

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

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Research Article

Keywords: Maternal position, Second stage of labor, Perineal damage, free birthing position, epidural analgesia

Posted Date: May 24th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1633462/v1>

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Abstract

Purpose

Actual evidences are insufficient to draw conclusions regarding the association between maternal position in labor and obstetrics outcomes. The aim of this study is to evaluate the effects of different maternal positions during the second stage of labor, with or without epidural analgesia, on important obstetric outcomes, in order to prevent perineal damage.

Methods

In this retrospective cohort study, we collected data of women undergoing a vaginal birth in a 2-years period. The associations between maternal and gestational characteristics and several obstetric outcomes were analyzed. We considered perineal damage as the primary outcome. Secondary outcomes were operative vaginal birth, duration of fetal descent, intrapartum blood loss, 1-minute and 5-minutes Apgar score.

Results

A total of 2240 nulliparous at term of pregnancy were included: 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, free-birthing positions are associated to a significant reduction of risk in terms of both episiotomy and perineal damage of any degree ($p < 0.0001$) and to a reduction in the duration of fetal descent (Spearman rho = 9.17, CI (3.07; 15.32), $p = 0.003$). No statistically significant differences were found in operative vaginal birth, intrapartum blood loss and 1-minute and 5-minutes Apgar score between the two groups.

Conclusions

Our results shows that free-birthing positions are associated with a significant increase in having an intact perineum and a reduction of any perineal trauma and episiotomy regardless the use of epidural analgesia.

Key Message

It is still under debate whether free birthing position can be a strategy to improve obstetric outcomes. Our study show that regardless the use of epidural, free maternal position in labor positively affects the possibility of giving birth with intact perineum.

Introduction

For centuries, there has been controversy around whether being upright (sitting, birthing stools, chairs, squatting, kneeling) or lying down (lateral, semi-recumbent, lithotomy, Trendelenburg's position) have advantages for women giving birth to their babies [1, 2–4].

The positions that women take in the delivery room are in fact largely influenced by constraints related to the monitoring and intervention during labor [5]. Although the lithotomic position still seems to optimize obstetric monitoring and intervention today, it does have an effect on the course of labor and on women's comfort.

Many authors have suggested that upright positions have several obstetrical advantages, regarding duration of labor [6], the need for operative delivery [7], the grade of perineal lacerations [8–10] the severity of post-partum bleeding and pain [11, 12] when compared to horizontal position. In addition to this, previous studies reported no statistically significant difference in neonatal outcomes when upright position was taken during delivery, concluding that mothers should be given the choice of the posture to be assumed [13, 14]. Moreover, in one of these randomized controlled trials, conducted on more than 500 patients, the authors demonstrated that the use of a squatting position is associated with fewer forceps deliveries and significantly shorter second stages of labor when compared to women who gave birth in semi-recumbent position [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 of falls – epidural analgesia is often associated with horizontal delivery position. Controversial data of the literature suggest that epidural analgesia in labor can prolong the second stage and increase instrumental delivery [15]: this can be related to the analgesia itself or to the less sensibility of the patient determining a less powerful push. It has been suggested that a more upright maternal position during part or all of the second stage may counteract these adverse effects, even under epidural analgesia. A multicenter randomized controlled trial of position during the late stages of labor in 3236 nulliparous women with an epidural, reported a statistically significant difference in the incidence of spontaneous vaginal delivery (SVB) between groups, with 35.2% of women achieving a SVB in the upright group, compared with 41.1% in the lying-down group, with no evidence of differences in most of the secondary maternal or neonatal outcomes (augmentation, interventions to maintain blood pressure, duration of labor, episiotomy, genital tract trauma, post-partum hemorrhage, maternal satisfaction, neonatal metabolic acidosis, 5-minute Apgar score of < 4, resuscitation at birth and admission to neonatal unit). No differences were noted for long-term outcomes at the 12-month follow-up neither for women, in term of urinary or fecal incontinence, dyspareunia and health-related quality of life, nor for infants (major morbidity)[16]. However, a Cochrane systematic review analyzing maternal position in the second stage of labor in 4464 women with epidural analgesia highlighted that in this field of research the studies are extremely heterogeneous, probably related to different study designs and interventions, different adherence to the allocated intervention and possible selection and attrition bias. Indeed no conclusive results have emerged from the analysis on the best position to offer to women for giving birth [17].

