

Does Intrapartum Epidural Analgesia Affect Nulliparous Labor and Postpartum Urinary Incontinence?

Ching-Chung Liang, MD; Shu-Yam Wong¹, MD; Yao-Lung Chang, MD;
Pei-Kwei Tsay², PhD; Shuenn-Dhy Chang, MD; Liang-Ming Lo, MD

Background: The effect of epidural analgesia on nulliparous labor and delivery remains controversial. In addition, pregnancy and delivery have long been considered risk factors in the genesis of stress urinary incontinence (SUI). We sought to determine the effect of epidural analgesia and timing of administration on labor course and postpartum SUI.

Methods: Five hundred and eighty three nulliparous women were admitted for vaginal delivery at ≥ 36 gestational weeks. We compared various obstetric parameters and SUI, at puerperium and 3 months postpartum, among patients who had epidural and non-epidural analgesia, and among those who had early (cervical dilatation < 3 cm) and late (cervical dilatation ≥ 3 cm) epidural analgesia.

Results: When compared with the non-epidural analgesia group ($n = 319$), the group that received epidural analgesia ($n = 264$) had significant prolongation of the first and second stages of labor, and higher likelihood for instrumental and cesarean delivery but similar incidence of severe vaginal laceration and postpartum SUI. Except for the first stage of labor, early administration of epidural analgesia did not result in a significant influence on obstetric parameters or an increased incidence of postpartum SUI.

Conclusion: Our findings showed that epidural analgesia is associated with an increased risk of prolonged labor, and instrumental and cesarean delivery but is not related to increased postpartum SUI. Regarding the impact of the timing of epidural analgesia given in the labor course, the first stage of labor appeared to last longer when analgesia was administered early rather than late.

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Key words: epidural analgesia, labor, urinary incontinence, postpartum

Epidural analgesia is a safe and effective method of pain relief during labor. However, its effect on nulliparous labor and delivery remains controversial. Some physicians have long argued that epidural analgesia prolongs the first stage of labor, especially if it is administered during the latent phase.⁽¹⁻⁴⁾ Based

on studies that found an association between the initiation of epidural analgesia early in labor and an increased rate of cesarean delivery,⁽⁵⁾ the American College of Obstetricians and Gynecologists recommends obstetrical practitioners should delay the administration of epidural anesthesia in nulliparous

From the Department of Obstetrics and Gynecology, ¹Department of Anesthesiology, Chang Gung Memorial Hospital, Taipei, Chang Gung University College of Medicine; ²Department of Public Health and Center of Biostatistics, Chang Gung University, Taoyuan.

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Correspondence to: Dr. Liang-Ming Lo, Department of Obstetrics and Gynecology, Chang Gung Memorial Hospital, 5, Fusing St., Gueishan Township, Taoyuan County 333, Taiwan (R.O.C.) Tel.: 886-3-3281200 ext. 8258; Fax: 886-3-3288252; E-mail: ccjoliang@cgmh.org.tw

women until cervical dilatation reaches at least 4 cm, and that other forms of analgesia should be used until that time.⁽⁶⁾ Various opioid analgesics are the most frequently prescribed alternative to epidural labor analgesia by most obstetricians. However, in routinely used dosage, parenteral or systemic opioid analgesia is often insufficient for labor pain relief.^(5,7) In addition, some women, especially those who receive intravenous oxytocin for induction or augmentation of labor, experience severe pain during early labor. In the past few years, we have administered epidural analgesia to those women who requested labor pain relief amid effective uterine contractions but who had not necessarily reached 4 cm of cervical dilatation.

The first purpose of our study was to determine the effect of epidural analgesia and the timing of administration on labor course. Furthermore, pregnancy and delivery have long been considered risk factors in the genesis of stress urinary incontinence (SUI). Nevertheless, little has been reported about the effect of epidural analgesia on the postpartum period and the incidence of urinary incontinence. Our second purpose was to determine the effect of epidural analgesia on postpartum SUI.

