Epidural Analgesia and the Risk of Third and Fourth Degree Obstetric Laceration in Nullipara Women

Laura L. Prince

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Epidural Analgesia and the Risk of Third and Fourth Degree Obstetric Laceration in Nullipara Women

Abstract

Background: Epidurals are commonly used to relieve labor pain; they are not without risk. Epidurals lengthen the length of the second stage of labor, cause maternal hypertension, itching, shivering, fever, urinary retention, vomiting, and dural puncture.

Methods: An exhaustive search of available medical literature was conducted using Medline-OVID, CINAHL, EBMR and Web of Science using the keywords: lacerations, epidural analgesia. Studies were included if they had minimum sample size of 1000 and were conducted on nullipara women. The Quality of relevant articles was assessed using GRADE.

Results: Three studies met inclusion criteria and were used in this systematic review. A retrospective cohort study, conducted in 1999, evaluating 1942 participants showed that epidural analgesia prolongs the second stage of labor, and it is indirectly associated with an increased rate of severe perineal trauma. A 2002 retrospective cohort study with 1059 women showed a significant increase in perineal trauma due to an associated threefold increase risk of instrument use in delivery. A retrospective cohort study conducted in 1991 with 3745 deliveries showed that epidural analgesia was associated with more episiotomies; however, the authors concluded it was not directly associated with an increase incident of birth canal trauma.

Conclusion: Epidural analgesia is a risk factor in causing severe perineal trauma in the nullipara patient due to its more frequent use of episiotomy and instrumental delivery.

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Capstone Project

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Master of Science in Physician Assistant Studies

Keywords
Epidural analgesia, Lacerations, nullipara

Subject Categories
Medicine and Health Sciences

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Epidural Analgesia and the Risk of Third and Fourth Degree Obstetric Laceration in Nullipara Women

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A Clinical Graduate Project Submitted to the Faculty of the
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Faculty Advisor: Eric Foote PA-C
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Biography

Laura Lael Prince is a native of Utah. She completed her bachelor degree in Biology with a minor in Biochemistry at Brigham Young University - Hawaii. Prior to PA school she worked as a Medical Assistant for 2 years and a blood bank phlebotomist for a year. She has an interest in Emergency Medicine or Surgery.
Abstract

Background: Epidurals are commonly used to relieve labor pain; they are not without risk. Epidurals lengthen the length of the second stage of labor, cause maternal hypertension, itching, shivering, fever, urinary retention, vomiting, and dural puncture.

Methods: An exhaustive search of available medical literature was conducted using Medline-OVID, CINAHL, EBMR and Web of Science using the keywords: lacerations, epidural analgesia. Studies were included if they had minimum sample size of 1000 and were conducted on nullipara women. The Quality of relevant articles was assessed using GRADE.

Results: Three studies met inclusion criteria and were used in this systematic review. A retrospective cohort study, conducted in 1999, evaluating 1942 participants showed that epidural analgesia prolongs the second stage of labor, and it is indirectly associated with an increased rate of severe perineal trauma. A 2002 retrospective cohort study with 1059 women showed a significant increase in perineal trauma due to an associated threefold increase risk of instrument use in delivery. A retrospective cohort study conducted in 1991 with 3745 deliveries showed that epidural analgesia was associated with more episiotomies; however, the authors concluded it was not directly associated with an increase incident of birth canal trauma.

Conclusion: Epidural analgesia is a risk factor in causing severe perineal trauma in the nullipara patient due to its more frequent use of episiotomy and instrumental delivery.

Keywords: Epidural analgesia, Lacerations, nullipara
Acknowledgements

To my parents and family: Thank you for always supporting me in my endeavors in every way possible and for me telling me each day to always do my best. I am proud to be your daughter and sister.
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List of Abbreviations

GRADE………………………………………Grading of Recommendations, Assessment, Development and Evaluations
OR…………………………………………….Odds Ratio
CI……………………………………………..Confidence Interval
Epidural Analgesia and the Risk of Third and Fourth Degree Obstetric Lacerations in Nullipara Women

