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Epidural analgesia in labor

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OBJECTIVE(S) : To evaluate the effects of intrapartum epidural analgesia on labor characteristics, and the side effects of the procedure on the mother and the neonate.

METHOD(S) : Eleven hundred sixty seven women received epidural analgesia for relief of labor pain and 900 women served as controls. The labor pattern as regards operative delivery rate, duration of labor, and oxytocin use were compared between the two groups. The side effects of the procedure and women's satisfaction were noted.

RESULTS : The operative delivery (cesarean sections and instrumental deliveries) rates were not significantly different in the two groups. The duration of the first and second stages of labor and the need for oxytocin were comparable in the two groups. The side effects observed were easily treatable. 90.75% women found the analgesia to be adequate, 90.40% said that they would want the procedure for next delivery, and 89.11% said that they would recommend it to other women.

CONCLUSION(S) : Epidural analgesia is a safe and effective method for labor pain relief. With active management of labor, it does not significantly alter the labor characteristics.

Key words : epidural analgesia, operative deliveries, labor duration, side effects, patient satisfaction

Introduction

Epidural analgesia has been accepted as the safest and most effective method of pain relief in labor. However, the potential effects of epidural analgesia on the progress and outcome of labor have been a subject of lasting controversy. Retrospective studies indicate that epidurals are associated with longer labors and/or increased incidences of operative deliveries. Similar results were obtained in nonrandomized prospective studies. But none of them could establish a causal relationship. Besides this, there has been no consensus regarding other undesired effects on the mother and the fetus. Critics of epidural analgesia state that epidural drugs can cross the placenta and affect the baby. Hence, adverse effects on the neonate are also a matter of concern. In the present study, we have tried to assess the effects of epidural analgesia on the course of labor and to evaluate the incidence of adverse effects on the mother and the fetus based on our experience of 1167 cases.

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Methods

This study was carried out between 1st July, 2000 and 1st January, 2005. A total of 2918 women delivered in our unit during the study period. Of these 300 were taken up for elective cesarean section for indications such as previous two cesarean sections, contracted pelvis, placenta previa, and fetal malpresentation. These women were excluded from the study. Five hundred and fifty one women came to the hospital with advanced labor i.e. with more than 6 cm cervical dilatation. They were also excluded from the study. Epidural analgesia was contraindicated in 28 women (22 had hemorrhage, four had coagulopathy, and two had local skin infection at the site of needle puncture) and they too were excluded from the study. The remaining 2039 women were offered epidural analgesia once they were in the active phase of labor. Of these 2039, 1167 women agreed for epidural analgesia while 872 women refused epidural mainly due to apprehension of the procedure. Active phase of labor was diagnosed by the presence of regular uterine contractions

and a cervical dilatation of more than 3 cm. Those women who refused epidural analgesia and those in whom epidural was contraindiated were taken as controls and were given injection tramadol 50 mg intramuscularly for pain relief. An informed written consent was taken for epidural analgesia. Prior to giving epidural analgesia, the subjects were preloaded with 500 mL of Ringer lactate given by intravenous drip. Epidural catheter was inserted and the drug was injected after giving a test dose of 2mL of 2% xylocaine to ensure proper placement of the catheter as indicated by nondevelopment of tingling and numbness. The drug injection to analgesia interval and the level of sensory loss as well as motor loss, if any, were noted. Pain relief was measured subjectively. Other complications related to the procedure were recorded.

Analgesia was maintained by the intermittent bolus technic, the drug being repeated as and when necessary. The recipients of epidural analgesia included spontaneously laboring women as well as women in whom labor was induced. Labor was managed according to the principles of active management of labor. Oxytocin infusion was added if the uterine contractions were found to be inadequate i.e. less than three contractions in 10 minutes. Cesarean section and instrumental vaginal deliveries were performed for obstetric indications. They were performed under epidural except in three women who had severe fetal bradycardia and were given general anesthesia. In women undergoing cesarean section under epidural the catheter was removed 8 hours after surgery. The demographics of women who accepted epidural analgesia and of women in the control group were comparable. Based on an intention-to-treat analysis of the data, the outcomes measured were operative delivery rate, duration of labor, the need for oxytocin, maternal and neonatal adverse effects, and woman's satisfaction.

Results

Table 1 shows the background data of women in the two groups. There was no significant difference in the two groups as regards age, height, weight, gestational period, and gravidity.

Table 2 shows the incidence of high risk pregnancies in the two groups. The incidences of both medical and obstetric factors complicating pregnancy were comparable in the two groups. The most common high risk condition was pregnancy induced hypertension in both the groups.

