

## Epidural Analgesia in Labour

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### Abstract

**Introduction:** Epidural analgesia has emerged as a special entity for alleviation of labour pains in modern obstetrics.

**Objectives:** To study the effect of epidural analgesia on mother and fetus and on progress and outcome of labour.

**Study Design:** Prospective interventional study.

**Setting:** Study was carried out in the labour ward of Jinnah Hospital, Lahore.

**Duration of Study:** The study was completed in six months from 1-07-2008 to 31-12-2008.

**Subjects and Methods:** Labouring women were divided into two groups. Group – I comprised of 35 parturients who were provided with epidural analgesia. Group – II consisted of another 35 women who had labours without the block. On reporting to labour room in active labour, whether spontaneous or induced the female was provided with the epidural analgesia by the anaesthetist. Top ups were given by the obstetrician.

Consultant Paediatric Gynaecologist, Incharge, Department of Maternal and Child Health (MCH), Children Hospital and Institute of Child Health, Lahore (CH & ICH), Pakistan Fetal and maternal monitoring was ensured.

**Results:** Maternal and fetal outcome was good in the two groups. Epidural analgesia did not significantly prolong the duration first stage of labour and increased rate of instrumental deliveries in the study group. Fetal outcome almost same in terms of apgar score. There were few minor anaesthetic complications which were managed easily.

**Conclusions:** Epidural analgesia is a safe, effective although costly and invasive method of pain relief during labour and delivery. It did not adversely effect the progress and outcome of labour. It prolonged the second stage of labour significantly and increased the oxytocin requirement and rate of instrumental deliveries. Neonates were born in a satisfactory condition. Postpartum period was uneventful for majority of women.

**Keywords:** Epidural analgesia, epidural space, labour induction.

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### Introduction

For most women labour is associated with very severe pain often exceeding all expectations. As the term approaches she is feared by the painful labour. As the labour pains serve no useful purpose, so it is unethical not to relieve the sufferings of the woman. The knowledge that it is possible to alleviate the labour pains dates far back in the history. Early Chinese writings describe the use of opiates and sporofics dur-

ing childbirth. Similarly alcohol and other materials have been used with limited success. An ideal analgesic for labour should preferably be noninvasive, easy to administer and monitor, without complications and safe for the mother and fetus.

In modern obstetrics alleviation of labour pains has emerged as a special entity. It ranges from the injectable opioids, self administration of nitrous oxide, acupuncture, hypnosis, psychoprophylaxis to the development of highly effective epidural analgesia.

Lumbar epidural analgesia has become the preferred method of pain relief for labour and delivery. Proper administration of epidural analgesia offers many advantages for both mother and fetus. With the availability of various local anesthetics, opioids and infusion techniques, the analgesia can be tailored to the specific needs of the mother, fetus and labour.<sup>1</sup> Epidural route is probably the most effective and most commonly used invasive route for achieving labour analgesia. Local anesthetics of varying concentrations are administered as intermittent boluses or as continuous infusion. Adjuvant drugs are able to enhance the quality and duration of analgesia.<sup>2</sup>

The epidural space is approached through lumbar or sacral route. The anesthetic agent injected blocks the posterior nerve roots blocking the sensory input and perception of pain but spares the anterior root fibers preserving the motor function.

All pregnant women should be given detailed information about both the benefits and possible side effects of epidural analgesia in good time before they go into labour: Optimal use of epidural analgesia depends not only on the availability of a 24 hours anaesthesia service but also on adequate knowledge, cooperation and enthusiasm of all those involved namely midwives, obstetricians and anaesthesiologist.<sup>3</sup>

Labour is a painful experience, only a mother can realize. The woman is scared of it as the term approaches. It is also governed by social, cultural and emotional background of an individual. The variety of techniques available for relieving labour pain should mean that every mother can find a method that will suit her. Among the different modalities available, epidural analgesia has probably emerged as the most effective and commonly used, although invasive route for achieving labour analgesia. Along with providing effective analgesia, the metabolic stress response to pain of labour is attenuated by epidural analgesia.<sup>4</sup> There are few complications of the procedure like hypotension, inadvertent dural puncture and headache which

are easily treated and self limiting. Permanent morbidity and mortality are rare.<sup>5</sup>

Most of the patients to receive epidural analgesia in different study groups are nulliparous who are more likely to have prolonged labour due to inefficient uterine action, cephalopelvic disproportion and instrumental delivery. Many of the women have indications for induction, augmentation or prolonged labour even before the initiation of block. These confounding variables should be taken into account when evaluating the results of epidural analgesia.

