Original Investigation

Does Epidural Labor Analgesia Increase the Rate of Cesarean Section?

A Retrospective Study

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OBJECTIVE

The aim of this study was to investigate the impact of epidural analgesia on the rate of Cesarean section in nulliparous women.

METHODS

Retrospectively a total of 200 nulliparous women who underwent spontaneous vaginal delivery at term with or without requesting labor analgesia were reviewed and screened. The primary outcome is the rate of Cesarean section at different cervix diameter. Others included maternal and neonatal outcomes due to epidural analgesia and drug delivery.

RESULTS

The data from a total of 139 subjects were eventually included into the analysis. Significant difference in the rate of Cesarean delivery was observed amongst the two groups (7.3% in patients with epidural analgesia versus 63.4% in patients without epidural analgesia, $P < 0.0001$). The pain rating, oxytocin use, and patient's satisfaction were also superior in those underwent epidural analgesia than those without analgesia. No significant differences were expressed in variables of non-reassuring fetal status.

CONCLUSIONS

Epidural analgesia does not increase the rate of Cesarean section, on the contrary, it is a reliable way to reduce the rate compared with the patients who do not received the analgesia in nulliparous women.■

KEYWORDS Epidural Analgesia; Labor Pain; Cesarean Section; Cervix; Nullipara

Sci Insigt. 2016; 2016:e00317. doi:10.15354/si.16.ar509

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Current evidence supports that epidural analgesia is safe in laboring women and systematic reviews on this topic suggest bettering defining dystocia and non-reassuring fetal status diagnoses by precise and repeatable criteria (1-3). Nevertheless, ample evidence from both randomized controlled trials and well-designed observational studies suggest pregnant women with induced labor are at higher risk for Cesarean delivery, of which predominantly related to an unfavorable Bishop Score at admission (4-6). Under such circumstances, an interdisciplinary team approach and quality assessment is required for successful delivery care. A national wide survey in the United States unraveled that large differences exist in obstetricians' approach to medical decision making with similar patient, and disclosed a real risk for nonevidence-based practice (7). Therefore, written evidence-based protocols are crucial for improving obstetric care outcome. The present study was designed to clarify the impact of epidural analgesia on the rate of Cesarean delivery in nulliparous women.

MATERIALS AND METHODS

After approval by the Hospital Ethics Examining Committee of Human Research, the data of 200 nulliparous women who underwent vaginal delivery at term with or without requesting labor analgesia were reviewed and screened. A total of 139 subjects met the criteria were assigned to this retrospective study. All those measure-up-to-standard participants who requested analgesia had signed an informed consent before initiation of analgesia.

Participating data were excluded from the analysis if any of the following criteria were met: (i) Allergy to opioids, a history of the use of centrally-acting drugs of any sort, chronic pain and psychiatric diseases records; (ii) Participants younger than 18 years or older than 45 years; (iii) Those who were not willing to or could not finish the whole study at any time; (iv) Parturients with spinal abnormalities, bleeding tendency, infection and anxiety to epidural puncture were not enrolled; (v) Alcohol addictive or narcotinum dependent patients were excluded for their influence on the analgesic efficacy of the epidural analgesics; (vi) Subjects with a nonvertex presentation; (vii) Diagnosed diabetes mellitus and pregnancy-induced hypertension; (viii) Twin gestation.
Once the data of subjects were eligible for inclusion, all demographic and clinical data were added including age at delivery, weight, height, gestational age of fetus, current status of smoking, VAS rating of pain intensity and vital signs before analgesia, and whether spontaneous rupture of the membrane > 12 hrs before oxytocin infusion.

The technique of epidural puncture and catheterization was performed to all participants. The test dose of 3.0 ml lidocaine 1.5% (45 mg) plus epinephrine 5 μg/ml was given to patients. After delivering test dose, all participants immediately received an epidural bolus of analgesic mixture 15ml of ropivacaine 0.125% (1.25 mg/ml) with sufentanil, 0.3 μg/ml, followed by patient-controlled analgesic (PCA) pump with a 5 ml patient-controlled bolus without background infusion, a lockout interval of 15 min and hourly limit 30ml.

