

Fetomaternal Outcome in Pregnant Females Following Epidural Analgesia in Labor

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Abstract

Introduction: The McGill Pain Questionnaire¹ ranks labor pain in the upper part of pain scale between cancer pain and amputation of digit. So in modern obstetrics, pain relief during childbirth to the parturient has become more demanding and sophisticated. Epidural analgesia is gold standard technique that has been used extensively nowadays but it has drawbacks like delayed onset and some degree of motor block. Recent trend of using local anesthetic in very low dose along with opioid could overcome them.

Objective: The objective of this study was to assess the onset, effectiveness, duration and extent of epidural analgesia with ropivacaine in combination with fentanyl and its practical application and acceptability by the parturient. The study also aims to know its effect on progress of labor, mode of delivery, side effects and complications to the mother or fetus.

Material and method: This observational study was conducted in OBGY department of SMIMER Surat, from Jan 2017 to Jun 2018. Full-term nulliparous patients from labor room were taken for study. Patients having a single fetus with vertex presentation, with CPD ruled out clinically and those expected to deliver normally were included in the study. Epidural analgesia was given when cervix dilatation was equal to or more than 3 cm. After epidural test dose, 15 ml of 0.2% Ropivacaine with 2 mcg/ml fentanyl was given as first dose with the help of lumbar epidural needle inserted at L3–L4 interspinous space. Pain was

assessed by VAS score which if found more than 3, another top up dose equal to first dose was repeated. VAS score <3 was considered as effective analgesia.

Observation: Total 40 patients were included in the study. Onset of analgesia was significantly faster as most patients achieved VAS <3 in 10 min. Eighty percent (32/40) of patients graded the adequacy of analgesia as good to excellent i.e. VAS <3. The mean number of top up doses given in this study was 1.35. The mean duration of active stage of first stage of labor was 147.43 min and second stage was of 37.35 min. 82.5% (32/40) mothers had spontaneous vaginal delivery, 10% (4/40) patients had LSCS delivery and only 7.5% (3/40) had instrumental delivery. Thus the rate of operative delivery was very low in this study. No patient had motor block, only 3/40 (7.5%) subjects suffered nausea and vomiting and 4/40 (10%) had urinary retention. Apgar score was >7 at 1 and 5 min in all babies.

Conclusion: The use of newer epidural anesthetic agent like ropivacaine in addition with low dose of opioids like fentanyl provides better analgesic effect during labor with minimal motor blockade of abdomino-pelvic muscles which encourages the parturients to actively participate in expulsion of fetus resulting in shorter duration of labor and lower rate of operative deliveries.

Keywords: Epidural analgesia; Labor pains; VAS score.

Introduction

The delivery of the infant into the arms of a conscious and pain-free mother is one of the most exciting and rewarding moments in medicine. The pain of labor is known since Garden of Eden. The McGill Pain Questionnaire¹ ranks labor pain in the upper part of pain scale between cancer pain and amputation of digit. The pain of early first stage of labor arises from dilation of lower uterine segment and cervix. Pain from late first stage and second stage of labor arises from descent of foetus in birth canal which leads to tearing of vaginal and perineal tissues. Pain relief during labor has been surrounded with myths and controversies. Hence providing effective and safe analgesia during labor has remained a challenge.

In past, ether and chloroform had been used for labor analgesia. But over last two decades neuraxial techniques have been introduced for pain relief during labor. Epidural analgesia is gold standard technique for pain relief in lower half of body but it has drawbacks like delayed onset and motor block. Recent trend of using local anaesthetic in very low dose along with opioid could overcome them. Ropivacaine, an amide local anaesthetic is less cardiotoxic in animals² as well as it may also be more selective for sensory fibers when compared to other local anesthetics, producing less motor block.³ This allows for increased maternal ambulation along with normal progression of labor which translates into fewer instrumental and more vaginal deliveries.^{4,5} Continuous lumbar epidural analgesia is an effective, precise and simple method for combating labor pain as compared with other methods. If properly carried out, it provides continuous and complete labor analgesia without any significant side effects and complications to both mother and fetus. But it is a technically difficult procedure as it requires skilled personnel and close supervision which is time consuming.

In our country, the awareness about labor analgesia is still lacking, the national awareness or acceptance of pain-relieving options for women in labor virtually does not exist. This study was planned to assess the quality of epidural analgesia and its effect on mother and foetus using newer local anaesthetic ropivacaine with opioid fentanyl.