Local anesthetics of varying concentration are administered as intermittent boluses or as continuous infusion. Adjuvant drugs are able to enhance the quality and duration of analgesia and decrease motor blockade. The current trend is in favour of an opioid which offers distinctive advantages. Fentanyl and sufentanil are mostly recommended and have no adverse effect on neonates attributed to their use.<sup>6</sup>

## Patient's and Methods

Objectives of the study were:

1. To evaluate the effect of epidural block on the progress of labour.
2. To assess the incidence of instrumental delivery and compare it with deliveries conducted without epidural block.
3. To determine fetal and maternal complications associated with the block.

The study was conducted in the department of Gynae and Obstetrics Jinnah Hospital, Lahore in collaboration with the anaesthesia department during 6 months period from 1<sup>st</sup> July 2008 to 31<sup>st</sup> December 2008.

Seventy cases were selected out of which 35 women were provided with epidural block and 35 were those without the block and the outcome of two groups was compared. The patients were counselled in the antenatal period. They were provided detailed information regarding availability, cost, effectiveness and possible complications. An informed consent was taken from the woman. The women were selected in the antenatal clinic of outpatient department. Patients of any gravidity at term gestation i.e. 37 – 42 weeks were selected. The gestational age was confirmed by history, clinical examination and ultrasonography. The patients having contraindications to the block as discussed in introduction were excluded from the study. The parturients with previous caesarean section, cases of intrauterine growth retardation and those with mac-

rosomic babies were also excluded. The women with estimated fetal weight of 2.5 – 4 Kg with reactive cardiotocography were included in the study.

On reporting to labour room in labour whether

spontaneous or induced, the women with adequate pelvic dimensions were provided with the service. The epidural analgesia was provided when she was in active phase of labour i.e. at 3 – 4 cm cervical dilatation. The protocol of the procedure was that mother was given a pre load of one litre of Hartman's solution intravenously in about half an hour to avoid postural hypotension. She was nursed in left lateral position to avoid aortocaval compression. Her blood pressure and pulse were taken before the start of procedure. Emergency tray containing airway, laryngoscope, endotracheal tube, thiopentone sodium, diazepam and ephedrine was kept ready. The anesthetist was called in with his trolley with necessary equipment.

Technique of midline epidural block: 3cc of 0.125% bupivacaine was injected in epidural space as test dose to confirm that duramater has not been punctured. Blood pressure of the woman was taken after 5 minutes. In the absence of any undesirable sensory or motor effect, 8 ml of 0.125% bupivacaine was given as bolus dose. Anesthesia was maintained by giving top ups of 8 – 10 ml of bupivacaine on demand of the patient.

Continuous maternal and fetal monitoring was ensured during labour and utmost measures were taken to avoid complications. The woman was nursed in left lateral position to avoid postural hypotension, blood pressure and pulse were recorded initially at 5 minutes interval for 30 minutes and then 15 minutes after each bolus dose of local anesthetic and then half hourly.

The motor block was assessed by the degree of weakness in the legs using modified Bromag's scale i.e. 0 – complete motor block, 1 – ankle movement only, 2 – able to slide legs up the bed, 3 – pull knees to 45°, 4 – no weakness. Maternal satisfaction was assessed by the absence of pain and categorized as excellent, good, fair and poor. The analgesia was maintained with conventional top-up regimen. Top-up was given on demand of mother i.e. on return of pain which was usually at interval of 1 – 2 hours. Continuous fetal monitoring was ensured. Cardiotocography was done before applying the block and the fetal heart sounds were recorded with electronic sonicaid at the interval of 15 minutes. In case of abnormal fetal heart patterns cardiotocography was repeated. The progress of labour was plotted on a partogram. The intensity, duration and interval of labour pains were monitored by palpatory method and 3 hourly vaginal examination was performed to assess the progress of labour. In case of ineffective uterine contractions or delay in progress of labour, active management was done and labour

was augmented with syntocinon as required.