METHODS

Between May 2004 and February 2005, we recruited all the healthy nulliparous women with singleton pregnancies admitted to our institution for vaginal delivery at ≥ 36 gestational weeks because of obvious true labor. Exclusion criteria were: (1) non-vertex presentation, (2) preeclampsia, (3) insulin-dependent diabetes mellitus, and (4) estimated fetal weight of at least 4,500 g. Active management of labor was used to achieve effective uterine contractions at a frequency of at least 3 in 10 minutes throughout labor. If the rate was less than this, oxytocin infusion was given. Vaginal examinations were performed for obstetric indications and/or at any time when the patient requested analgesia. Cesarean section was performed for those women who had fetuses in acute distress, chorioamnionitis or non-progression of labor. The Ethics Committee of our University Hospital approved this study protocol.

After informed consent was obtained from each patient, epidural analgesia was administered to the women who desired epidural analgesia for labor pain

relief amid effective uterine contractions. Those who had epidural analgesia administered when cervical dilatation was < 3 cm were considered early epidural analgesia users, while those who received epidural analgesia when cervical dilatation was ≥ 3 cm were late users. Every woman received an intravenous (i.v.) preload of 500-1,000 ml of Ringer's lactate solution. The regional block was sited in the left lateral position at the second or third lumbar interspace with an 18-gauge Tuohy needle. A 3-4 ml test dose of 1% lidocaine was given to detect intravenous or subarachnoid injection. If the test dose was negative, 10 ml of 1% lidocaine containing fentanyl 50 μg and epinephrine 50 μg was given as an initial loading dose. After 10-20 minutes of normal recordings (electrocardiography, pulse oxymetry, automated noninvasive blood pressure and fetal heart rate monitoring), a continuous epidural infusion of 0.065% bupivacaine and fentanyl 2 $\mu\text{g}/\text{ml}$ was given at a rate of 8 ml/h. The infusion was increased incrementally up to a maximum of 14 ml/h to achieve adequate labor pain relief.

On the third or fourth postpartum day, a research nurse questioned all women as to whether they had experienced SUI or other lower urinary tract symptoms before or during pregnancy. Their urinary symptoms before delivery were verified and they were also asked specifically about symptoms in the 3 month postpartum period. At 3 months after delivery, the same research nurse, using a telephone questionnaire, interviewed all women as to whether they had experienced the following: (1) urinary incontinence after delivery, (2) incontinence provoked by coughing, laughing, sneezing or physical stress, and (3) the frequency of urinary incontinence.

Postpartum SUI was defined as an involuntary leakage of urine with coughing, laughing, sneezing or any other physical effort after vaginal delivery. At the same time, urinary incontinence had to occur at least twice or more a month, regardless of the quantity of urine lost, as was defined by Thomas et al.⁽⁸⁾

Our computerized obstetric database was analyzed to compare the 2 groups (epidural versus non-epidural, early versus late administration of epidural analgesia) with regard to age, length of the first and second stages of labor, incidence of instrumental vaginal delivery and cesarean section, pregnancy complications, fetal head circumference and birth weight, and incidence of postpartum SUI. Statistical

analyses included Chi-square analysis and Student's *t* test, as indicated. A *p* value < 0.05 was considered statistically significant.

RESULTS

Of the 264 women who requested epidural analgesia for labor pain relief, 203 (76.9%) delivered fetuses vaginally and 61 (23.1%) underwent cesarean sections. Another 319 women, including 277 (86.8%) who had vaginal deliveries and 42 who had cesarean deliveries (13.2%), did not receive epidural analgesia.

The duration of the first and second stages of labor were statistically significantly longer in women who received epidural analgesia compared to those who did not receive epidural analgesia (Table 1). The incidences of instrumental vaginal delivery and cesarean section significantly increased in the epidural analgesia group. Among the 264 women who received epidural labor pain control, 155 women were early users and 109 were late users.