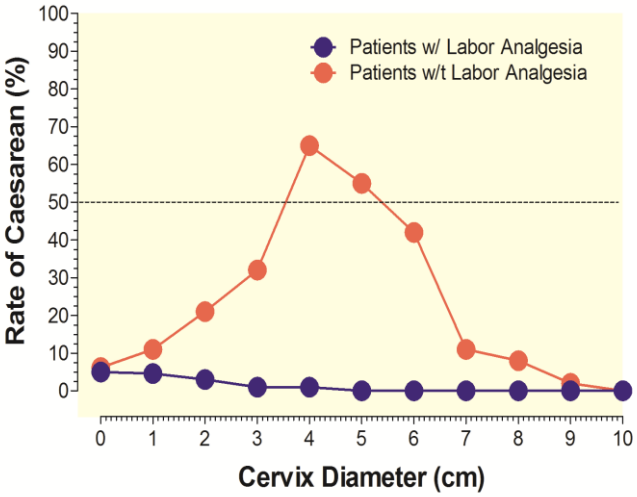
The maternal parameters monitored during the whole study from before the analgesic procedures to the completion of the labor including the heart rate by 5-lead electrocardiograph, respiratory rate, noninvasive systolic and diastolic blood pressure, mean arterial pressure and fingertip pulse oximetry. A catheter was inserted in a right or left antecubital vein for fluid and drug administration. Ringer's solution 8 ml/kg was titrated 15 minutes prior to initiation of EA. Intrapartum fluid management included replacement of preexisting fluid deficits, normal losses (maintenance requirements), the amount of urine collected via a measurable basin-like container, and hemodynamic variables.

The intrauterine pressure sensor, if necessary, was placed to show the intensity of uterine contraction. Oxytocin was infused by the nursing staff set by the obstetricians according to clinical guidelines. A decision whether an operative delivery need to be proceeded to was made by the obstetrical team who did not involved in this study depending upon maternal and fetal indications.

During the whole process of study, the patient-derived VAS scores of pain at rest were measured hourly with the 100-mm gauge (based on a 0-100 linear VAS, 0 = no pain; 100 = worst pain imaginable). Global pain to each patient, namely the pain intensity on average the patient felt during labor, was scored. In addition, the maternal satisfaction with analgesia was assessed via the VAS system (a 1-100 mm linear VAS used, 1 = dissatisfaction; 100 = fully satisfied).

A continuous external electronic fetal heart-rate monitoring and tocodynamometry were made. Apgar scores were rated by the paediatric personnel according

Figure 1: Rate of Cesarean Delivery in Relation to the Cervix Diameter.



to the standard assessment. Umbilical-cord blood gas analysis was performed by the investigators.

The rate of Cesarean delivery was selected as the primary outcome. The following measures were selected as the secondary outcomes: the verbal ratings of VAS pain and satisfaction with analgesia; oxytocin requirements; infant outcomes, such as the body weight, Apgar scorings.

Statistical Analyses

Analyses were performed using GraphPad Prism version 5.0 (GraphPad Software Inc., San Diego, CA, USA). Values are expressed as the mean, standard deviation (SD), median, interquartile interval, or numbers. All categorical data were analyzed with a Chi-square test to indicate the trend. Continuous variables like as the effects of the epidural analgesia on patient's self-rated VAS of pain and satisfaction were summarized by calculating the median and interquartile interval, and compared with the Kruskal-Wallis test. The demographic data and background characteristics were presented as mean ± SD and analyzed with Student *t* test. All reported P values are two-sided and a P value of less than 0.05 was considered to indicate statistical significance.