The second stage of labour was allowed for 2 hours in primigravida and one hour in multigravida in case of satisfactory fetal and maternal condition. In case of delay, active intervention was done in the form of assisted delivery as forceps application, vacuum extraction or by caesarean section according to fetal condition, station and rotation of presenting part. In my unit facilities for fetal scalp pH sampling are not available, so we rely on the presence of meconium in the liquor and abnormal fetal heart patterns for diagnosis of fetal distress. When any of these abnormal findings were present active intervention was done to expedite the delivery. Caesarean sections were done either under general anesthesia or epidural block depending upon maternal and fetal condition. When delivery was anticipated in 10 – 15 minutes 6 – 8 ml of bupivacaine was given in sitting position for perineal analgesia. Neonatologist was called in at the time of delivery and neonatal condition was assessed in terms of Apgar score. The mother was monitored continuously to pick up the complications which were hypotension, unilateral block unblocked segments, post partum headache and urinary retention. Anesthetic intervention was required sometimes like resetting of catheter or change of position while giving top up or supplementary doses of analgesic. The mother was kept under observation for 48 hours and along with routine postpartum monitoring, she was observed in terms of blood pressure, headache, urinary retention, return of motor function and recovery from complications if any. The patients were called after 6 weeks for follow up and were enquired about any residual complication and their experience with the epidural block.

## Results

The study was conducted on 70 parturients. They were divided into two groups. Group – I consisted of 35 patients who received epidural analgesia while the control group – II consisted of another 35 mothers who

had labours without epidural analgesia. The results were analyzed statistically and student's "t" test was applied. P value was calculated to find out the significance, level of significance was taken as  $P > 0.05$ . The results were compared with international and local literature. 22 parturients (62.6%) in study group and 21 (60%) in control group were between 21 – 25 years. While there were 2 mothers (5.5%) in the study group and 3 (8.4%) in the control group who were below 20 years of age. Those above 31 years were 2.6% in study group. There was no significant age difference between the two groups. So  $P < 0.05$ . Distribution of patients by gravidity were observed. 28 patients (80%) in group 1 and 26 patients (74.2%) in group 2 were primigravidas. 6 patients (17.1%) in group 1 and 7 patients (20%) in group 2 were in their second or third pregnancy. 1 patient (2.6%) in group 1 and 2 patients (5.5%) in group 2 were having their fourth pregnancy.

Mothers at term gestation were included in the two groups. 83% of parturients in the study group and same number of percentage in the control groups were delivered before the completion of 40 weeks while there were 17% mothers in the study group and same number in the control group who delivered after 40 weeks of gestation. There was non-significant difference between the gestational age at the time of delivery between the two groups.

Most of the parturients were admitted with spontaneous onset of labour, in latent or active phase. But as already stated epidural analgesia was only applied when the women progressed into active phase of labour i.e. at or  $> 3$ cm dilatation with fully effaced cervix. 4 women (12%) in the study group and 7 (20%) in the control group had induced labour due to obstetric reasons.