Table 1. Comparison of Epidural versus Non-epidural Analgesia on Obstetric Parameters

	Epidural	Non-epidural	<i>p</i> value
Cesarean delivery	61/264 (23.1%)	42/319 (13.2%)	0.001*
Vaginal delivery	203/264 (76.9%)	277/319 (86.8%)	0.001*
Age (y)	28.9 ± 3.6	28.1 ± 4.1	0.373†
Duration (min)			
First stage	235.5 ± 152.6	157.5 ± 152.9	< 0.001†
Second stage	59.8 ± 40.9	38.9 ± 34.8	< 0.001†
Birth weight (g)	3171.8 ± 380.5	3131.9 ± 345.4	0.156†
HC (cm)	33.2 ± 2.5	33.1 ± 1.3	0.470†
Instrument delivery	36/203 (17.7%)	25/277 (9%)	0.005*
Vaginal laceration	29/203 (14.3%)	41/277 (14.8%)	0.874*

Abbreviations: Duration: duration of labor; HC: head circumference; *: Chi-square test; †: Student's *t* test.

Early administration of epidural analgesia increased the incidence of prolonged first-stage labor but did not increase the incidence of instrumental vaginal delivery or cesarean section (Table 2).

Comparison of epidural with non-epidural analgesia on de novo postpartum SUI is shown in Table 3. The frequencies of postpartum SUI were similar among women who received epidural analgesia and those who did not (Table 3), whether undergoing vaginal delivery or cesarean section. Extending the follow-up to 3 months postpartum, the difference remained not significant for vaginal or cesarean delivery (4.7% versus 6.4%, *p* = 0.599; 4.8% versus 4.9%, *p* = 0.853). Regarding the timing of epidural analgesia given in the labor course, there was no significant difference in postpartum SUI between the immediate postpartum or late postpartum period and for vaginal or cesarean delivery (Table 4). The frequency of SUI at 3 months postpartum was not significantly different among primiparae who underwent vaginal deliveries (5.4%, 26/480) and those who had cesarean sections (4.9%, 5/103) (*p* = 0.717).

Table 2. Comparison of Early versus Late Administration of Epidural Analgesia on Obstetric Parameters

	Early	Late	<i>p</i> value
Cesarean delivery	40/155 (25.8%)	21/109 (19.3%)	0.214*
Vaginal delivery	115/155 (74.2%)	88/109 (80.7%)	0.205*
Age (y)	29.1 ± 3.6	28.5 ± 3.6	0.582†
Duration (min)			
First stage	299.3 ± 158.8	186.7 ± 128.5	< 0.001†
Second stage	58.4 ± 37.2	60.9 ± 43.7	0.667†
Birth weight (g)	3181.7 ± 383.7	3158.9 ± 378.4	0.086†
HC (cm)	33.2 ± 3.1	33.3 ± 1.4	0.577†
Instrument delivery	18/115 (15.7%)	18/88 (20.5%)	0.375*
Vaginal laceration	13/115 (11.3%)	16/88 (18.1%)	0.165*

Abbreviations: Duration: Duration of labor; HC: Head circumference; *: Chi-square test; †: Student's *t* test.

Table 3. Comparison of Epidural versus Non-epidural Analgesia on De Novo Postpartum Urinary Incontinence in Cesarean and Vaginal Delivery Groups

	Vaginal delivery			Cesarean delivery		
	Epidural	Non-epidural	<i>p</i> value	Epidural	Non-epidural	<i>p</i> value
Puerperium	36/203 (17.7%)	51/277 (18.4%)	0.772*	8/61 (13.1%)	6/42 (14.3%)	0.652*
Three months postpartum	13/203 (6.4%)	13/277 (4.7%)	0.443*	3/61 (4.9%)	2/42 (4.8%)	0.920*

*: Chi-square test

Table 4. Comparison of Early versus Late Administered Epidural Analgesia on De Novo Postpartum Urinary Incontinence in Cesarean and Vaginal Delivery Groups

	Vaginal delivery			Cesarean delivery		
	Early	Late	<i>p</i> value	Early	Late	<i>p</i> value
Puerperium	19/115 (16.5%)	17/88 (19.3%)	0.599*	5/40 (12.5%)	3/21 (14.3%)	0.753*
Three months postpartum	9/115 (7.8%)	4/88 (4.5%)	0.346*	2/40 (5.0%)	1/21 (4.8%)	0.883*