Nowadays there is no clear scientific evidence if free maternal position during labor is related to different obstetric outcomes compared with the classical lying-down position in terms of fetal descent interval, rate of episiotomies and perineal damage of any degree, amount of post-partum bleeding or neonatal Apgar score.

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

Materials And Methods

In this retrospective cohort study, we collected data of women giving birth at “Fondazione Policlinico Universitario A. Gemelli (FPG) IRCCS” in the period between January 2017 and December 2019. The STROBE guidelines for cohort studies have been followed. As the aim of the study was to compare the possible effect of free-birthing position on obstetrics outcome in nulliparous women with or without epidural, we only recruited women at their first pregnancy aged between 18 and 40 years old, giving birth at a gestational age > 37 weeks, singletons, cephalic presentation with an estimated fetal weight and a neonatal weight appropriate for gestational age (AGA). We excluded all patients undergoing a caesarean section, pregnancies complicated by fetal anomalies or those with preexisting chronic illness.

All the patients admitted in labor in the delivery room were asked to give written informed consent to use the data of the pregnancy and outcome for research; we stored all pregnancy and delivery characteristics in a registry and we subsequently performed a retrospective analysis of the data extracted anonymously.

All the patients had the opportunity to choose the position the felt more comfortable with during the second stage of labor, according to the CTG trace and the progress of labor. In particular we documented the position the patient choose for pushing. If more than one position has been assumed during the second stage, we considered the one when the child was born.

Women choosing to have analgesia received epidural analgesia using ropivacaine at different concentration basing on cervical dilatation (from 0.1% starting at 4 cm of dilatation until 0.2% with full dilatation) with sufentanil 10 µg·ml in the first administration.

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 three stages of increasing perineal damage according to the classification of Sultan et al.[18] (a) first-degree vaginal tear; (b) second-degree vaginal tear; (c) episiotomy - versus women with intact perineum. Secondary outcomes were: (1) assisted vaginal delivery - as opposed to spontaneous vaginal delivery; (2) estimated blood loss during delivery; (3) duration of fetal descent during labor; (4) 1-minute and (5) 5-minutes Apgar scores.

The potential associations between the recorded maternal and gestational parameters and the two categorical outcomes - (1) all types of perineal trauma onset versus no trauma; (2) type of vaginal

delivery - were first evaluated with standard univariate analyses: chi-squared test for categorical variables; t-test and Kruskal-Wallis test for normally distributed and non-normally distributed continuous variables, respectively (distribution assessed with Shapiro-Wilk test). The potential independent predictors of each categorical outcome were then evaluated using multivariate logistic regression. In all models, covariates were included in a stepwise forward process using the following criteria: clinical relevance; $p < 0.2$ at univariate analysis; age, gestational age, body mass index, maternal position at delivery and type of anesthesia forced to entry. Anesthesia and - when included as covariate in the multivariate models - perineal trauma were treated either as dichotomous variables (epidural versus no/local anesthesia; episiotomy versus no episiotomy, respectively) and ordinal, including the different types of anesthesia (none; local; epidural) and the above mentioned four levels of perineal trauma as dummy variables. The goodness-of-fit was checked using Hosmer-Lemeshow test, and the predictive power assessed through C-statistics (area under the Receiving Operator Curve). Standard post-estimation tests were used to check the final model validity, performing multicollinearity and influential observation analyses (using standardized residuals, change in Pearson and deviance chi-square), and testing for potential statistical interactions between outcomes and included covariates. We found very few variables which were collinear (1-minute and 5-minutes Apgar scores), and chose to include only the first in the final models. Also, less than 10% of influential observations were found for each model, and when analyses were repeated excluding the outliers, no relevant changes were observed, and no observation was thus excluded. Missing values were less than 5% for all variables, therefore no missing imputation technique was adopted.

