

Does Epidural Analgesia Affect the Rate of Spontaneous Obstetric Lacerations in Normal Births?

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The precise relationship between epidural use and genital tract lacerations in normal childbirth is unclear. Data from a clinical trial on measures to lower genital tract trauma in vaginal birth were used for a secondary analysis. The goal was to assess whether epidurals affect the rate of spontaneous obstetric lacerations in normal vaginal births. Maternal characteristics and intrapartum variables were compared in women who did and did not use an epidural in labor, and also in those with and without any sutured lacerations following vaginal birth. Variables that were statistically different in both cases were entered into regression equations for simultaneous adjustment. Epidural use was not an independent predictor of sutured lacerations. Predictors of sutured lacerations included nulliparity, a prolonged second stage, being non-Hispanic white, and an infant birthweight greater than 4000 grams. Elements of midwifery management need further research. *J Midwifery Womens Health* 2007;52:31–36 © 2007 by the American College of Nurse-Midwives.

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INTRODUCTION

Epidural analgesia has become a common technique for managing labor pain in the United States. A national estimate in 2002 determined that 63% of all women used an epidural for pain relief in labor.¹ For most women, epidurals provide more effective pain relief than other modalities; however, many untoward effects are associated with their use. These include maternal hypotension, itching, shivering, fever, urinary retention, and dural puncture.^{2,3} Negative effects on the labor include immobility, a prolonged second stage, and fetal malposition.^{2–5} In addition, several technical procedures are used more commonly in women who have labor epidurals, including intravenous fluids, oxytocin augmentation of labor, bladder catheterization, operative vaginal delivery (forceps or vacuum), and episiotomy.^{3,4} Each of these has potential negative health effects as well.

Women in the United States tend to have fewer options for pain management in childbirth, compared with women who live in Europe.⁶ Because epidural use is so prevalent in the United States, its relationship to common obstetric outcomes is important to clarify. One of these is the relationship between epidurals and genital tract trauma following normal vaginal birth.

It has been argued that epidurals might reduce trauma rates by causing relaxation of the vaginal outlet and thus allowing a slow and controlled delivery of the fetal head.⁷ Epidurals have been associated with a higher rate of serious perineal lacerations.⁴ However, this observation is confounded by the increased use of episiotomy and vaginal operative procedures in women with epi-

durals, both of which are recognized as primary risk factors for severe perineal injury.^{2,4,8}

Recent studies have compared the rates of third- and fourth-degree lacerations in women with and without labor epidurals, and used multivariable techniques to adjust for relevant maternal and clinical variables. Multivariable adjustment is important because primigravidas are more likely to use labor epidurals and they sustain more lacerations during childbirth than multiparous women. Likewise, women with larger infants may have slower, more painful labors, and therefore be more likely to request an epidural; these women also sustain a greater number of lacerations during vaginal birth.

Multivariable techniques can adjust for these inequalities. Five studies^{8–12} reported overall rates of third- and fourth-degree lacerations ranging from 3% to 14%, and found that rates approximately doubled in women who received epidurals. In these studies, nulliparity, high fetal weight, prolonged labor, and epidural analgesia were consistently found to be important explanatory variables for severe perineal injury. When episiotomy and/or vaginal operative procedures (forceps or vacuum) were added into regression models, epidural analgesia was not always retained as an independent predictor of severe trauma. However, if epidurals cause a prolonged second stage, which is terminated by a vaginal operative delivery and episiotomy, then epidurals may contribute to the causal chain of events leading to obstetric trauma.

A large clinical trial at the University of New Mexico Health Sciences Center allowed an opportunity to examine the relationship between epidural analgesia in labor and spontaneous genital tract lacerations in women who had completely normal vaginal births with midwives. The focus of this analysis was to identify any contribution of epidurals to sutured trauma in a large sample of women who did not have episiotomies or vaginal oper-

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ative births. This allowed for separation of any effect of a labor epidural from the added effects of episiotomy and operative vaginal birth techniques.

METHODS AND MATERIALS

Data from a randomized clinical trial of perineal management methods were used for this report.¹³ The study was conducted at the University of New Mexico Health Sciences Center between 2001 and 2005. Healthy gravidas in the care of midwives were recruited prenatally, and informed consent was obtained in English or Spanish. Women in labor without health problems were randomized to one of three perineal management strategies for the second stage: warm compresses to the perineum, massage with lubricant, or hands kept off the perineum until crowning of the infant's head. The goal of the original study was to compare perineal management strategies to determine if any were associated with fewer obstetric lacerations following vaginal birth. A previous publication reporting the primary results includes a full description of the key study variables and the trial methodology.¹³

Over a 38-month period, 1211 women were enrolled in the study. A staff nurse-midwife (one of twelve) performed the randomly allocated perineal technique prior to the birth. Data collected after each birth included a complete assessment of all obstetric lacerations (whether sutured or not), and collection of other data items, including maternal demographic characteristics, clinical intrapartum variables, and birth outcomes. Obstetric lacerations were diagnosed by the midwife in the usual manner, following the visual inspection of the woman's vaginal vault and external genitalia after the birth. In a 25% random sample of study births, reliability checks were conducted. In these, a second midwife made an independent assessment and recorded any birth-related trauma. Lack of agreement for the site(s) and extent of trauma was clinically important in only 4% of duplicate assessments.¹³ It should be noted that episiotomies are rarely performed by any clinicians (midwives, obstetricians, and family physicians) at the

research setting, and the rate is under 1% for all provider groups.