*: Chi-square test

DISCUSSION

Until now, whether or not epidural analgesia prolonged labor and increased the risk of cesarean delivery for dystocia has remained controversial. In their prospective study, Thorp et al. reported that epidural analgesia in nulliparous women in labor was associated with significantly longer first and second stages of labor, and significant increases in cesarean sections and dystocia.⁽⁵⁾ They found a significant correlation between cervical dilatation at epidural analgesia commencement and risk of cesarean birth. The risk of cesarean delivery was 50% if the epidural analgesia was commenced when cervical dilatation was 2 cm, 33% if commenced when it was 3 cm and 26% if commenced when it was 4 cm. There were no cesarean deliveries in the group of patients who had epidural analgesia that commenced when cervical dilatation was ≥ 5 cm.⁽⁵⁾ Conversely, Chestnut et al. evaluated randomized early administration (< 5 cm cervical dilatation) of epidural analgesia in nulliparous patients and concluded that it did not prolong labor or increase the incidence of operative deliveries when compared with late administration (≥ 5 cm cervical dilatation) of epidural analgesia.⁽⁹⁾ Luxman et al. chose 4 cm dilatation as a threshold between early and late epidural administration in their randomized study.⁽¹⁰⁾ There were no statistically significant differences between the two groups in rate of cervical dilatation, duration of second-stage labor, number of instrumental deliveries or cesarean sections. Ohel and Harats chose 3 cm dilatation as a threshold between early and late epidural administration and found no difference in the incidence of instrumental deliveries when early epidural analgesia was chosen compared to late administration.⁽¹¹⁾ Read et al. assessed obstetric outcomes in 1,355 consecutive

patients who had vaginal deliveries at their hospital.⁽²⁾ Approximately 405 patients received lumbar epidural analgesia and the remaining patients received either meperidine or no analgesia. They concluded that mean cervical dilation rates in both primigravida and parous women were lower in women given epidural anesthesia in the latent phase of labor compared to those receiving it in the active phase, pethidine or no analgesia. In our series, 59% of women (155/264) received epidural analgesia before reaching 3 cm cervical dilatation (early) and they had a more prolonged first stage of labor than the 41% of women who were given epidural analgesia later in the labor course. Other than that, they were not different in terms of the incidence of instrument-assisted vaginal delivery or cesarean section (Table 2).

The relationship between operative delivery and epidural analgesia remains an area of debate. In a retrospective study of painless labor and instrumentation in Taiwan, Chung et al. found that epidural analgesia decreased the rate of cesarean section but increased the frequency of instrumental delivery.⁽¹²⁾ Two meta-analyses systematically and independently reviewed the previous literature, drawing similar conclusions that epidural analgesia did not increase rates of instrumental vaginal delivery or cesarean section for dystocia.^(13,14) In our study, instrumental vaginal delivery and cesarean section were used more frequently, and the length of the first and second stages of labor were significantly longer, in the group of women who received epidural anesthesia compared to the non-epidural group. Alexander et al. found that the rate of cervical dilatation was significantly slower in women who received epidural analgesia, resulting in a longer active phase of labor compared with Friedman's original data.⁽¹⁵⁾ One hypothesis is that epidural analgesia results in sup-

pression of prostaglandin $F_{2\alpha}$ release, leading to diminished uterine contractility and prolongation of the active phase of labor.⁽¹⁶⁾ Additional evidence showed that women given epidural analgesia during the active phase of labor required a greater dose of oxytocin to effect cervical dilation compared with women given meperidine.⁽¹⁷⁾ In our study, the majority of women were given epidural analgesia early in the labor course rather than late (59% vs. 41%), which might further hamper the progress of labor, leading to cesarean section due to arrest problems. With regard to shortening of the second stage of labor, instrumental assistance to achieve vaginal delivery was often applied since perineal analgesia frequently affected the patient's urge to bear down.