Aims and Objectives

To study the onset, effectiveness, duration and extent of epidural analgesia with ropivacaine in

combination with fentanyl, to study its effect on progress of labor and mode of delivery, to evaluate its effect on fetal outcome and to study the side effects and complications of the method in mother and fetus.

Materials and Methods

This observational study was conducted in the Dept of Obstetrics and gynaecology, SMIMER Surat from Jan 2017 to June 2018. Full term, nulliparous mothers with gestational age >37 weeks with single fetus in cephalic presentation with CPD ruled out clinically and those expected to deliver vaginally with ASA Grade 1 or 2 were included in the study. Patients with any medical disease like DM, PIH, cardiac disease; etc., previous LSCS, twin pregnancy, abnormal lie, infection at the site epidural analgesia, altered coagulation profile; etc. were excluded from the study. Epidural analgesia was given when cervical dilation was equal to or more than 3 cm. Proper history was taken, general, systemic and obstetric examination was done, patient was explained about advantages and disadvantages of epidural analgesia and consent was taken from patients willing for procedure.

After explaining the process, IV access was taken and 500 ml of Ringer Lactate was given as preload. Patients were pre-medicated with Inj. glycopyrrolate 0.2 mg IV and Inj. ondansetron 4 mg IV. Subjects were given left lateral position with hips and knees fully flexed, painting and draping of back was done, 18G Tuohy epidural needle was inserted in L2-L3 or L3-L4 interspinous space and epidural space was identified by loss of resistance technique. The multiorifice epidural catheter was inserted through needle, advanced cephalad till 3-4 cm of it is in the epidural space. First a test dose of 3 ml of local anesthetic solution (2% lignocaine with adrenaline) was injected first to rule out intrathecal or intravenous placement of catheter. After waiting for 5 min, when no problem was found, total 15 ml of 0.2% of ropivacaine along with 2 micro/ml of fentanyl was given as first dose. Pulse, BP, RR and fetal heart rate was monitored every 5min for initial 15 min and then done half hourly. Level of analgesia was assessed by "Pinprick method". Degree of pain was assessed by VAS score with VAS 0- no pain and Vas 10- as worst pain. Analgesia was considered adequate if VAS <3. Onset of analgesia was defined as time required from first bolus dose to VAS <3. Progress of labor was charted on partograph. The patient was made to lie in left lateral position preferably but was allowed to sit

whenever she wanted to. Top up dose equal to first dose was given whenever VAS >3. Side effects like hypotension, bradycardia, respiratory depression, nausea, vomiting, and pruritis were noted. Motor blockade was assessed by modified Bromage Scale.

The study ended at the time of delivery. Fetal Apgar was noted at 1 and 5 min. The epidural catheter was removed and was checked for its integrity. The study was approved by institutional ethical committee.

Result and Discussion

Total 40 patients were included in the study according to inclusion criteria. Most of the subjects (80% i.e. 32/40 subjects) were below 25 years of age reflecting the trend of early marriage and lesser use of contraception in our study.

This could be because the maximum patients attending our hospital belonged to low socio-economic status in which early marriage and early pregnancy is common.

The analgesic effect was analyzed in terms of: (a) Onset of analgesia (when VAS <3), (b) Sensory level of blockade extended proximally up to T10, (c) Degree of motor block, (d) Adequacy of analgesia, (e) Number of top up doses required. As shown in Table 1, after giving 1st dose of 15 ml of 0.2% ropivacaine + 2 µg/ml fentanyl through epidural catheter, patients were assessed for onset of pain relief at pre-determined interval. Within 0–5 minutes, 57.5% (23/40) had achieved VAS

<3. Further 30% (12/40) and 12.5% (5/40) had achieved analgesia within 6–10 minutes and 16–20 minutes respectively. Thus, almost 80% of patients had analgesic effect within 10 minutes which is very much desirable and appreciable. Sensory level of blockade extended up to T10 bilaterally in the study group. Fortunately, in our study we did not get any patient in whom it extended above T10. None of the subjects given epidural analgesia with ropivacaine + fentanyl had motor block in present study which was analyzed by Modified Bromage Scale. Cohen et al.⁶ Rujata et al.⁷ also had no motor block in their study. Despite providing excellent pain relief in labor, epidural analgesia using local anesthetics alone produces motor block in many patients associated with prolonged second stage and increased incidence of instrumental delivery. It can cause hypotension and impairment of uterine blood flow during labor which is an important cause for fetal asphyxia and neonatal morbidity. In an attempt to reduce adverse effects of high concentration of ropivacaine, opioid adjuvant like fentanyl was added as analgesic which if used alone, do not provide satisfactory analgesia throughout labor. Addition of an opioid to local anesthetic solutions can provide effective analgesia with simultaneous reduction in chances of motor block thus allowing patient to remain ambulatory.

