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ORIGINAL ARTICLE

Effects of Epidural Labour Analgesia in Mother and Foetus

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Abstract

Objective Aim of study was to determine effect of epidural analgesia on progress of labour and mode of delivery, to find out its complications in labour and puerperium and to evaluate neonatal outcome in terms of APGAR score.

Method The present study was conducted in Department of Obstetrics and Gynaecology at Government Medical College Aurangabad over period of 2 years from June 2014 to June 2016 after taking approval from institutional ethical board. Hundred low-risk primigravidas were included in the study, 50 women received epidural analgesia for relief of labour pain at 3–4 cm and 50 women served as control. The important outcome FACTORS studied were the following : (1) duration of active phase of I stage, and II stage, (2) mode of delivery, (3) APGAR scores, (4)

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untoward reactions and intrapartum complications, (5) overall satisfaction of the mother.

Results The operative delivery rates were not significantly different in both the groups (8% in the control group and 6% in the study group: p value NS, i.e. > 0.05). The duration of first stage (our study showed no significant difference in the duration of first stage in both the study and control groups p value > 0.05) and second stage of labour (p value NS > 0.05) and the need for oxytocin were comparable in the two groups. The side effects observed were minimal. It has given excellent pain relief and improved neonatal outcome (5 min). EA is associated with rates of vaginal delivery (88 v/s 84%) and LSCS rate (8 v/s 6%) which are comparable with control group.

Conclusion Epidural analgesia is a very promising, safe and effective method of pain relief. No major complications and a good APGAR score make it a good option of care in modern obstetrics.

Keywords Epidural analgesia · Patient satisfaction · Operative delivery · Labour duration

Introduction

"The delivery of an infant into the arms of a conscious and pain free mother is one of the most exciting and rewarding moments in medicine"—Moir [1]. One of the worst known and most severe forms of pain known to mankind is that of labour. The pain gets progressively severe as labour advances and often aggravated by anxiety, fear and ignorance. The effects of labour pain are mainly hypercarbia, loss of consciousness, decreased uterine blood flow [2]. At present The American College of Obstetricians and Gynecologists and the American Society of Anaesthesiologists concur that maternal request is sufficient for pain relief during labour barring a medical contraindication [3]. Unrelieved maternal pain leads to a series of metabolic changes in the mother including surge in the catecholamine levels which may adversely affect the foetus [4].

Pain relief in labour has always been surrounded by myths and controversies. There was a religious debate about the appropriateness of anaesthesia in labour. Then came a time in 1950 when neuraxial techniques were used for pain relief in labour [5]. During the last two decades, there have been several advances that lead to comprehensive and evidence-based management of labour pain. Modern neuraxial labour analgesia reflects a shift in obstetrical anaesthesia, thinking away from a simple focus of pain relief towards a focus on overall quality of analgesia [6].

The International Association for the Study of Pain (IASP) declared 2007–2008 as the, "The Global Year Against Pain in Women-Real Women, Real Pain". The focus was to study both acute pain and chronic pain in women. Labour pain was found to be a good study model for treating acute pain. Increasing knowledge of the physiology and pharmacotherapy of pain and the development of obstetric anaesthesia as a subspeciality have improved the training in obstetric anaesthesia leading to an overall improvement in the quality of labour pain relief [7].

Epidural analgesia reverses the adverse ventilatory effects of pain [8] and results in an increase in oxygen tension in both mother and foetus [9], which may be beneficial, especially when additional conditions contributing to foetal or maternal hypoxia are also present. Hence, epidural analgesia should be strongly recommended to all patients who do not have any contraindications to this method of treatment [10]. Considering the monumental advantages of epidural analgesia, this study has been taken up in our tertiary care centre to provide pain-free delivery (since it is not widely available in government set-up). Also, labour pain is a good study model for the treatment of acute pain. Other benefits include study of pain relief of patients in labour and raising the quality of available care.

Aims and Objectives

1. To compare the course and duration of first and second stage of labour, need for caesarean section in parturients with or without epidural analgesia
2. To compare foetal outcome between both groups in terms of APGAR score, NICU admissions
3. To study the side effects and complications of the procedure if any.

Materials and Methods

The present study was a prospective case–control clinical study conducted at GMC Aurangabad, Dept. of Obstetrics and Gynaecology from June 2014–June 2016. Fifty low risk primigravida patients at term and in labour(>=4 cm) were subjected to thorough physical examination. Those who classified as physical status ASA 1 were given epidural analgesia and served as cases. The controls were 50 low risk primigravida at term and in labour with or more than 4 cm cervical dilatation. The following inclusion and exclusion criteria were considered (Tables 1, 2, 3, 4, 5, 6).