The study protocol and consent forms for the clinical trial were approved by the local institutional review board (the Human Research Review Committee [HRRC]) and also by the National Indian Health Service Institutional Review Board. This report is based on a secondary analysis of the database, which retained no personal identifiers. HRRC approval has been retained, by annual review, until all data analyses are completed and articles from these data are published.

Because the perineal management strategies tested in the trial were not associated with increased or decreased trauma rates, and the trauma profiles of the original groups as randomized were almost identical,¹³ the trial arms were pooled for this report. The analysis for this report consisted of all women who had a spontaneous vaginal birth without an episiotomy. Data from 35 births were excluded: 25 operative deliveries (9 cesareans, 3 forceps, and 13 vacuum) and 10 births where the woman had an episiotomy. This left data from 1176 women for analysis, all of whom had normal, spontaneous vaginal births, and no episiotomy. The SAS system (version 8; SAS, Inc., Cary, NC) was used for all analyses.¹⁴

Descriptive data are reported for obstetric lacerations according to anatomic site and whether any suturing was performed. Frequencies of maternal characteristics and intrapartum clinical variables were examined in women who did and did not have an epidural in labor, and also for women who did and did not experience sufficient trauma to warrant suturing. Statistical significance for the differences in proportions was assessed by the χ^2 procedure. Variables that demonstrated statistically significant differences ($P < .05$) for both epidural use and sutured lacerations were considered as possible confounders, and were entered into logistic regression models for simultaneous adjustment.

Crude and adjusted risk ratios (RRs) with 95% confidence intervals (CIs) for the relationship of epidural use to sutured lacerations were compared using logistic regression. A forward selection method was used to first add the demographic, and then the clinical variables found to be significant in the univariate analyses. Variables that were insignificant in the presence of the others were systematically deleted. Those variables remaining in the final model were identified as independent predictors of sutured obstetric trauma.

RESULTS

Data for genital tract trauma is shown in Table 1. Of 1176 women, 227 (19.3%) experienced genital tract trauma that was sutured by the midwife. There was considerable variation in which lacerations were sutured depending on the site of the trauma.

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Table 1. Anatomic Distribution of Genital Tract Trauma (N = 1176)

Site of Laceration*	n	Sutured, n (%)
Vaginal	465	139 (29.9)
Labial	576	62 (10.8)
Periurethral	150	5 (0.03)
Clitoral	48	5 (10.4)
Cervical	1	1 (100)
Perineal		
First degree	275	30 (10.9)
Second degree	199	113 (56.8)
Third degree	8	8 (100)
Fourth degree	4	4 (100)

*Note: Women could have trauma at more than one site.

Table 2 shows proportions of maternal and intrapartum variables in women who did or did not use an epidural for labor pain. Women receiving epidurals were more likely to be nulliparous, non-Hispanic white, and to have gained more weight during pregnancy. Epidural usage was associated with oxytocin infusion, Valsalva pushing (forceful bearing down with contractions, sustained breath holding), a prolonged second stage, and a larger infant. Women with epidurals were more likely to have sutured trauma.

Table 3 shows proportions of the same maternal and

Table 2. Demographic and Clinical Variables Related to Epidural Use

Variables	Epidural Use		P
	Yes (n = 419)	No (n = 757)	
Demographics	n (%)	n (%)	
Maternal age ≥ 30 yr	65 (15.5)	138 (18.2)	NS
Maternal education >high school	158 (37.7)	243 (32.3)	NS
Non-Hispanic white	165 (39.4)	215 (28.4)	<.001
Nulliparas	205 (48.9)	247 (32.6)	<.001
Body mass index ≥ 30	79 (18.9)	145 (19.4)	NS
Weight gain in pregnancy ≥ 40 lbs	127 (30.5)	176 (23.4)	<.01
Intrapartum factors			
Oxytocin infusion	228 (54.4)	168 (22.2)	<.001
Valsalva pushing	128 (30.6)	106 (14.0)	<.001
Prolonged second stage*	35 (8.3)	13 (1.7)	<.001
Terminal fetal bradycardia	46 (11.0)	71 (9.4)	NS
Sitting for delivery (45° or more)	347 (82.8)	618 (81.6)	NS
Head delivered between contractions	153 (36.5)	239 (31.6)	NS
Head delivered OA	400 (95.5)	715 (94.5)	NS
Compound presentation	55 (13.1)	77 (10.2)	NS
Birthweight ≥ 4000 gms	43 (10.3)	50 (6.6)	<.05
Sutured trauma	97 (23.2)	130 (17.2)	<.05

NS = not significant; OA = occipito-anterior.