To further explore the relationship between the recorded maternal and gestational characteristics and the onset of perineal trauma at delivery, six additional univariate analyses were run, using the same approach previously described. In each analysis, the recorded variables were compared between: (1) women with intact perineum and women with first-degree vaginal tear; (2) women with intact perineum and women with second-degree vaginal tear; (3) women with intact perineum and women undergoing episiotomy; (4) women with first-degree vaginal tear and women with second-degree vaginal tear; (5) women with first-degree vaginal tear and women undergoing episiotomy; (6) women with second-degree vaginal tear and women undergoing 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: given intact perineum as the reference category, the first OR was referred to women with first-degree vaginal tear; the second to women with second-degree tear; the third to women with episiotomy.

Finally, we evaluated the potential association between all recorded maternal and gestational characteristics and the four continuous outcomes. A Spearman correlation coefficient between the outcomes and each continuous parameter was first computed, and four multiple regression models were then fit. Separate analyses were initially made for 1-minute and 5-minutes Apgar scores. However, the two outcomes showed collinearity (Spearman $\rho = 0.70$), and the regression coefficients, both raw and adjusted, were almost coincident. Thus, only the analyses related to the 1-minute score were reported to avoid redundancy. The same above specified criteria were used for model building, and the validity of

final regression models was assessed as follows. The assumption of constant error variance was checked graphically, plotting Pearson residuals vs. fitted values, and formally, using the Cook-Weisberg test for heteroskedasticity. High leverage observations were identified by computing Pearson, standardized and studentized residuals, and Cook's D influence. In all models, we found less than 10 high-leverage observations, excluding which we noted no substantial changes. Statistical significance was defined as a two-sided p-value < 0.05, and all analyses were carried out using Stata, version 13.1 (Stata Corp., College Station, Texas, USA, 2013).

Results

The study included 2240 women at their first pregnancy giving birth beyond 37 weeks of gestation. The demographic characteristics of the study population are exposed in Table 1. Nearly 80% of the sample delivered in a semi-recumbent position (76.9%) and the remaining 23.1% gave birth in a free position. This difference might be due to the use of epidural that often cause a weakness of the legs in the very beginning leading the patients to choose the semi-recumbent position. The 68.7% of the patients chose to have epidural anesthesia. Most of the patients (45.1%) had episiotomy, while 28.7% and 16.9% had a first and second degree tear respectively and 9.2% had intact perineum. No third or fourth degree tear have been observed in our population. The mean blood loss was 302 ml and the mean neonatal weight was 3100 g.

Spontaneous Vaginal Delivery (SVD) versus Assisted Vaginal Delivery (AVD)

The results of the comparison of maternal and gestational characteristics by mode of delivery is reported in Table 1: patients undergoing assisted vaginal delivery were more frequently under epidural anesthesia, they all had episiotomy, experienced a more conspicuous blood loss and a lower neonatal Apgar score as compared to SVD. Free birthing position was significantly higher in patients achieving a SVD. None of the patients giving birth with an AVD spent her second stage of labor pushing in a free position.

Perineal damage

Table 2 and Table 3 show the results of the uni and multivariate analyses evaluating the relationship between the recorded maternal and gestational characteristics and the presence of perineal trauma: free birthing position is significantly associated with intact perineum and in general with less severe vaginal tear degree. The use of epidural is significantly higher in the group of patients having an episiotomy which was also the group with a major blood loss.

The analyses evaluating the potential predictors of each recorded outcome confirm that free birthing position is positively associated with intact perineum compared to any perineal damage with an OR of 0.41. Moreover in patient with intact perineum the third stage has been managed expectantly more frequently as compared to the active management of the patients undergone episiotomy . The mean blood loss was significantly higher in patients with episiotomy and this data is also confirmed in the model having as reference category the intact perineum group (Table 1 and 3). Our results show an OR of

10.8 of having an episiotomy for women giving birth with epidural and the association with semi-recumbent position is also significant being the OR for episiotomy 0.06.