BACKGROUND-
Epidural analgesia relieves labor pain very well, as such it has become popular in modern times among women. Epidural analgesia and other regional analgesic techniques are widely accepted as the only consistent effective means of relieving pain from labor and delivery.\textsuperscript{1} Anesthesiologists perform epidural analgesia by positioning a catheter in the epidural space and administering a variation of local anesthetics and opioids to relieve labor pain. Epidurals are not without risk. They are known to temporally prolong the second stage of labor and cause maternal hypotension, itching, shivering, vomiting, fever, urinary retention, and dural puncture.\textsuperscript{2-3}

Though epidurals are very effective at providing analgesia, the relationship between epidurals and the risk of perineal lacerations in nullipara women has not been thoroughly investigated. The question remains: does epidural analgesia increase the risk of 3\textsuperscript{rd} and 4\textsuperscript{th} degree lacerations in nullipara women?

Sultan\textsuperscript{4} proposed a classification system in 1999 for obstetric perineal lacerations. In this classification, first degree laceration is defined as injury to perineal skin and vaginal epithelium only. Second degree lacerations extend into the fascia and perineal muscles. Third degree laceration is characterized by a laceration extending through fascia and musculature and involves some the external anal sphincter and internal anal sphincter damage. Finally, fourth degree laceration is defined as a third degree laceration with involvement of the rectal mucosa as well. Perineal trauma can have
lasting effects on women. The most common being fecal incontinence, dyspareunia, perineal pain and recto-vaginal fistulas, even after surgical repair.⁵

**METHODS**

An exhaustive literature search was completed using OVID-Medline, EBMReviews, Web of Science, and CINAHL using the term words “analgesia, epidural” and “laceration.” Inclusion criteria were retrospective cohort studies or randomized controlled trials looking at the specific relationship between epidural analgesia and 3rd and 4th degree perineal lacerations in nullipara women. Bibliographies of relevant studies were also searched. Abstracts and methods were reviewed to assess studies done on nulliparous women; studies where population size of nullipara women was less than 1000 were excluded. The search was narrowed to include studies that were in the English language and done on humans. Articles that cited publications that met inclusion criteria were assessed using Web of Science. Applicable articles were evaluated using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE).⁶

**RESULTS**

A total of six studies were found eligible from the electronic search; three studies met inclusion criteria and were included in this systematic review. All three studies⁵,⁷,⁸ were retrospective cohorts (See Table I and II).

**Robinson et al Study**

In 1999, a retrospective cohort study by Robinson et al⁷ had 1942 nullipara participants. Inclusion criteria included women who had single, non-complicated, and full term pregnancies with fetuses presenting cephalically and delivering vaginally. Exclusion criteria were mothers with diabetes, cardiac conditions, and inflammatory
bowel diseases. Medical records were reviewed in one women’s hospital from December
1994 through July 1995. Overall rates of 3rd and 4th degree laceration was n=210 (10.8%) and n=63 (3.2%), respectively (OR 1.8, 95% CI 1.3-2.4). Out of all participants, 1376 (70.9%) had an epidural and of those 16.1% had a severe laceration. Comparatively, of the 566 (9.7%) women who did not have an epidural 9.7% had a severe laceration. Fifty-three percent of women who had an epidural also had an episiotomy versus 32.3% of women who did not have an epidural. Severe lacerations were more frequently seen in women who had epistomies (23.8% versus 5.5%). Women who had epidurals were more likely to have oxytocin induction or augmentation, have a baby over 4000g, be older than 21 years, have private medical insurance, and be nulliparous. Women with epidurals were found to be at a statistically significantly higher risk for operative vaginal deliveries (41.8% versus 8.7%). Women who had assisted delivery via vacuum or forceps and had an epidural were 21.15% of participants versus 5.7% in women who did not have epidural analgesia. Data were stratified to tell if increased obstetric delivery assistance explained the higher incidence of third and fourth degree lacerations. A logistic regression analysis was done to control for birth weight, use of oxytocin, and maternal age. These calculations inferred epidural was a significant predictor of severe perianal injury (OR 1.4, 95% CI 1.0-2.0). Another regression was done to evaluate whether higher rates of instrument delivery were responsible for severe lacerations. No significant difference was found according to use of epidurals (OR 0.9, 95% CI 0.6-1.3). This evidence suggests an increase in operative interventions is responsible for higher rates of severe perineal trauma, and not epidurals alone.
Carroll et al Study

