women with epidural anesthesia in the second stage of labor. However, the confidence intervals for each estimate were wide, and clinically important effects have not been ruled out. The

outcomes were downgraded for study design, high heterogeneity, and imprecision in effect estimates.

There were no reported data on blood loss (>500 mL), the incidence of a prolonged second stage, or Apgar scores. Because of these strong limitations, the authors could not state anything conclusive about the effect of the position in the second stage of labor among women with epidural analgesia. The results from our cohort study showed significant differences in perineal damage, the rate of episiotomy, and EBL in a homogenous population of nulliparous women with and those without an epidural. A more recent systematic review and meta-analysis showed that the duration of the second stage of labor is reduced in cases with a flexible sacrum birthing position and that even though the reduction in duration varies across studies with considerable heterogeneity, women should be encouraged to choose their comfortable birth position.¹⁹ These results are in line with our study that reports a significant reduction in the fetal-descent period among women giving birth in a free position ($P=.03$).

Research implications

Future research should focus on prospectively evaluating the maternal and neonatal outcomes in patients who give birth in a nonsupine position. In addition, the long-term outcomes will need to be ascertained in terms of the possible differences in continence and sexual function in these patients.

Clinical implications

From a clinical point of view, we can state that offering women the option of giving birth in a position they feel more comfortable with, even in the presence of epidural anesthesia, can have several advantages in addition to patients' satisfaction. It has been widely demonstrated that factors such as a maternal feeling of control, increased mobility, and an increased diameter of the pelvic outlet can contribute to a shorter duration of the second stage.²⁰ Moreover, the increased rate of perineal integrity can affect the long-term outcomes in

terms of continence and dyspareunia and lead to a faster recovery and less pain in the immediate postpartum period.

Strength and limitations

The retrospective nature of this study is a strong limitation and make it difficult to remove the tendency of confounding in these types of studies. We need to highlight that these types of studies can show association but not causality. For example, when looking at the data on AVD and nonsupine birthing position, we might suppose that an alternative birthing position was not possible for those cases instead of that the position led to a need for AVD. The authors of the meta-analysis mentioned previously²¹ recommend that "researchers who aim to compare different birthing positions should consider study designs which enable women to choose birthing position." This is why we believe that even if the lack of randomization represents a strong limitation, the design of our study is appropriate because it enables the patients to choose the position they felt more comfortable with during labor.

Another potential limitation that needs to be acknowledged is the lack of a formal sample size calculation, and thus it is possible that the study was not adequately powered to demonstrate some association. However, our main results, although requiring confirmation from appropriately designed studies with a prospective follow-up, are in line with previously published research.

It is also important to state that such a high rate of episiotomy in the semirecumbent position could also be related to the delivery attendant's preference and them feeling more comfortable in performing it in this position rather than in alternative ones.

The strengths of our study include a large sample size, adjusted for several potential confounders (all in-hospital recorded), that included women with broadly similar characteristics.

Conclusion

Nonsupine birthing positions during the second stage of labor are associated with

a significant increase in the possibility of giving birth with an intact perineum and with a significant reduction in any degree of perineal trauma and the requirement for an episiotomy regardless of the use of epidural analgesia, in addition to a reduction in the fetal-descent period and postpartum blood loss. Considering that the minority of patients chose an alternative position during labor, on the basis of our results, we believe that future prospective studies are needed to clarify if the nonsupine position during the second stage of labor needs to be implemented to improve perinatal outcomes and maternal satisfaction. ■

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.xagr.2023.100160](https://doi.org/10.1016/j.xagr.2023.100160).

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