Estimated blood loss (EBL)

The relationship between EBL during delivery and selected maternal and gestational characteristics is shown in Table S3. The factors significantly associated with a higher blood loss in our population were: increased maternal BMI ($p=0.03$), assisted vaginal delivery ($p=0.02$), giving birth in semi recumbent position ($p=0.03$), the presence of a second degree vaginal tear ($p=0.01$) or episiotomy and an active management of the second stage of labor ($p<0.001$). The neonatal weight increase and the duration of fetal descent showed a strong linear correlation with the amount of blood loss ($p<0.001$).

Duration of fetal descent

Table S4 reports the relationship between the duration of fetal descent during labor and selected maternal and gestational characteristics. Free birthing position is positively associated with a reduction in fetal descent length as opposed to semi recumbent maternal position ($p=0.003$), while the amount of EBL and the increase of neonatal birth weight are inversely correlated with the duration of fetal descent ($p<0.001$). Finally the presence of epidural anesthesia does not seem to significantly affect duration of fetal descent ($p=0.1$).

Apgar score

The relationship between the recorded Apgar score (after 1 minute) and selected maternal and gestational characteristics is reported in Table S5. For the 5-minutes Apgar score, the coefficients (both raw and adjusted) almost coincided to those of the 1-minute score, thus only the latter were reported to avoid redundancy. Maternal position did not affect the neonatal Apgar score in our series which resulted to be strongly related to the mode of delivery – being significantly lower in cases of AVD- ($p<0.001$) and to the presence of a second degree vaginal tear ($p=0.04$) and of an episiotomy ($p=0.015$).

Discussion

The most important finding of the present study is the impact that free birthing position has on the perineal damage in women at their first pregnancy regardless the use of epidural. The included population of women giving birth in a free position (including either side-lying, hands-and-knees, squatting, upright, sitting, or kneeling position) had a 0.41 fold increased possibility of having a perineal damage versus intact perineum compared to patients in a semi-recumbent position. This result gain importance also in light of the evidence that factors like epidural and lithotomic position can significantly raise the risk of performing episiotomy ($p < 0.05$). While neonatal outcomes do not seem to be significantly affected by maternal position in the second stage of labor, the amount of EBL and the length of fetal descent are significantly lower in women pushing in a free position.

We need to highlight that our population present a relatively high rate of patients giving birth in a semi recumbent position, probably due to the widespread use of epidural. Indeed, especially in the very beginning after the procedure, the patients might feel weakness in their legs leading to the choice of lying down.

The latest Cochrane Review [17] reports no significant differences between upright and recumbent positions on the rate of operative birth with a RR = 0.97, duration of the second stage of labor (average mean difference - 22.98 minutes; 95% CI -99.09 to 53.13; two trials, 322 women; I² = 92%; very low-quality evidence), neither in any other important maternal or fetal outcome, including trauma to the birth canal requiring suturing (average RR 0.95; 95% CI 0.66 to 1.37; two trials; 173 women; studies = two; I² = 74%; very low-quality evidence), abnormal fetal heart patterns requiring intervention (RR 1.69; 95% CI 0.32 to 8.84; one trial; 107 women; very low-quality evidence), low cord pH (RR 0.61; 95% CI 0.18 to 2.10; one trial; 66 infants; very low-quality evidence) or admission to neonatal intensive care unit (RR 0.54; 95% CI 0.02 to 12.73; one trial; 66 infants; very low-quality evidence) for women in the second stage of labor with epidural anesthesia. However, the CIs around each estimate were wide, and clinically important effects have not been ruled out. Outcomes were downgraded for study design, high heterogeneity and imprecision in effect estimates.