A 2002 retrospective cohort study by Carroll et al\(^5\) had 2759 participants. Medical records were pulled on all births between June 1996 and June 2000; 1059 of these women were nulliparas. Inclusion criteria were women who had vertex, vaginally delivered, and singleton babies of at least 36 weeks gestation. Exclusion criteria were mothers who were diabetic or had cardiac disease due to change in management of delivery. The overall laceration rate was calculated to be 6.38\% (3\(^{\text{rd}}\) degree) and 11.3\% (4\(^{\text{th}}\) degree) in nullipara women. Epidural analgesia was given to 634 women, and 10.25\% had severe laceration, while 5.22\% of the 2135 women who did not have an epidural had with severe laceration. Epidural analgesia showed an increase in instrument use (16.72\% versus 4.71\% respectively), episiotomy (26.50\% versus 20.75\% respectively), and induced labor (63.25\% versus 42.26\% respectively). Logistic regression in this study was conducted to control potential confounders of episiotomy, parity, induction, age of mother, and birth weight. Results found epidural analgesia to be statistically significant predictor of a 3\(^{\text{rd}}\) or 4\(^{\text{th}}\) degree laceration of the perineum. Another confounding factor was instrument use in labor. Of women who had an epidural and an instrument-assisted delivery, severe laceration occurred in 41 out of 528 women (7.77\%); however, laceration occurred in only 91 out of 2025 (4.49\%) women who had neither epidural nor instrument delivery. Results from this study initially reported epidural analgesia as an independent risk factor for severe laceration. Conversely, another regression was done to control instrument use and found that epidurals did not show a statistically significant increase risk for tear (OR=1.287, CI=0.907-1.826). It
showed that epidural was an independent cause for instrument use with an odds ratio of 3.01 and that instrument use was a strong predictor of severe laceration (OR=3.245).

**Walker et al Study**

A retrospective cohort study published in 1991 by Walker et al\textsuperscript{8} included 3745 nullipara deliveries. Data was abstracted from medical records starting October 1986 to January 1990. Inclusion criteria included spontaneous deliveries, term deliveries between 38 and 42 weeks gestation, vertex and labors that progressed normally. Exclusion criteria were fetal distress and those delivered by caesarian section. Epidurals were given to 77\% (n=2896) of nullipara mothers during labor. Severe lacerations were sustained in 4.6\% of nullipara women, and 24\% received minor lacerations, comparatively to 1.6\% and 41\% in multiparous women, respectively. This demonstrates an association between nulliparity and the risk of laceration. Episiotomy reduced the percentage of patients sustaining minor lacerations from 75\% to 11\%, although it raised the risk of a severe laceration from 1\% to 4\%. A four-factor multivariate nominal response model was done to examine the relationship between laceration and epidural analgesia, forceps use, episiotomy and parity. Use of epidural analgesia was not found to not be associated with perineal laceration (p=0.2351) in nulliparas. Nullipara women were more likely to have a severe laceration when compared to multiparas (OR=3.01). Instrument use was found to also be a strong indicator of laceration in labor (OR= 2.3); trauma was increased from 2\% to 4.3\% when forceps were used.

**DISCUSSION**

Epidural analgesia is widely used in child labor. For most women they provide sufficient pain relief, more so than any other modality.\textsuperscript{9} The studies demonstrate
conflicting results. After adjusting for confounders, Robinson et al.\(^7\) showed an almost 2-fold increase in risk of severe laceration when using epidural analgesia. However, Carroll et al and Walker et al studies do not reflect an increased risk of severe laceration with use of epidural.\(^{5,8}\) Two other studies,\(^{9-10}\) which were excluded from this review due to small sample size, also failed to support a direct association between epidural analgesia and severe perineal lacerations.

Certain known predictors of lacerations are well known to be associated with epidural analgesia, which would suggest that epidurals could indirectly increase the risk for lacerations of the perineum. Epidurals increase the second stage of labor. Invariably this can cause a decrease in progression of labor leading to the need of intervention. Most of these interventions are found to be a risk factor for perineal laceration. Instrument use, episiotomy, and oxytocin use are the common modalities used.