Table 3 shows the modes of delivery in the two groups. The cesarean section rate was 9.43% in the epidural group as compared to 10% in the control group. The incidence of instrumental vaginal deliveries was also comparable in the two groups; 25.45% in the epidural group and 23.34% in the control group. The overall incidence of operative deliveries was 34.88% in the epidural group and 33.34% in the control group. When statistically analyzed, there was no difference in the operative delivery rate between the study and the control group. Epidural analgesia did not increase the cesarean section rate.

Table 1. Demographic data.

	Epidural group (n=1167)	Control group (n=900)
Age (years)	24.97 ± 3.90	25.18 ± 4.08
Height (cm)	158 ± 4	159 ± 3
Weight (kg)	54.40 ± 2.5	53.50 ± 1.5
Gestational age		
<37 weeks	136 (11.65)	124 (13.77)
37-40 weeks	900 (77.12)	666 (74.00)
>40 weeks	131 (11.23)	110 (12.23)
Gravidity		
Primigravidas	504 (43.19)	376 (41.72)
Multigravidas	663 (56.81)	524 (58.22)

Figures in brackets represent percentages.

Table 2. Incidence of high risk pregnancy.

Risk factor	Epidural group	Control group	P value
Mild pregnancy induced hypertention	76 (6.51)	78 (8.66)	0.07
Severe pregnancy induced hypertension	24 (2.06)	34 (3.77)	0.02
Cardiac disease	05 (0.43)	04 (0.44)	0.77
Tuberculosis	02 (0.17)	01 (0.11)	0.82
Bronchial asthma	04 (0.34)	03 (0.33)	0.72
Sickle cell trait	05 (0.43)	03 (0.33)	0.99
Thalassemia trait	05 (0.43)	04 (0.44)	0.77
Previous lower segment cesarean section	53 (4.54)	62 (6.88)	0.02
Severe oligohydramnios	02 (0.17)	05 (0.55)	0.26
Polyhydramnios	04 (0.34)	02 (0.22)	0.92
Breech presentation	08 (0.69)	05 (0.55)	0.92
Twin pregnancy	28 (2.40)	12 (1.33)	0.11

Figures in brackets represent percentages.

Table 3. Comparisson of obstetric outcome.

	Epidural group (n=1167)	Control group (n=900)	P value
Mode of delivery			
Normal vaginal	760 (65.12)	600 (66.66)	0.49
Instrumental vaginal	297 (25.45)	210 (23.34)	0.29
Cesaran section	110 (9.43)	90 (10.00)	0.71
Oxytocin requirement	842 (72.15)	625 (69.44)	0.19
Prolonged 2nd stage	75 (6.43)	47 (5.22)	0.29
Neonate's 5 minute apgar <6	08 (0.69)	07 (0.77)	0.98
Birth weight			
<2.5 kg	427 (36.59)	392 (43.55)	0.001
2.5-3.0 kg	599 (51.33)	417 (46.33)	0.02
>3.0 kg	141 (12.08)	91 (10.12)	0.18

Figures in brackets represent percentage.

The oxytocin requirement was not found to be significantly different in the two groups.The second stage of labor was considered prolonged if its duration was more than 1 hour in multiparas and more than 2 hours in primiparas, following which intervention in the form of an instrumental vaginal delivery was carried out. The incidence of prolonged second stage was 6.43% in epidural group as compared to 5.22% in the control group. The difference was not statistically significant (P=0.29).

On analyzing the neonatal outcome, it was seen that there was no statistically significant difference in the 5 minute apgar score in the two groups. On comparing the birth weights of the neonates, the control group had a highly significant greater number of neonates with weight less than 2.5 kg (P=0.001); however, epidural analgesia had no bearing on birth weight (Table 3).

Table 4 shows the comparison of the duration of the first stage of labor in the two groups. This was calculated as the time interval between her entering the active phase of labor or her presenting to the labor room and full dilatation of cervix. Since this was an on-demand service, it included women up to 6 cm dilatation of cervix at the time of insertion of epidural catheter. This may not have given the exact duration of first stage in this group of women. This limitation was also present in the control group. However, the data reveal comparable values of labor duration in both the groups.

Table 5 reveals that the incidences of fetal distress, non-progressive 2nd stage of labor, and cephalopelvic disphoportion were not statistically different in the two groups. 1.62% women in the epidural group had cesarean section for nonprogressive 1st stage as against 1.66% in the control group; the difference was insignificant.

Table 4. Duration of 1st stage of labor.