There were no data reported on blood loss (greater than 500 mL), prolonged second stage and data on Apgar scores. Because of these strong limitations, the authors could not state anything conclusive about the effect of position for the second stage of labor for women with epidural analgesia. The results from our cohort study report significant differences in terms of perineal damage, rate of episiotomy and EBL in a homogenous population of nulliparous women with and without epidural. A more recent systematic review and meta-analysis published in 2019 over the effect of maternal birth position on duration of the second stage of labor, show that this is reduced in cases of a flexible sacrum birthing position and that even though the reduction in duration varies across studies with considerable heterogeneity, laboring women should be encouraged to choose her comfortable birth position [20]. These results are in line with our study reporting a significant reduction of fetal descent length in women giving birth in a free position ($p = 0.03$).

From a clinical point of view we can state that offering the women to give birth in the position they feel more comfortable, even in presence of epidural anesthesia, can have several advantages other than patients' satisfaction: it has been widely demonstrated that factors such as maternal feeling of control, increased mobility, increased diameter of the pelvic outlet can contribute to a shorter duration of the second stage [21]. Moreover the increased rate of perineal integrity can affect the long term outcomes on continence, dyspareunia and health-related quality of life in addition to a faster recovery and less pain in the immediate post-partum period. These long term outcomes will need to be ascertained in future research exploring the possible differences in continence and sexual function in these kind of patients.

Strength And Limitations

The retrospective nature of the study is of course a strong limitation of our study and make it difficult to remove the tendency to confounding in such papers. We need to highlight that such studies can show association but not causality: for example looking at the data regarding ADV and free birthing position we might suppose that free birthing position were not possible in those cases rather than free birthing position reset the need for ADV. The authors of the meta-analysis above mentioned¹⁹ 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 represent a strong limitation, the design of our study is appropriate because it enable 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, thus it is possible that the power to demonstrate some association cannot be enough. However, our main results, although requiring confirmation from appropriately designed studies with a prospective follow-up, are in line with previously published research.

The strengths of our study include the collection of the largest sample so far available, adjusted by several potential confounders (all in-hospital recorded), including women with broadly similar characteristics.

Conclusion

In conclusion free-birthing positions are associated with a significant increase in the possibility of giving birth with an intact perineum and in a significant reduction of any perineal trauma and episiotomy regardless the use of epidural analgesia together with a reduction in fetal descent and in post-partum blood loss. Considering the fact that it is the minority of patients that choose a free position during labor, intra-partum strategies aimed at increasing the free birthing position during the second stage of labor needs to be implemented in order to improve perinatal outcomes and to accomplish maternal satisfaction.

Tweetable abstract

Free birthing positions in labor raise the possibility of giving birth with intact perineum regardless the use of epidural. (@aogs_GiuliadiMarco14)

Abbreviations

EBL: Estimated blood loss

SVD : Spontaneous vaginal delivery

AVD: Assisted vaginal delivery

Declarations

Tweetable abstract: Free birthing positions in labor raise the possibility of giving birth with intact perineum regardless the use of epidural. (@aogs_GiuliadiMarco14)

Funding Statement

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript

Ethics approval

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

Consent to participate

Informed consent was obtained from all individual participants included in the study.

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Tables

Table 1. General characteristics of the sample, overall and by maternal birthing position.

<i>Variables</i>	Overall sample (n=2240)	Free position * (n=518)	Semi-recumbent (n=1722)	p**
Mean maternal age (SD), years	31.6 (4.7)	31.2 (4.9)	31.7 (4.6)	0.013
Mean maternal BMI (SD), Kg/ m ²	26.8 (3.8)	26.5 (3.5)	26.9 (3.9)	0.04
Mean gestational age (SD), weeks	39.7 (1.2)	39.6 (1.2)	39.7 (1.2)	0.4
<i>Maternal birthing position, %</i>				
- Semi-recumbent	76.9	--	--	--
- Free*	23.1	--	--	--
<i>Type of anesthesia, %</i>				
- None	8.3	17.4	5.6	<0.001
- Local	23.0	20.1	23.9	0.14
- Epidural	68.7	62.6	70.5	<0.001
<i>Maternal and perinatal outcomes:</i>				
<i>Mode of delivery, %</i>				<0.001
- Spontaneous	88.7	100	85.4	
- Assisted	11.3	0.0	14.6	
<i>Perineal status, %</i>				
- Intact	9.2	19.1	6.3	<0.001
- First degree tear	28.7	48.6	22.7	<0.001
- Second degree tear	16.9	25.3	14.4	<0.001