Labour was induced because of obstetric reasons in 4 parturients in the study group and 7 in the control group. 1 parturients in the study group and 3 in the control group were induced for post – dated pregnancy according to unit protocol. Premature rupture of membranes was the indication of induction of labour in 2

**Table 1:** Duration of first stage of labour.

Duration (Hours)	Group – I		Group – II		P value
	No.	%	No	%	
< 12 without oxytocin	9	25.7	14	40	< 0.05

< 12 with oxytocin	22	63	18	51.4	< 0.05
> 12 with oxytocin	2	5.7	1	2.8	< 0.05
Secondary arrest inspite of oxytocin augmentation	2	5.7	2	5.7	< 0.05

**Table 2:** Duration of second stage of labour.

Duration (Hours)	Group – I		Group – II		P value
	No.	%	No	%	
< 1 hour	6	17.1	30	86	> 0.05
1 – 2 hours	26	74.2	5	14	> 0.05
> 2 hours	3	8.5	0	0	> 0.05

**Table 3:** Mode of delivery

Mode	Group – I		Group – II		P value
	No.	%	No	%	
Spontaneous vaginal delivery	28	80	32	91.4	< 0.05
Instrumental delivery	2	5.7	0	0	< 0.05
1. Forceps	1				
2. Ventouse extraction	1				
Lower segment caesarean section	5	14.2	3	8.5	< 0.05

patients in group 1 and 2 patients in group 2. While 1 patient in study group and 2 in control group were induced due to mild PIH i.e diastolic blood pressure between 90 – 100 mmHg, but no proteinuria and no haemodynamic derangements.

Most of the women delivered within 12 hours either with or without oxytocin augmentation. Most of the patients who delivered without oxytocin augmentation were multigravidae while the requirement of oxytocin was more in the primigravidae. 2 patients in each group had arrest inspite of oxytocin augmentation and they were delivered by caesarean section. There was no significant difference in the duration of the first stage of labour in the two groups. So the P value is <0.05 (Table 1).

Most of the patients delivered in less than one hour in the control group while in the study group second stage of labour was prolonged and 75% of patients delivered within 1 – 2 hours. Majority of them were primigravidae. In 3 patients in study group, second stage was prolonged beyond 2 hours. The duration of second stage of labour was significantly prolonged in the epidural group (Table 2).

The rate of spontaneous vaginal delivery was low in the study group as compared to control group i.e. 80% as compared to 91.4%. There was increase in the number of instrumental deliveries in the study group while there was non-significant increase in the caesarean section rate (Table 3).

5 patients in the study group and 3 in the control group had caesarean sections due to obstetric reasons. 3 in study group had fetal distress in first stage and one had arrest of progress due to in coordinate uterine contractions inspite of oxytocin augmentation and 1 had failure of head to descend after full cervical dilatation. One patient in the control group had failure of head to descend, 1 had primary dysfunctional labour and 1 had fetal distress so caesarean section was done.

Most of the neonates in the two groups had good Apgar scores. Only one of the neonates in each group had Apgar score less than 4 at 1 minutes and remained in neonatal unit for few days. One of the neonates had congenital heart disease on further evaluation.

Most of the neonates had weight in the range of 3.1 – 3.5 Kg. There was no significant difference in the weight distribution between the two groups.

Most of the patients were satisfied with the pain relief provided by the block. 63% found it excellent while 28.6% found it quite good. While 8.6% were partly relieved of pain and 2.8% were not satisfied with epidural analgesia.

There were few anesthetic complications associated with epidural analgesia. 2 patients had uneventful hypotension. While another one had unilateral block and unblocked segments, which required anesthetic intervention. 2 patients needed perineal infiltration for episiotomy. There were no serious complications.

As bupivacaine was used for analgesia, it caused motor blockade of varying degree in the women. Two of the parturients had no motor power while there was not a single patient without muscle weakness.

Most of the patients were feeling well in the post-partum period. One patient had headache in the study group. 4 patients in the study group and 3 in the control group had backache while 2 parturients in the study group and 1 in the control group had urinary retention which required intermittent catheterization. Most of the patients recovered fully in 24 – 48 hour.