Duration (hours)	Epidural group (n=1167)	Control group (n=900)	P value
< 5	54 (4.63)	46 (5.12)	0.16
5-8	589 (50.47)	463 (51.44)	0.69
>8	524 (44.90)	391 (43.44)	0.53

Figures in brackets represent percentages.

Table 5. Indications for operative delivery.

Indication	Epidural group (n=1167)	Control group (n=900)	P value
Instrumental delivery			
Fetal distress	120 (0.28)	91 (10.11)	0.95
Prophylaxis	89 (7.62)	60 (6.66)	0.45
Nonprogressive 2nd stage	88 (7.54)	59 (6.55)	0.43
Cesarean section			
Fetal distress	59 (5.05)	50 (5.55)	0.68
Cephalopelvic disproportion	32 (2.74)	25 (2.77)	0.93
Nonprogressive 1st stage of labor	19 (1.62)	15 (1.66)	0.91

Figures in brackets represent percentages.

Table 6 shows the incidence of unintended effects of epidmal analgesia on the mother and the neonate observed in the study.

Table 6. Unintended effects of epidural analgesia.

Unintened effect	Number	Percentage
Maternal		
Tachycardia	41	3.51
Hypotension	20	1.71
Motor loss	61	5.23
Vomiting	20	1.71
Rigors	18	1.54
Dural puncture	02	0.17
High spinal	08	0.69
Pruritus	05	0.42
Urinary retention	02	0.17
Fever	02	0.17
Backache	09	0.77
Headache	02	0.17
Neonatal		
Apgar < 6	08	0.69
Jaundice	03	0.25

There was no fetal hypoglycermia and no problems in breast feeding.

On evaluation of the epidural group after delivery, 93.32% women opined that the procedure was acceptable, 90.75% felt that the pain relief was adequate, 90.40% said that they would opt for the procedure in their next delivery, and 89.11% said that they would recommend epidural analgesia to other women.

Discussion

The last decade has seen a remarkable advance in our understanding of the effects of regional analgesia on the progress and outcome of labor. Earlier studies suggested that epidural analgesia increased the cesarean section rate [1,2]. Prospective randomized trials disproved this [3]. Several authors [4-8] have reported stable or declining cesarean section rates despite sharply rising epidural analgesia services in various institutions. These studies have suggested that the pregnant population and obstetric practice styles are likely to change little, or atleast change slowly when compared to sudden availability of epidural analgesia. Metaanalysis of nine such studies of over 37,000 women found no increase in cesarean section rate with increased availability of epidural analgesia [9]. The present study also failed to show an increase in the cesarean section rate in the women opting for epidural analgesia.

Another important matter of concern has been the rate of instrumental deliveries with epidural analgesia. The following have been considered to be causing a rise in instrumental deliveries –

- Inhibition of urge to push.
- Inhibition of ability to push – This is unlikely, since maternal expulsive efforts are Valsalva maneuvres and are not impaired until high level blocks are achieved.
- Ferguson reflex–Distending the lower vagina causes oxytocin release in animals. Epidurals could theoretically block the afferent limb of this relex. But oxytocin levels vary dramatically in laboring women, and the relationship between oxytocin levels and spontaneous delivery is weak. However, routine oxytocin infusion in the second stage does shorten it and reduce the need for forceps delivery.
- Relaxation of the pelvic musculature – It is unclear how important this is when modern dilute local anesthetic solutions are employed. However, evidence is clear that the pattern of fetal descent is altered in patients with epidural analgesia, and delaying maternal expulsive efforts for some time after full dilatation does reduce the incidence of instrumental delivery.

Metaanalysis has suggested that instrumenrtal delivery may be increased up to twofold [10]. But there is tremendous variability between institutions and among obstetricians in these rates (from 0-80% in various studies), implying obstetric practice style is probably the dominant factor. An apparent small overall increase in the risk of forceps delivery in our study was in fact due to an increase in forceps performed for resident training and teaching; the difference vanished when forceps deliveries performed for obstetrical indications only were considered. Besides, low outlet forceps and ventouse deliveries as performed in modern obstetrics are reasonably safe and have little risk of hazardous complications associated with midcavity and high forceps deliveries done previously. The use of low concentration solutions of local anesthetic agents and the combination of local anesthetic solution with opioid can significantly reduce the prolongation of second stage and the incidence of instrumental deliveries.

It is unclear whether the epidural block prolongs the first stage of labor. The mechanism suggested was that fluid loading prior to the block could cause reflex decrease in autidiuretic hormone, which in turn would decrease oxytocin release. Metaanalysis of 10 randomized trials [10] found 42 minutes prolongation (about 8% of total first stage labor time) in women receiving epidural when compared with those receiving opioid. The mean duration of second stage of labor was only 14 minutes longer in women receiving epidural

analgesia in the metaanalysis [10]. There are studies which suggest that epidural does not have an effect on the length of labor [11,12]. In our study, there was no significant prolongation of labor.