*Active pushing of >2.5 hours in nulliparas; >1 hour in multiparas.

Table 3. Demographic and Clinical Variables Related to Sutured Trauma

Variables	Sutured Trauma		P
	Yes (n = 227)	No (n = 949)	
Demographics	n (%)	n (%)	
Maternal age ≥ 30 yr	40 (17.6)	163 (17.2)	NS
Maternal education >high school	96 (42.7)	305 (32.2)	<.01
Non-Hispanic white	91 (40.1)	289 (30.5)	<.01
Nulliparas	155 (68.3)	297 (31.3)	<.001
Body mass index ≥ 30	43 (19.0)	181 (19.2)	NS
Weight gain in pregnancy ≥ 40 lbs	67 (29.5)	236 (25.0)	NS
Intrapartum factors			
Oxytocin infusion	97 (42.7)	299 (31.5)	<.01
Valsalva pushing	61 (26.9)	173 (18.2)	<.01
Prolonged second stage*	20 (8.8)	28 (3.0)	<.001
Terminal fetal bradycardia	28 (12.3)	89 (9.4)	NS
Sitting for delivery (45° or more)	176 (77.5)	789 (83.1)	<.05
Head delivered between contractions	66 (29.1)	326 (34.3)	NS
Head delivered OA	211 (93.0)	904 (95.3)	NS
Compound presentation	30 (13.2)	102 (10.7)	NS
Birthweight $\geq 4,000$ gms	32 (14.1)	61 (6.4)	<.001
Epidural in labor	97 (42.7)	322 (33.9)	<.05

NS = not significant; OA = occipito-anterior.

*Active pushing of >2.5 hours in nulliparas; >1 hour in multiparas.

clinical variables in women who did or did not sustain sufficient genital tract trauma to warrant suturing. Women with sutured trauma were more likely to be nulliparous, non-Hispanic white, and have education beyond high school. Sutured trauma was associated with oxytocin infusion, Valsalva pushing, a prolonged second stage, and a larger infant. Fewer women with sutured trauma were sitting (45° or more from horizontal) for delivery, and more used an epidural for labor pain.

RRs and 95% CIs for the relationship of epidural usage to sutured lacerations were calculated. As shown in Table 4, the unadjusted risk ratio was statistically significant, but the relationship after adjustment for demographic (parity and race/ethnicity) and for both demographic and clinical

Table 4. Logistic Regression Models: Dependent Variable = Sutured Trauma

Model	Risk Ratio (95% CI)
Epidural (unadjusted model)	1.45 (1.08–1.95)
Epidural + demographic variables*	1.12 (0.82–1.53)
Epidural + demographic and clinical variables†	1.01 (0.73–1.39)

*Adjusted for demographic variables (parity and race/ethnicity).

†Adjusted for demographic and clinical variables (prolonged second stage, oxytocin, Valsalva pushing, and infant birthweight).

Table 5. Predictors of Sutured Obstetric Trauma: Final Logistic Regression Model*

Variables	Risk Ratio (95% CI)
Nulliparity	4.89 (3.55–6.75)
Non-Hispanic white	1.44 (1.05–1.98)
Prolonged second stage	2.36 (1.25–4.46)
Birthweight \geq 4,000 gm	2.97 (1.81–4.88)

*Note: Each variable is adjusted for all others in the model.

variables (oxytocin infusion, Valsalva pushing, prolonged second stage, and infant birthweight) showed no significant relationship between epidural usage and sutured lacerations.

The final regression model is shown in Table 5. With simultaneous adjustment, four variables remained as statistically significant predictors of sutured lacerations: nulliparity, being non-Hispanic white, a prolonged second stage (active pushing of >2.5 hrs in first-time mothers, and >1 hour in multiparas), and a birthweight >4000 grams. Variables that were deleted as insignificant in the presence of the other variables included oxytocin, Valsalva pushing, and epidural analgesia. As such, epidural use was not found to be an independent predictor of sutured trauma in these data.

DISCUSSION

This report used prospectively collected data to examine whether epidural usage in labor was an independent predictor of sutured genital tract trauma following spontaneous vaginal childbirth, and it was found not to be. The significant relationship observed in the univariate analyses disappeared with multivariable adjustment.