## Discussion

The use of patient controlled epidural analgesia and combined spinal epidural analgesia provide ambulatory or mobile analgesia which are becoming increasingly popular.<sup>2</sup> In the last decade delivery by CIEA and CSEA has become a gold standard in most modern perinatal centers.<sup>7</sup> The onset of complete analgesia is more rapid with CSEA technique. There is no fear of increase in instrumental deliveries and urinary catheterization with considerable reduction in nursing problems and backache. There is more maternal satisfaction because of preservice of motor power and ambulation allowed.<sup>8</sup>

As the facilities for CIEA and CSEA are not available in my unit and opioids like sufentanil are still not in use in Pakistan so I used bupivacaine as the sole agent for analgesia regimen. This provides satisfactory analgesia but at the same time produces more motor blockade. As the infusion pumps are not in use, hence I relied on intermittent top-up regimen. Apart from availability, cost of infusion pump needs to be included in evaluation of cost benefit ratio.<sup>9</sup>

After initiation of the block with bupivacaine as the sole agent, the top-ups were given on demand of the patient. Two to five top-ups of bupivacaine were usually required depending upon cervical dilatation at the time of placement of epidural catheter and gravidity of the patient. Multigravidae and patients in advanced labour required less doses. Continuous fetal and maternal monitoring was ensured, partogram was maintained to assess progress of labour. As the facilities

for fetal scalp pH are not available in the unit, so I relied on derangements of fetal heart sounds, decelerations on cardiotocography and presence of meconium in the liquor for the detection of fetal distress.

There are certain conflicting issues regarding influence of epidural analgesia on obstetric mechanisms. As far as duration of labour is concerned several randomized and non-randomized studies have shown different results. According to Zhong et al epidural analgesia prolongs the second stage of labour but it does not prolong the first stage of labour.<sup>10</sup>

Another study shows that active management of labour reduced the length of first stage of labour as compared with control.<sup>11</sup> The amount of oxytocin required for each centimeter of cervical change is more in the epidural group.<sup>12</sup>

In my study special attention was given to control ineffective uterine contractions with oxytocin augmentation in both groups whenever required without delay. This resulted in 63% of parturients delivering within 12 hours in the study group as compared to 51.4% in the control group. So overall there was not much difference in the duration of first stage of labour but oxytocin was certainly required by more women in the study group. There were another 5.7% as compared to 2.8% women whose first stage lasted for more than 12 hours and 5.7% in each group had arrest of labour inspite of oxytocin augmentation. So oxytocin requirement is increased with epidural analgesia and there is increased duration of first stage of labour in some of the patients but most of the patients delivered within 12 hours with or without oxytocin augmentation.

Different studies have shown an increase in the duration of second stage of labour with epidural analgesia. This might be overcome by active management of labour or judicious use of oxytocin in the second stage.<sup>13</sup>

In some studies there is inverse relationship between cervical dilatation at epidural placement and second stage of labour. Fifty percent of women lose their urge to expel in case of epidural analgesia which prolongs second stage of labour. There is 10 – 56% increased incidence of instrumental delivery. This wide variation is due to different concentrations of local anesthetic used, combined regimen with opioids, augmentation with oxytocin and consideration of recommendations of American College of Obstetricians and Gynecologists to wait for 3 hours after full dilatation of cervix in case of satisfactory fetal and maternal condition. But as the facility for fetal for fetal scalp blood sampling is not available in our unit so patients

were reviewed after one hour and intervention was decided after one to one and a half hour. In only 2 cases I waited for more than two hours and both the patients delivered vaginally with satisfactory fetal and maternal outcome. There was significant increase in the duration of second stage of labour in the study group ( $P > 0.05$ ). Most of the patients had second stage of 1 – 2 hours which is longer than that of non epidural group in which most of patients delivered in less than one hour. The incidence of instrumental delivery is 5.7% as compared to 0% in the control group. The duration of second stage of labour and the incidence of instrumental deliveries would have been much less if combination regimen with opioids and combined spinal epidural technique was available in Pakistan. For malrotated head, ventouse extraction was applied.

Clinical trials have suggested that epidural analgesia does not increase the rate of caesarean delivery either overall or for dystocia. Introduction of on demand epidural service does not increase primary caesarean section rate.<sup>11,13</sup> In my study the caesarean section rate was 14.2% in the epidural group as compared to 8.5% in the non-epidural group which is a non-significant difference ( $P < 0.05$ ). Caesarean sections were done for obstetric indications. Epidural analgesia was extended to provide block for caesarean section, but cases of fetal distress were performed under general anesthesia as it takes about 30 – 40 minutes to extend the block of T<sub>6</sub> level and in case of fetal distress it is not feasible to wait for this period of time.