Metaanalysis of studies revealed that oxytocin was required after analgesia nearly twice as frequently in the epidural group [10]. Our study could not establish such a relationship. Zang et al [13] have also reported similar results.

When managed properly, epidural analgesia has proved to be remarkably safe. It is true that there are some side effects and complications but these are rarely serious and are largely preventable. The study also included women with high risk factors like cardiac disease, pregnancy induced hypertension, previous cesarean delivery, twin pregnancy etc (Table 1). There were no adverse effects of epidural analgesia even on these women.

In our study, hypotension developed in 1.71% (Table 6). A fall in blood pressure invariably occurs after receiving an epidural. There are two main reasons for this. First, the blood pressure is almost always raised before the epidural is inserted – for the simple reason that the woman is usually in pain. Once the pain is relieved, the blood pressure starts to fall to normal again. The second reason is epidural induced peripheral vasodilatation. This usually responds to intravenous fluids and ephedrine. In this study, around 1.5% cases required ephedrine, which is similar to the incidence mentioned in literature. Also, the fall in blood pressure was never severe enough to cause adverse fetal effects. Tachycardia was present in 3.5% of the cases.

Local anesthetics have the potential to cause numbness and weakness in the legs. The block of motor nerves results in reduced mobility. Except in the case of ambulatory epidural, this will confine the woman to bed and may result in difficulties with pushing in the second stage of labor. Some women feel that the loss of mobility and sensation with an epidural is unacceptable. In our study, the motor loss developed in 5.23% cases (Tabel 6). The use of low concentration of local anesthetic solution would reduce the incidence of motor blocks.

Vomiting occurred in 1.71% (Table 6). It cannot be solely attributed to epidural as use of oxytocies can also induce vomiting in some women.

Shivering occurs commonly following an epidural. The cause for such shivering is obscure. Our incidence of rigors was 1.54% (Table 6). Shivering may be reduced by lower doses, by warming of the anesthetic before administration, and by adding narcotics to the anesthetic.

Dural puncture occurs during the insertion of the epidural catheter in approximately 1% of women, of whom about 80% will develop a headache. This can vary from a mild headache to a very severe one; but it is usually easily treatable. Most will resolve within 10 days. In our study, only two (0.17%) women had this complication (Table 6). A high spinal level developed in 8 (0.69%) women but none of them had any complications due to this. Serious neurological damage associated with epidural block is extremely rare. Large series of cases [14,15] have demonstrated a low incidence of weakness and sensory loss (4 to 18 per 10,000 women); in most symptoms resolve spontaneously within 3 months. There are likely to be as many cases related to pregnancy and labor itself as those directly caused by the epidural [16]. Death associated with epidural analgesia is extremely rare.

Previous research has suggested an association between epidural analgesia during labor and low back pain. There is no evidence to demonstrate a convincing causal association [16].

Loss of bladder sensation may lead to the need for catheterization. The problem is reduced by the use of dilute solutions of the anesthetic which preserve bladder sensation. In our study two women experienced this side-effect (Table 6).

Epidural can cause a rise in the maternal temperature [2,10,17]. The clinical significance of this rise is not well understood, but in some cases it appears to lead to fetal tachycardia. Fever was present in only two cases in the study (Table 6). When opiates are used women may experience varying degrees of itching of the skin.

We did not observe any undesired effect on the fetus in the form of abnormal heart rate pattern or neonatal fever as has been described by Palmer et al [18].

A low 5 minute apgar score was not found to be significantly increased in the study. Hill et al [19] have proved that epidural analgesia may actually be beneficial to the fetus as it reduces stress related effects in the mother. Other neonatal side effects like jaundice, hypoglycemia, and lactation problems were not increased.

Over 90%, of women find epidural to be of great benefit in terms of pain relief [20,21]. A smaller proportion (under 10%) find epidural to be of little or no use. Women's satisfaction with epidural is correspondingly high in various studies including ours. 90.4% of our women would request an epidural in a subsequent pregnancy.

Apart from labor there is no other circumstance where it is considered acceptable for a person to experience untreated severe pain amenable to safe intervention. The obstetrician must offer pain relief to a woman in labor and epidural analgesia is a desirable option.

Conclusion

Epidural analgesia during labor is highly effective and safe for both the mother and the fetus. Most of the women receiving it are highly satisfied, would want it in their next labor and would recommend it to other women.

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