Table 2 shows that 80% (32/40) of parturient graded the adequacy of analgesia as good to excellent. In four subjects it was not possible to evaluate adequacy of analgesia (NPE) as they

Table 1: Onset of analgesia (when VAS <3)

Onset of analgesia (min)	Cases	Percentage (%)
0–5 min	23	57.5
6–10 min	12	30.0
11–15 min	00	-
16–20 min	05	12.5
Total	40	100.0
Mean ± SD	8.37 ± 4.99	

underwent caesarean section in first stage of labor. Four subjects (10%) had VAS >3, out of which 3 subjects were uncomfortable and troublesome pain (VAS 4) and 1 patient had miserable pain (VAS 6) which distressed her throughout her delivery. The adequacy of analgesia was graded on VAS (Visual Analogue Scale) 0–10 according to the subject's response. Zero point was indicated as no

pain to 10 point which indicated worst pain ever experienced.^{8,9} Our results were comparable to studies of Terrance W et al.¹⁰, Paddalwar S et al.,¹¹ Isha et al.¹²; etc. (Fig. 1).

As shown in Table 3, the number of top up doses required in the present study ranged from 0 to 3. 12.5% (5/40) required no top up doses, 45% (18/40) required one top up dose, 37.5% (15/40)

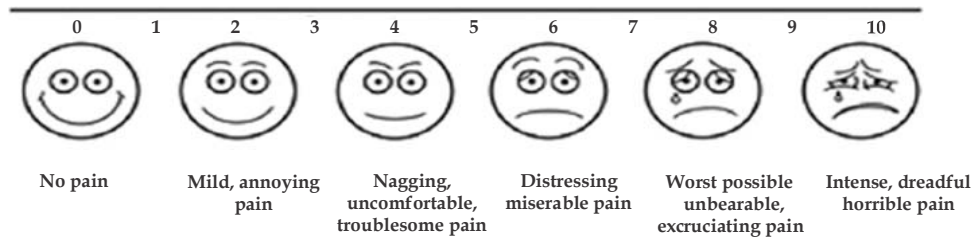


Fig. 1: Visual analogue scale.

Table 2: Adequacy of analgesia

Adequacy of analgesia (VAS Score)	Cases	Percentage (%)
<3	32	80
>3	04	10
NPE	04	10
Total	40	100

*NPE-Not Possible to evaluate

were given two top up doses and only 5% (2/40) required three top up doses. The mean number of top up doses given in our study was 1.35 which was comparable to studies of C. Price et al.¹³ Rolseng Ok et al.¹⁴ Rujuta et al.⁷ etc which ranged from 1.2 to 3. When number of top up were analyzed in reference to the weight of patients, it

was found that 55% of patients (10/18) who were given 1 top up doses, 60% of patients (9/15) who were given 2 top up doses and 50% of patient (1/2) who received 3 top up doses belonged to weight band of 61-70 kg. This means that more the weight of the patient, more the requirement of top up doses.

Table 3: No. of top-ups

No. of top-ups	Cases	Percentage
0	05	12.5
1	18	45.0
2	15	37.5
3	02	5.0
Total	40	100.0

As given in Table 4, in maximum number of patients, i.e. 75% (7+7+8+8 → 30/40) the duration of active phase of first stage of labor ranged from 0 to 199 minutes. The mean duration of active phase of first stage of labor in studies by Joupilla et al.¹⁵ Jean Marc Berman et al.¹⁶ Raed Salim et al.¹⁷

Rujuta et al.⁷ Paddalwar et al.¹¹ was ranged from 159 minutes to 344 minutes and the mean in our study was 147.4324 minutes. Thus, administrating epidural block does not have a significant effect on the course of active phase of first stage of labor while it provides good labor analgesia.