- Episiotomy	45.1	7.0	56.6	<0.001
<i>Third stage of labour, %</i>				
- Expectant management	99.0	99.6	98.9	
- Active management	1.0	0.4	1.1	0.14
<i>Blood loss</i>				
Mean blood loss (SD), mL	302 (239)	260 (205)	314 (246)	<0.001
>500mL, %	10.5			
<i>Mean neonatal weight (SD), grams</i>				
Mean neonatal weight (SD), grams	3100 (250)	3100 (250)	3100 (250)	0.9
<i>Mean duration of fetal descent (SD), min</i>				
Mean duration of fetal descent (SD), min	66.7 (62.0)	72.9 (50.0)	65.0 (65.0)	0.012
<i>1-minute Apgar score</i>				
Mean score (SD)	8.8 (0.7)	8.9 (0.7)	8.7 (0.7)	0.003
Score <5, %	0.4	0.6	0.3	0.9
<i>5-minutes Apgar score</i>				
Mean score (SD)	9.7 (0.6)	9.8 (0.6)	9.7 (0.6)	0.006
Score <7, %	0.2	0.4	0.1	0.2

SD = Standard deviation.

* Including: (a) side-lying (n=259), (b) hands-and-knees (n=81), (c) squatting (n=70), (d) upright (n=47), (e) sitting (n=34), (f) kneeling (n=27). ** Chi-squared test for categorical variables; t-test and Kruskal-Wallis test for normally distributed and non-normally distributed continuous variables, respectively.

Table 2. Potential predictors of perineal trauma during delivery. Perineal trauma was defined as the occurrence of either first-, second-degree vaginal tear, or episiotomy.

Variables	Perineal trauma (n=2033)	Intact perineum (n=207)	p ^B	Adjusted OR (95% CI)	p ^D
<i>Birthing position, %</i>			<0.001		
- Semi-recumbent	79.4	52.2		1 (ref. cat.)	–
- Free ^A	20.6	47.8		0.41 (0.30-0.57)	<0.001
Mean maternal age (SD), years	31.8 (4.6)	30.0 (5.4)	<0.001	1.07 (1.03-1.10)	<0.001
Mean maternal BMI (SD), Kg/ m ²	26.9 (3.8)	26.4 (3.8)	0.11	1.02 (0.98-1.06)	0.4
Mean gestational age (SD), weeks	39.6 (1.2)	39.7 (1.3)	0.6	0.93 (0.82-1.07)	0.3
<i>Mode of delivery, %</i>			<0.001		
- Spontaneous vaginal delivery	87.7	99.5		1 (ref. cat.)	–
- Assisted vaginal delivery	12.3	0.5		19.9 (2.75-144)	0.003
<i>Type of anesthesia, %^C</i>					
- None	6.3	28.5	<0.001	1 (ref. cat.)	–
- Local	24.8	5.3	<0.001	14.5 (7.28-28.7)	<0.001
- Epidural	68.9	66.2	0.4	2.79 (1.90-4.09)	<0.001
Epidural (versus no/local anesthesia), %	69.0	66.2	0.4	0.85 (0.62-1.18)	0.3

<i>Blood loss</i> ^E					
Mean blood loss (SD), mL	309 (237)	233 (243)	<0.001	–	–
>500mL, %	10.9	7.3	0.11	–	–
Mean neonatal weight (SD), grams	3100 (247)	3074 (254)	0.03	1.01 (1.00-1.01)	0.04
Mean duration of fetal descent (SD), min	67 (63)	69 (52)	0.6	–	–
<i>Mean Apgar score (SD)</i>					
- 1-minute	8.8 (0.7)	8.8 (0.8)	0.8	–	–
- 5-minutes	9.7 (0.6)	9.7 (0.8)	0.8	–	–

^A Including either side-lying, hands-and-knees, squatting, upright, sitting, or kneeling position. ^B Chi-squared test for categorical variables; t-test and Kruskal-Wallis test for normally distributed and non-normally distributed continuous variables, respectively. ^C Anesthesia was included either as dichotomic variable (epidural versus no/local anesthesia), or as dummy variable, with no anesthesia as reference category. ^D Final model including 2204 observations. Area under the ROC curve = 0.79. ^E Not included in the final model as a consequence, rather than a predictor, of perineal trauma. SD = Standard deviation; OR = Odds ratio; CI = Confidence Interval; ref. cat. = reference category.