RESULTS

Data from 200 patients were reviewed and screened for eligibility. A total of 139 subjects were collected and had the characteristics of epidural analgesia or without analgesia. Sixty one (30.5%) were excluded.

The material from included subjects underwent assignment was analyzed for baseline characteristics. There were no significant differences in the demographic and background data between the two groups (**Table 1**). Vital signs all were within the physiological ranges throughout the analgesic period and not significantly different among the groups.

A big difference in the rate of Cesarean delivery was shown in the two groups; the total difference in the CS rate in the patients with epidural analgesia was 7.3% and 63.4% in those without analgesia ($P < 0.0001$, **Table 2**). Along the changes in cervix diameter, the rate of CS showed significant change in analgesia group, in which the CS rate was marked reduced, whereas in the no-analgesia group, the rate increased and peaked as the cervix diameter reached 4 cm (**Figure 1**). In addition, the percentages of subjects who obtained oxytocin infusion also expressed significant difference ($P < 0.01$, **Table 2**).

The pain scorings in both groups displayed substantial difference (VAS 25 versus 98 during the first stage in the analgesia and no-analgesia groups, respectively, $P < 0.01$; VAS 20 versus 85 during the second stage in the analgesia and no-analgesia groups, respectively, $P < 0.01$, **Table 2**). Patients scored higher satisfaction of the analgesia-related delivery experience than the comparison ($P < 0.01$, **Table 2**). There were no significant differences in Apgar scorings.

DISCUSSION

Our study demonstrated that epidural labor analgesia does not result in intrapartum Cesarean delivery in comparison with those without analgesia. On the contrary, epidural analgesia can reduce the rate of Cesarean section in nulliparous women.

While Dr. Wong found that intrathecal opioid use significantly shortened the first stage of labor compared with the systemic opioid administration (8), in the present study, epidural analgesia was not increase, but decrease Cesarean rate. It suggests that epidural analgesia in nulliparous women is not a risk factor for Cesarean delivery. Nonetheless, one major finding in this study is that more oxytocin was prescribed to them for poor labor pain controlled patients who did not received epidural analgesia. These are not in agreement with other reports that an association existed between EA and

Table 1. Baseline Characteristics of the Subjects.*

Characteristic	Patients w/ Labor Analgesia (n=68)	Patients w/t Labor Analgesia (n=71)	P Value
Age at delivery – yr	25.5 ± 3.2	25.0 ± 5.6	0.97
Weight – kg	74 ± 11	77 ± 17	0.91
Height – cm	163 ± 5	159 ± 9	0.88
Gestational age of fetus – week			
Median	39	38	0.85
Interquartile interval	38 – 41	37 – 40	
Current smoker – n (%)	22 (14.6)	24 (17.0)	0.51
Spontaneous ROM > 12 hrs before oxytocin infusion – n (%)	31 (20.5)	36 (25.5)	0.18
Use of oxytocin prior to analgesia – n (%)	23 (15.2)	27 (19.1)	0.33
Reasons for oxytocin			
Induction of labor after prelabor ROM – n (%)	14 (60.9)	18 (66.7)	0.96
Augmentation of labor – n (%)	7 (30.4)	5 (18.5)	0.72
Maternal request – n (%)	2 (8.7)	4 (14.8)	0.92
Pain ratings before analgesia with VAS†			
Median	63	85	0.17
Interquartile interval	52 – 77	67 – 90	
Vital signs prior to analgesia			
Blood pressure			
Systolic pressure – mmHg	116 ± 13	120 ± 13	0.76
Diastolic pressure – mmHg	65 ± 7	68 ± 8	0.41
Heart rate – beats per minute	72 ± 10	71 ± 5	0.62
Respiratory rate – breaths per minute	22 ± 7	19 ± 8	0.84
Oral temperature – ºC	37.3 ± 0.1	36.9 ± 0.4	0.16

* Plus-minus values indicate the means ± standard deviation (SD). P values were calculated with Student t test or the Chi-square test, as appropriate.
† The Visual Analog Scale (VAS) ratings of pain intensity is a 100-point linear gauge in which 0 = no pain, 100 = worst pain imaginable.
ROM: rupture of membranes.