Worth noting is that instrument use was found to be a large factor in lacerations. This was found to be true in the studies conducted by Carroll et al\(^5\) and Robinson et al.\(^7\) Instrument assisted deliveries more than tripled the risk for laceration in one study\(^5\) and 1.5 times the risk of laceration in another.\(^7\) The link between instrumentation use and severe lacerations is further supported by other research not included in this review.\(^9\) Specifically, Lacerations were found to be more common amongst women who had forceps or vacuum devices utilized in labor.\(^5,7,8\) Herein lies the indirect link between perianal lacerations and epidural use in that women who had epidurals had a threefold risk for instrument-assisted delivery.\(^5\)

Episiotomy was found to decrease the incidence of 1\(^{st}\) and 2\(^{nd}\) degree lacerations but increase the incidence of 3\(^{rd}\) and 4\(^{th}\) degree laceration.\(^5,7-8,10\) One study\(^8\) regards the
lack of efficacy of episiotomies as reducing the incident of or severity of perineal trauma with their data, and confirms that it in fact causes worse and more severe tears. Since episiotomies were more common in women who had epidurals\textsuperscript{7}, this brings in even more controversy.

Additionally, the use of oxytocin is another variable to be looked at. Oxytocin use was found to be more common in the nullipara woman.\textsuperscript{5,7,10} Use of oxytocin to induce labor or supplement stage two of labor was recorded.\textsuperscript{5,10} Since oxytocin use was considered a confounder, the results were adjusted to minimize its influence on the risk of perineal laceration\textsuperscript{5,7}.

Each of the retrospective cohort studies had the same limitations. All three studies\textsuperscript{5,7-8} patient population was limited to one institution; each article had a large sample size but had little variation in patient population. All studies assumed that each physician or provider had a uniform definition of degree of laceration as well as the same experience and relative skill. Two of the studies\textsuperscript{5,7} used logistic regression analysis to control for confounding factors. The third study\textsuperscript{8} used a multivariate nominal response model which results cannot necessarily be comparable to those done by logistic regression. This results in an overall low quality of evidence.

**CONCLUSION**

Epidurals are widely used in modern medicine for the relief of pain during childbirth. Evidence shows that epidural analgesia is not an independent risk factor for third or fourth degree lacerations in nullipara women, rather it is an indirect risk factor. Since epidurals are associated with a higher use of instrumentation in delivery, and
episiotomies, the indirect risk relates to the fact that nullipara women who had an episiotomy, instrument delivery or both consistently had a higher incidence of perineal laceration.
References


### Table I. Characteristics of Reviewed Studies

<table>
<thead>
<tr>
<th>Quality Assessment</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Studies</td>
<td>Design</td>
</tr>
<tr>
<td></td>
<td>Limitations</td>
</tr>
<tr>
<td>Lacerations</td>
<td>3 Retrospective cohorts</td>
</tr>
<tr>
<td>Instrument delivery</td>
<td>3 Retrospective cohorts</td>
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<tr>
<td>Episiotomy</td>
<td>2 Retrospective cohorts</td>
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</table>

### Table II. Summary of Findings

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of Patients N=6809</th>
<th>Treatment (total N=4613)</th>
<th>Placebo or no treatment (total N=2196)</th>
<th>Laceration OR (95% CI)</th>
<th>Instrument delivery OR (95% CI)</th>
<th>Episiotomy OR (95% CI)</th>
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<tr>
<td>Robinson et al²</td>
<td>1376</td>
<td>566</td>
<td>OR=1.4 (1.0-2.0)</td>
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<td>high</td>
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<tr>
<td>Carroll et al³</td>
<td>341</td>
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<td>OR=1.287 (0.907-1.826)</td>
<td>OR=3.248 (2.162-4.869)</td>
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</tr>
<tr>
<td>Walker et al⁴</td>
<td>2896</td>
<td>849</td>
<td>P=0.2351</td>
<td>OR=2.3 (1.8-3.0)</td>
<td>OR=4.17 (2.9-5.8)</td>
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