Table 3. Comparison of selected maternal and gestational characteristics between: (1) women with intact perineum and women with first degree vaginal tear; (2) women with intact perineum and women with second degree vaginal tear; (3) women with intact perineum and women undergoing episiotomy; (4) women with first degree vaginal tear and women with second degree vaginal tear; (5) women with first degree vaginal tear and women undergoing episiotomy; (6) women with second degree vaginal tear and women undergoing episiotomy.

Variables	Intact perineum (n=207)	First degree vaginal tear (n=643)	Second degree vaginal tear (n=379)	Episiotomy (n=1011)	p *
<i>Birth position, %</i>					A B C E F
- Semi-recumbent	52.2	60.8	65.4	96.4	
- Free **	47.8	39.2	34.6	3.6	
Mean maternal age (SD), years	29.9 (5.4)	31.0 (4.7)	32.2 (4.3)	32.1 (4.5)	A B C D E
Mean maternal BMI (SD), Kg/ m ²	26.4 (3.8)	27.0 (4.0)	27.1 (3.9)	26.7 (3.6)	
Mean gestational age (SD), weeks	39.7 (1.3)	39.5 (1.2)	39.7 (1.2)	39.7 (1.2)	D E
<i>Mode of delivery, %</i>					C E F
- Spontaneous vaginal delivery	99.5	99.7	99.5	75.6	
- Assisted vaginal delivery	0.5	0.3	0.5	24.4	
<i>Type of anesthesia, %</i>					
- None	28.5	13.5	7.1	1.3	A B C
- Local	5.3	20.8	27.5	26.3	
- Epidural	66.2	65.7	65.4	72.4	E F
<i>Blood loss</i>					
Mean blood loss (SD), mL	233	231 (170)	297 (211)	363 (267)	B C D

	(243)				E F
>500mL, %	7.3	4.4	9.2	15.6	C D E F
Mean neonatal weight (SD), grams	3070 (250)	3090 (260)	3100 (230)	3100 (240)	B C D E
Mean duration of fetal descent (SD), min	69 (52)	66 (49)	68 (76)	66 (65)	
<i>1-minute Apgar score</i>					
Mean score (SD)	8.8 (0.8)	8.9 (0.6)	8.9 (0.6)	8.7 (0.8)	B E F
Score <5, %	0.48	0.31	0.26	0.40	
<i>5-minutes Apgar score</i>					
Mean score (SD)	9.7 (0.8)	9.8 (0.4)	9.8 (0.7)	9.6 (0.6)	A E F
Score <7, %	0.48	0.16	0.26	0.10	

* Chi-squared test for categorical variables, t-test for continuous variables with parametric distribution, Kruskal-Wallis test for continuous variables with non-parametric distribution. ** Including either side-lying, hands-and-knees, squatting, upright, sitting, or kneeling position. ^A = p<0.05 for comparisons between intact perineum and women with first degree vaginal tear; ^B = p<0.05 for comparisons between women with intact perineum and women with second degree vaginal tear; ^C = p<0.05 for comparisons between women with intact perineum and women undergoing episiotomy; ^D = p<0.05 for comparison between women with first degree vaginal tear and women with second degree vaginal tear; ^E = p<0.05 for comparison between women with first degree vaginal tear and women undergoing episiotomy; ^F = p<0.05 for comparison between women with second degree vaginal tear and women undergoing episiotomy. All p-values that are not reported were >0.05. SD = Standard deviation.

Supplementary Files

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