Table 2. Primary and Secondary Outcomes.*

Outcome	Patients w/ Labor Analgesia (n=68)	Patients w/t Labor Analgesia (n=71)	P Value
Caesarean – n (%)	5 (7.3)	45 (63.4)	< 0.0001
Length of labor – hr†(Vaginal deliveries only)	9.0 ± 4.0	8.9 ± 4.5	0.83
Duration of first stage – min	409 ± 56	411 ± 52	0.72
Duration of second stage – min	59 ± 10	56 ± 9	0.83
Average VAS pain ratings (0 – 100 mm)‡			
First stage of labor			< 0.001
Median	25	98	
Interquartile interval	16 – 45	81 – 100	
Second stage of labor			< 0.001
Median	20	85	
Interquartile interval	15 – 37	76 – 97	
Use of oxytocin after analgesia – n (%)	7 (10.2)	32 (45.1)	< 0.01
Maternal overall satisfaction (VAS, 1 – 100mm)§			< 0.01
Median	88	22	
Interquartile interval	76 – 97	11 – 305	
Infant weight – g	3,300 ± 340	3,400 ± 350	0.83
1 – min Apgar < 7 – n (%)	4 (5.8)	5 (7.0)	0.69
5 – min Apgar < 7 – n (%)	0	0	–

* Plus-minus values are means ± standard deviation (SD). P values were calculated with Student t test or the Chi-square test, as appropriate.
† The length of labor indicates the time period from the onset of regular uterine contraction to the 1 hr after delivery of placenta.
‡ The VAS system of pain is a 0 to 100 mm linear gauge in which 0 = no pain, 100 = worst pain imaginable.
§ The VAS system of satisfaction with analgesia is a 1 to 100 mm linear gauge in which 1 = dissatisfaction, 100 = fully satisfied.

intrapartum oxytocin infusion (9), and the EA combined with oxytocin infusion would increase the rate of CS (10). By contrast, out retrospective study did not show positive correlation between epidural labor analgesia and oxytocin, but a negative relationship.

The study merely investigated the nulliparous women with single and vertex presentation, but whether such results could be applied to other populations were not guaranteed. Another question is the difficulty in blinding the study groupings from the obstetricians who ultimately made the decision for Cesarean delivery due to its retrospective property. We monitored the fetal heart-rate as a possible indicator for emergency CS, though; the association amongst EA, fetal heart-rate variability and Cesarean delivery was not analyzed.

In sum, when the EA was used in controlling labor pain, cervical dilation is not a major aspect needed to be concerned. Cesarean delivery in nulliparous women at term with vertex presentation was not increased when giving epidural analgesia. Further perspective research is required to determine whether other patient groups are also likely to fit in such treatment. ■

Acknowledgement

We are indebted to all obstetricians, midwives, pediatricians, nurses and anesthesiologists who participated in collecting the data in our hospital.

ARTICLE INFORMATION

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Study concept and design: Li and Shen.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Li, Zhu, Liu.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Li, Zhu, Liu.
Obtained funding: N/A.
Administrative, technical, or material support: Shen.
Study supervision: Shen.

Conflict of Interest Disclosures: All authors declared no competing interests of this manuscript submitted for publication.

Funding/Support: N/A

Role of the Funder/Sponsor: N/A

How to Cite This Paper: Li H, Zhu Y, Liu Y, Wang W, Wang N, Xu S, Shen X. Does epidural labor analgesia increase the rate of Cesarean section? A retrospective study. Sci Insigt. 2016; 2016:e00317.

Digital Object Identifier (DOI): http://dx.doi.org/10.15354/si.16.ar509.

Article Submission Information: Received, November 22, 2016; Revised: December 05, 2016; Accepted: December 11, 2016.

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