Both instrumental vaginal delivery and prolonged labor course tend to increase the strain on the pelvic floor muscles and the possibility of traction trauma on the pudendal nerves, which may subsequently lead to SUI. However, we found the frequency of SUI 3 months postpartum was similar among women who received epidural analgesia and those who did not. Up to now, very few studies have examined the association between delivery of epidural analgesia and postpartum SUI, and they have produced conflicting results. There may have been differences in patient populations, definition of SUI and the questioning techniques. Schuessler et al. studied primigravidas 6 months after delivery, including patients who developed SUI during pregnancy.⁽¹⁸⁾ They presented a hypothesis that epidural anesthesia during vaginal delivery may prevent the development of SUI. On the contrary, Viktrup and Lose studied primiparae 3 and 12 months postpartum, and assessed only those patients who developed de novo SUI after delivery. They reported that SUI actually appeared to be more frequent in women who had received epidural anesthesia.⁽¹⁹⁾ In another prospective study, Viktrup and Lose monitored a group of primiparous women 5 years after the first delivery and reported women with SUI 3 months after the first delivery had a 92% risk of having SUI 5 years later.⁽²⁰⁾ We studied primiparae 3 months postpartum in the current study and assessed only those patients who developed de novo SUI after delivery. There were no statistically significant differences in SUI 3 months postpartum between the epidural and non-epidural groups for vaginal or cesarean delivery. SUI in young women was usually the result of pelvic

floor injury during vaginal delivery. Whether cesarean section may prevent such injury and consequent development of SUI is controversial.

Results from our study suggest that the incidence of postpartum SUI is not significantly different between vaginal and cesarean deliveries. It is quite possible that in cases of obstructed labor, pelvic injury is already too extensive to be prevented by surgical intervention. However, postpartum SUI may be prevented by elective cesarean section with no trial labor. Unlike most prior studies, non-elective cesarean sections were analyzed as one group with no further differentiation between cesarean sections for obstructed labor and other obstetric conditions (i.e. fetal distress, maternal indications, etc.). Groutz et al. compared cesarean sections performed for obstructed labor versus elective cesarean sections with no trial labor.⁽²¹⁾ Results from their study showed similar prevalence of SUI 1 year postpartum among primiparae who underwent spontaneous vaginal delivery and those who had cesarean section for obstructed labor. Conversely, elective cesarean section with no trial labor was associated with a significantly lower prevalence of postpartum SUI.

In conclusion, our findings show that epidural analgesia is associated with an increased risk of prolonged labor, and instrumental and cesarean delivery but it is not related to increased postpartum SUI. Except for prolonged first stage of labor, there was no significant obstetric impact between early and late administration of epidural analgesia. We advocate that obstetricians should delay the administration of epidural anesthesia in nulliparous women until the cervical dilatation reaches the active phase.

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產中的硬膜外麻醉對初產婦生產過程與產後尿失禁有何影響？

梁景忠 黃樹欽¹ 詹耀龍 蔡培癸² 張舜智 羅良明

背景：硬膜外麻醉對初產婦產程的影響仍有爭議，加上懷孕與生產一直被認為是造成應力性尿失禁的危險因素。本研究的目的在探討：硬膜外麻醉被使用在待產中不同時機，對初產婦生產與產後應力性尿失禁有何影響。

方法：比較 583 名大於等於 36 週，有或沒有接受硬膜外麻醉的初產婦的各項產科因子，以及產後初期與產後 3 個月，發生應力性尿失禁的情形。同時分析子宮頸口小於 3 公分，以及大於等於 3 公分時施行硬膜外麻醉，兩組在各項產科因子與產後出現應力性尿失禁的比較。

結果：接受硬膜外麻醉的初產婦有較長的第一與第二產程；有較高使用產械和剖腹生產的比率；然而，對產道裂傷與產後發生應力性尿失禁的情形與沒有接受硬膜外麻醉的初產婦之間，沒有統計學上的差異。除了第一產程外，無論子宮頸口大於或小於 3 公分時施行硬膜外麻醉，對其他產科因子以及產後發生應力性尿失禁並沒有影響。

結論：初產婦接受硬膜外麻醉會延長產程，以及增加使用產械和剖腹生產的機會；然而，並不會增加產後應力性尿失禁的發生率。子宮頸口仍然小於 3 公分時就施行硬膜外麻醉，則會延長第一產程。

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關鍵詞：硬膜外麻醉，產程，尿失禁，產後

長庚紀念醫院 台北院區 婦產部，¹麻醉部；長庚大學 醫學院；²長庚大學 公衛科

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通訊作者：羅良明醫師，長庚紀念醫院 婦產部。桃園縣333龜山鄉復興街5號。Tel.: (03)3281200轉8258; Fax: (03)3288252; E-mail: ccjoliang@cgmh.org.tw