All women who participated in this study were free of serious medical and obstetric complications and were in midwifery care in a medical center setting. All women had a spontaneous vaginal birth without an episiotomy. Thus, these conclusions would not necessarily apply to women with medical or obstetric problems, those having operative births, or those receiving traditional, physician-led care.

An epidural in our clinical setting is typically a continuous lumbar epidural; these are requested by the mother and midwife, and administered by the hospital's anesthesia service. Because of the associated care measures and the additional professionals involved in epidural administration, inaccurate reporting by midwives of women's epidural use would be very unlikely. Women in the study who used a labor epidural had continued analgesia until delivery.

In these data, 35.6% of women received a labor epidural, compared with 63% of women in the nation.¹ In many childbirth settings, the array of options for pain management has narrowed, but where pain management options exist, they tend to be utilized. In this midwifery

practice, several nonpharmacologic options are available and are routinely encouraged. These include paced breathing, activity and position change, showers, use of a birth ball or rocking chair, and massage.¹⁵ Opioids are also available, and fentanyl is the preferred choice among the midwives. Often, one or more of these methods will be utilized before proceeding to an epidural.

The precise timing of epidural administration (cervical dilatation or number of hours after hospital admission) was not recorded in our dataset. Because healthy gravidas are not typically admitted to the hospital's labor unit until active labor is established, it is unlikely that many epidurals would have been administered in the latent phase of first stage labor in this setting.

Rigid time limits for normal labor are not enforced in our clinical setting. With an epidural, a 1- to 2-hour period of rest will commonly precede active pushing in the second stage. Waiting until some degree of passive descent has occurred before the woman begins actively pushing has been found to increase the likelihood of having a spontaneous delivery without causing predictable harm to mother or infant.^{16,17}

Midwife assessment of genital tract trauma was comprehensive and detailed. The midwife group's expertise with assessment and suturing of genital tract trauma is maintained through their ongoing didactic and clinical teaching of a variety of health sciences students. All lacerations at all anatomic sites were systematically recorded after each birth, and if any suturing was performed, this was also noted. Those lacerations left unsutured would have been judged by the midwife to be small, shallow, well-approximated, and not bleeding.

The overall rate of third- and fourth-degree lacerations was quite low, at 1%. However, of the eight that occurred, seven were in women who did not have an epidural. While this may suggest that epidural analgesia might be protective against severe perineal trauma, these numbers are too small for any firm conclusions to be drawn. A higher proportion of women with versus those without an epidural had a controlled delivery, with the baby's head born between uterine contractions, but the difference was not statistically significant (Table 2). However, this birth technique was shown in the trial to be associated with a lower overall rate of trauma.¹³ Further investigation of whether this technique has a role in preventing third- or fourth-degree lacerations will require far larger datasets, because extensive perineal trauma tends to be very infrequent in midwifery practice.

Most women in this dataset, with or without an epidural, changed position frequently throughout labor and were upright for pushing and birth. In our setting, women with epidurals are helped to change positions every 1 to 2 hours. Four out of five women in both groups delivered in a sitting position (45° or more from horizontal). This may have muted any differences in trauma between women who did or did not receive an epidural.

Midwifery data from Australia have indicated that increased childbirth trauma accompanies epidural usage, especially with immobility and bed confinement; the highest rates of trauma are associated with the lithotomy position for birth.¹⁸ Upright positions in the second stage, when an epidural is used, have been associated with lower rates of instrumental delivery and perineal trauma.¹⁹

Epidurals have also been traditionally associated with the fetal head position of occipitoposterior (OP) at birth.^{2,4,5} Because a larger head diameter is presented by the OP position, spontaneous birth becomes less likely, and genital tract trauma more likely. A recent study of more than 1500 nulliparas used serial ultrasounds to document fetal head positions throughout labor and at birth, in women with and without an epidural.²⁰ With an epidural, 13% of women delivered OP, but without an epidural, only 3% did so. However, the details of usual labor management were not discussed in the paper. In our data, 3% of women in both groups delivered OP. Of the 16 vaginal operative births (forceps and vacuum) that were excluded from our analysis sample, only one birth was OP, so these exclusions would not have biased our observed frequency of OP at birth. Alternatives to bed rest and recumbent positions may partially explain the low rate of OP in our data, and this topic deserves further research.

Specific labor management techniques, beyond cointerventions typically required by use of an epidural (intravenous fluids, oxytocin infusion, continuous electronic fetal monitoring, and bladder catheterization) need greater research attention with regard to genital tract trauma reduction. Because epidural use is so common, associated care measures that increase the likelihood of spontaneous vaginal birth without genital tract lacerations would improve the health of new mothers. Our data showed that epidural use was not associated with a higher rate of sutured lacerations, and we hypothesize that elements of midwifery care, such as activity and position change in labor, upright positions for birth, and clinician patience, are part of the explanation. These deserve focused attention in future research.

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