Inclusion criteria

1. Primi gravida with full-term singleton pregnancy (37–41 weeks) with vertex presentation

Table 1 Demographic data of both the groups as regarding age, BMI, gestational age and registration status

	Control group	Study group
Mean age (years)	21.90 ± 3.20	21.96 ± 3.07
Mean BMI	22.35	21.98
Mean gestational age (weeks)	38.46	38.44
Registration status (% of booked patients)	54	60

Demographic profile of patients (age, BMI, registration status and gestation age) in both groups are comparable. The mean age of patients in control group is 21.90, while that in study group is 21.96. The mean BMI of patients in control group is 22.35, while that in study group is 21.98 The mean gestational age of patients in control group is 38.46, while that in study group is 38.44. In the present study, 60% of the patients in the study group and 54% of the patients in the control group were emergency admissions, while 40% of the patients in study group and 46% in control group were booked patients

Table 2 Duration of first and second stage of labour

Duration of first stage of labour	Control group	Study group	χ^2-value	p value
< 8 h without oxytocin	11 (22%)	9 (18%)	0.69	0.87 NS, $p > 0.05$
< 8 h with oxytocin	30 (60%)	29 (58%)		
8–12 h with oxytocin	8 (16%)	11 (22%)		
> 12 h	1 (2%)	1 (2%)		
Total	50 (100%)	50 (100%)		
Duration of second stage of labour	Control group	Study group	χ^2 value	p value
< 1 h	45 (90%)	49 (98%)	2.83	0.09 NS, $p > 0.05$
≥ 1 h	5 (10%)	1 (2%)		
Total	50 (100%)	50 (100%)		

Operative delivery rates were 8% in control group and 6% in study group (non-significant). The mean duration of first stage of labour in patients of control group is 6.77 and in study group 7.24 (non-significant). The mean duration of second stage of labour in patients of control group is 45 min and in study group 41.12 min (non-significant). The need for oxytocin and side effects of drugs used in both the groups were comparable. Out of five patients in control group, three patients had deep transverse arrest (DTA) and two patients had inadequate bearing down efforts. The mean duration of second stage of labour in patients of control group is 45 min and in study group 41.12 min

Table 3 Distribution of patients in regards of mode of delivery

Mode of delivery	Control group	Study group	χ^2-value	p value
Vaginal	44 (88%)	42 (84%)	1.47	0.47 NS, $p > 0.05$
Instrumental	2 (4%)	5 (10%)		
LSCS	4 (8%)	3 (6%)		
Total	50 (100%)	50 (100%)		

In control group, three patients underwent LSCS due to prolonged second stage of labour (DTA) while the same indication was for one patient for LSCS in study group. One patient each in control and study group underwent LSCS in view of prolonged first stage of labour; other indications for LSCS include foetal distress for patient in study group

Table 4 Distribution of patients according to unintended effects of epidural analgesia

Symptoms	No of patients	Percentage
Nausea/vomiting	4	8.00
Backache	3	6.00
Rigor	2	4.00
Pruritis	2	4.00
Hypotension	1	2.00

In the present study most common side effect was nausea and vomiting followed by rigours, pruritis and hypotension. The side effects were not very troublesome or life threatening. They could be easily managed symptomatically

Table 5 Distribution of patients according to VAS score in both the groups in different stages of labour

VAS score	Control group	Study group	*t* value	*p* value
0 min	7.80 ± 0.88	7.94 ± 0.91	0.78	0.43, NS
30 min after administration of drug	7.92 ± 0.92	2.68 ± 0.86	29.26	0.0001, S
2nd stage of labour	8.62 ± 1.06	1.94 ± 0.61	38.28	0.0001, S

The VAS score is significant in second stage in study group as compared to the control group showing the satisfactory pain relief due to use of epidural anaesthesia

Table 6 Distribution of patients according to neonatal outcome in both groups

APGAR score at 5 min	Control group	Study group	⅏2-value	*p* value
> 8	39 (78%)	40 (80%)	0.21	0.89 NS, $p > 0.05$
5–8	8 (16%)	8 (16%)		
< 5	3 (6%)	2 (4%)		
Total	50 (100%)	50 (100%)		
NICU admissions	Control group	Study group	⅏2-value	*p* value
Yes	7 (14%)	7 (14%)	0.00	1.00 NS, $p > 0.05$
No	43 (86%)	43 (86%)		
Total	50 (100%)	50 (100%)		

Majority of neonates in both the study and control groups had APGAR score > 8 min. There was no increase in the rate of NICU admissions in both the study and control groups

2. Obstetric high-risk factors ruled out by clinical and ultrasound examination.
3. Normal foetal heart rate pattern (CTG) before the time of induction.
4. Women in whom active phase of labour is established as diagnosed by regular uterine contractions and cervical dilatation is more than 4 cms.