Apgar score of most of the neonates was good and most of them had score of more than 7. Paediatrician was available in the labour room and resuscitation was required in very few neonates and they recovered well. Overall effects of epidural analgesia are minor on the fetus and appear to be of little clinical significance.

In best circumstances 80 – 85% mothers are totally pain free. In my study 63% of women were totally pain free while another 28.6% had good pain relief. Most of the mothers were satisfied with the analgesia provided while 2.8% had poor pain relief comparable to 1 – 10% rate in the literature. They had painful episodes either continuously or intermittently and these were the patients who required anesthetic intervention as pain was often caused by complications such as unblocked segments and unilateral block.

Epidural analgesia although relatively free of life threatening complications in experienced hands, still carries a risk of minor complications. Three patients had systolic blood pressure below 90 mmHg which was corrected by rapid infusion of crystalloid solu-

tions. No other therapeutic measure were required. The incidence of unilateral block as quoted by Narang<sup>14</sup> is 1.5 – 21% determined by deviation from midline during catheter insertion. The incidence in my study is 10% which is comparable to the literature. The incidence of unblocked segments was 10% compared to 8% as reported by Tan et al.<sup>15</sup>

These complications were corrected by increasing the dose of bupivacaine or change of posture. 20% of the patients required perineal infiltration for spontaneous vaginal delivery and episiotomy and punctional block for instrumental delivery which might be due to ineffective sacral block. Variable degrees of motor blockade was seen in patients ranging from Grade 0-IV. Bromage's modified scale was used to assess power in L<sub>1</sub>-S<sub>4</sub>. There was no case of dural puncture or inadvertent spinal block and systemic anesthetic toxicity. All the epidural catheters were removed intact and motor power returned within 4-6 hours in most of the parturients.

Most of the patients remained well during the postpartum period. Postpartum back pain may occur in upto 44% of women after childbirth. Randomized studies show that epidural does not cause back pain. In my study 20% of patients had backache as compared to 15% in the control group.

While some other studies show an increased rate of catheterization after epidural block. In my study 4 vs 2 parturients required intermittent catheterization in the first 24 hours postpartum. Most of them fully recovered after 48 hours.

At 6 weeks follow-up most of the mothers could recall the labour with epidural analgesia to be good and had recovered fully.

## Conclusion

Recent advances in technology have allowed the doctors to help convert the agony of painful labour to a pleasant experience for a woman. Among the different modalities available, lumbar epidural analgesia has gained wide spread popularity since the last decade. It provides effective analgesia for labour and delivery and can be extended to cover obstetric manipulations and caesarean sections. The quality of analgesia is far superior to other methods available. It greatly diminishes most of the physiochemical stress responses to labour and allows the woman to cooperate with the obstetrician. It has few minor maternal and fetal side effects which are self limiting and easily manageable.

Major complications are fortunately very rare. It does not prolong the first stage of labour significantly or increase the caesarean section rate. It does increase the duration of second stage of labour, the requirement of oxytocin augmentation and rate of instrumental deliveries. These can be much lower if newer pharmacological agents like Fentanyl and Sufentanil are used as adjuvant drugs and combined spinal epidural or patient controlled analgesia technique is used.

In developed countries upto 80% of parturients receive epidural analgesia in labour but here in Pakistan, it is not in widespread use. It is a luxury available to upper class females in private hospitals and in some tertiary care centers. Epidural analgesia should be offered to every labouring woman.

The pregnant females should be given information about the availability, cost, effectiveness and possible complications in the antenatal period. Trained personnel should be available round the clock who can apply and monitor the analgesia. Epidural sets should be available at subsidiary rates, so that every mother can afford it.

A trained midwife, a dedicated obstetrician and experienced anaesthetist can convert the nightmare of painful labour into a pleasant event in woman's life after which she is blessed with a baby.

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