Exclusion criteria

1. Cephalopelvic disproportion
2. Any medical disorder complicating pregnancy.
3. Maternal septicaemia/coagulopathy.
4. Infection at local site of catheter placement.
5. Anatomical deformity of spine or any local infection.
6. Allergy to study drug.

Primigravida coming to labour room and antenatal clinic fulfilling the inclusion criteria were offered the option of epidural analgesia. Cases consisted of 50 parturients willing for epidural analgesia, and controls consisted of 50 parturients in whom no analgesia was given. A complete relevant history was obtained, and clinical examination was done. An informed written consent was taken from parturient and her relatives who were willing for epidural analgesia. The whole procedure was explained to them including its advantages and disadvantages. Lignocaine sensitivity test was done. Routine investigations along with BT/CT were done and noted. Insertion of epidural catheter was done by anaesthetist in OT. Baseline parameters like heart rate, blood pressure, SpO2 and FHR were recorded on CTG. The epidural analgesia was practised in office hours only.

Technique of epidural anaesthesia Prior to insertion of epidural catheter, patient was given intravenous ranitidine. Maternal pulse, BP, cervical dilatation, effacement, uterine contractions were noted on partograph. Preloading was done with ringer lactate solution 10 ml/kg. A16 G epidural needle was placed in L2-L4 space. Inj lidocaine 1.5% was injected in the space after the test dose. After the drug was given the patient was monitored carefully for any rise in pulse. The placement of epidural catheter in the epidural space was confirmed by nondevelopment of tingling and numbness. At 0 min, 10 ml solution of bupivacaine/ropivacaine 0.125% with 2 mcg/cc of fentanyl was given.

Monitoring After insertion of epidural catheter, patient was shifted to labour room and monitored for pulse, blood pressure every half hourly and cervical dilatation every 2 h. Patient was accompanied by relative for support. Progress of labour was monitored by partograph. Foetal heart rate was monitored using CTG. Top-up doses were given every 60–90 min after confirming two segments regression of sensory level or on patient request, until the delivery of the baby. Level of pain was graded according to VAS scale. Duration of first stage of labour was calculated as the time interval between patient entering the active stage of labour at which epidural catheter insertion was done and full

dilatation of cervix. Normal duration in primigravida was 8–12 h. Prolonged first stage was defined as duration of labour > 12 h. Duration of second stage of labour was calculated from full dilatation of cervix to expulsion of foetus from the birth canal. Normal duration in primigravida without epidural analgesia was 1 h and with epidural 2 h. Labour was managed according to principles of active management. Oxytocin infusion was added if uterine contractions were less than 3 in 10 min. Lower segment caesarean section (LSCS) and instrumental deliveries were performed for obstetric indication or if CTG abnormalities were found. Occurrence of adverse effects of epidural analgesia like hypertension, bradycardia, pruritis, nausea, vomiting, urinary retention as well as Neonatal NICU admissions was recorded. Patients complaining of nausea and vomiting were treated with intravenous ranitidine and ondansetron.

Indication of Oxytocin in Active Labour (> 4 cm)

1. If uterine contraction was less than 3 in 10 min each lasting for 20–40 s.
2. If in spite of good uterine contractions, there was no dilation or descent for 2 h.

Statistical analysis was done by using descriptive and inferential statistics using Chi-square test and Student's unpaired t test; software used in the analysis were SPSS 17.0 version, EPI-INFO 6.0 version and GraphPad Prism 5.0 version, and $p < 0.05$ was considered as level of significance.

Discussion

There are many techniques which are both regional and non-regional to provide labour analgesia. However, epidural analgesia gives the most superior analgesia for labour.

The demographic characteristics are age, body mass index, gestational age, registration status. The results in both control and study group were comparable.

There was no case with failure of procedure or inadequate block in our study.

Our study showed no significant difference in the duration of first stage of labour in both the study and control groups. The results in our study were comparable to that of Labour EA Papalkar et al. [9] which showed no significant difference in the duration of first stage in both the study and control groups. The study conducted by Dipti et al. [11] showed shortened duration of first stage in epidural group. This may be due to the use of ropivacaine, resulting in decreased inhibitory effect of catecholamines on uterine contractility and hence rapid cervical dilatation. In the study of Hincz [12], the mean duration of first stage was prolonged in epidural group. This may be explained on the basis that prolonged labour seems to occur more frequently when a higher dose of local anaesthetic is used.

In our study, duration of second stage of labour in the study and control groups was comparable. There was no prolongation of second stage of labour. This was probably due to adequate hydration of mothers and use of appropriate dose of analgesic. The results of our study were comparable to that of Labour EA [9] papalkar et al. However, the study conducted by Dipti et al. [11] showed that second stage of labour is prolonged in epidural group. This has been attributed to motor blockade with concomitant weakness of pelvic floor muscles that reduces the effective maternal pushing and involuntary bearing down reflex. In the present study, there was no increase in the rates of operative deliveries and instrumental deliveries. The results of our study were comparable to that of Labour EA [9] papalkar et al., Dipti et al. [11] Hincz [12], which showed that the instrumental delivery rates were not increased with epidural anaesthesia in labour. However, Anwar et al. [13] and Hincz et al. [12] reported an increased rate of forceps delivery in patients receiving epidural analgesia (54, 16.7%, respectively.) This observation may be related to higher concentrations of local anaesthetic agents used in earlier days with intermittent boluses which resulted in significant motor blockade. This may further decrease maternal mobility and reduce maternal effort in the second stage. It may also predispose to inadequate rotation of the foetal presenting part secondary to relaxation of pelvic floor muscles resulting in higher rates of instrumental deliveries.

In our study, total seven LSCS were done(four in control group and three in study group). Three patients in control group underwent LSCS due to prolonged second stage of labour (DTA), and only one patient had DTA in study group who underwent LSCS. One patient (each in control and study group) underwent LSCS in view of prolonged first stage of labour. Foetal distress was diagnosed in one patient of study group who underwent LSCS. The majority of the LSCS in the study of Anwar et al. [13] were done for foetal distress depicted by decelerations on CTG (cardiotocography) and meconium-stained liquor. In our study, there were seven LSCS. Out of them five were done under general anaesthesia and two were done with top-up dose of epidural. No patient had abnormal CTG findings immediately after epidural anaesthesia, and hence no patient had undergone emergency LSCS immediately post-procedure.

In the present study, most common side effect was nausea and vomiting followed by rigor, pruritis and hypotension. In the study of Labour EA [9] papalkar et al. and magurie [14], most common side effect was hypotension followed by nausea vomiting, rigor, pruritis. In the

study conducted by pandya et al. [15], only one patient had post-dural puncture headache. More side effects in our study could be due to increased doses of the drug. However, the side effects were not life threatening and could be managed with symptomatic treatment. It did not affect the process of labour.

In the present study, excellent satisfaction was seen in women in terms of pain relief according to VAS scoring system. The results of the present study were comparable to that of Desai et al. [16]. As known widely, epidural analgesia is the gold standard for pain management during labour and hence it is widely used all over the world. The WHO guidelines clearly mention that even the mere request from the delivering mother is an indication for administering EA.

In our study, level of acceptance was found to be significantly low as majority of women were belonging to rural areas and lower socio-economic status. There is lack of education, lack of awareness, fear of delivery complications in these women. They have a desire to deliver after suffering from labour pains.

In the present study there were a higher number of neonates with APGAR score $>$ 8 min in both the study and control groups. There was no increase in the rate of NICU admissions in both the study and control groups.

The results of the present study were comparable to other studies done by Paplakar et al. [9], Dipti et al. [11], Hincz et al. [12] and Anwar et al. [13] Hincz et al. [12] found in their study a significantly low APGAR score at 1 min ($<$ 7 score) of the babies delivered by mothers receiving EA; moreover, this observation was confirmed by logistic regression models run through their data. In contrast to other studies, they also observed lower cord arterial pH. They attributed this short-term effect of EA (low 1-min Apgar score) to the fact that fentanyl was used together with bupivacaine for EA administration during labour in their hospitals. In our study, no such observation was there.

Conclusion

Epidural analgesia thus strives at making childbirth a pleasurable, luxurious and painless experience. Present study showed that there was no prolongation of the first and second stage of labour. No significant increase in the incidence of instrumental or operative delivery was observed. There was no adverse effect in mother and foetus. There was no major complication noted in mother. Hence, epidural analgesia is one of the most effective and safest modality of pain relief. It carries a special place in modern obstetrics. It is on the verge of becoming a very safe and popular technique in our country in near future for labouring women making labour pains easy and bearable.

Compliance with Ethical Standards

Conflict of interests The authors declare that they have no conflict of interest.

Ethical Standards The authors state that approval for the study protocol was taken from the ethical comitee of Government Medical College, Aurangabad. No regulations or policies of the journal are violated.

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