Table 4: Duration of active phase of first stage of labor

Duration (min)	Case
0-99	7
100-119	0
120-139	7
140-159	8
160-179	0
180-199	8

(Contd.)

Duration (min)	Case
200-219	2
220-239	2
240-259	2
>260	0
Total	36
Mean \pm SD	147.43 \pm 51.34 (min)

Table 5 depicts that the mean duration of second stage of labor was 37.361 minutes which was very well comparable with other studies of Joupilla et al.¹⁵ Russel et al.¹⁸ Rashmi et al.¹⁹ in which it ranged from 17 to 56 minutes. Only Cohen et al.⁶ found in their study that the mean duration of second stage of labor was 82 minutes. Four patients were delivered by LSCS and were not included in evaluation of second stage of labor. In our study, none of the subjects had

a prolonged second stage, i.e. more than 2 hours for primi, according to ACOG guidelines. This may be because we had used a low dose of local anesthetic (0.2% ropivacaine only) which did not produce motor block and preserved some degree of perineal sensation which helped in adequate bearing down efforts. Effective coaching of mothers during second stage also helped in preventing undue prolongation of second stage of labor.

Table 5: Duration of second stage of labor

Duration (min)	Case
11-20	04
21-30	10
31-40	09
41-50	07
51-60	06
Total	36
Mean \pm SD	37.36 \pm 12.73 (min)

As far as mode of delivery was studied, 82.5% (33/40) had spontaneous vaginal delivery, 10% (4/40) had LSCS and only 7.5% (3/40) had instrumental delivery. Out of 4 subjects that were delivered by caesarean section, two subjects had arrest of descent in second stage while the other two had fetal distress in 1st stage. When compared with Seema Shreepad Karhade and Shalini Pravin Sardesai in (2015)²⁰ who used 0.2% Ropivacaine with fentanyl in the management of labor analgesia, she found the incidence of vaginal delivery, instrumental delivery and LSCS in her study was 53.3%, 30% and 16.6% respectively while in our study it was found to be 82.5%, 7.5% and 10% respectively. Yancey et al.²¹ concluded in their studies that on demand analgesia does not increase the operative deliveries. Cohen et al.⁶ (1996) observed comparatively high incidence of cesarean sections though it was comparable to their national cesarean rate. In the present study, the duration of second stage as well as the rates of operative deliveries was quite less compared to the other studies. This may be due to: (a) the low concentration of local anesthesia (0.2% ropivacaine) used which reduced the motor block and allowed

some perineal sensation to remain, leading to an urge to bear down. (b) Effective coaching and use of oxytocin for second stage augmentation in indicated cases. Total 18 subjects were augmented with oxytocin in second stage of labor in this study.

As far as maternal side effects were concerned, none of the mothers suffered hypotension, 7.5% (3/40) patients had nausea and vomiting which were treated with inj. Ondansetron 4 mg intravenously. 10% (4/40) patients had urinary retention in the immediate postpartum period which was tackled by emptying the bladder with Foley catheter for 24 hours. So while using epidural analgesia we should motivate each and every patients for micturition after delivery to prevent urinary retention. Cohen et al.⁶ (1996) observed similar incidence of urinary retention in both groups. Dahl et al.²² (1999) observed a higher incidence of urinary bladder catheterization in bupivacaine only group compared to bupivacaine sufentanil group. Four subjects had backache in postpartum period which was relieved by systemic analgesics.

Neonatal neurobehavioral assessment by Apgar score was done at 1 minute and 5 minutes after

delivery. 100% of neonates had good Apgar score at 1 min and at 5 min. more than 7 in this study. Purdie and McGrady et al.²³ noted that APGAR score was good at 1 min and at 5 min with 0.1% ropivacaine and with 0.1% bupivacaine also. Paddalwar et al.¹¹ noted that mean APGAR score at 1 min and at 5 min was >8.

Conclusion

In today's world, there is an increase in the rates of on demand labor analgesia and today's obstetrician and anesthetists need to know the various modalities which can be offered to the parturients. Ideal obstetrics analgesia technique should produce effective pain relief with minimal side effect for both mother and baby and it should not affect the progress of labor. Various techniques are available for pain relief during labor. Among them, Epidural analgesia is gold standard technique for labor analgesia. This study was conducted in Obstetrics and Gynecology department of SMIMER, Surat. Total 40 primipara patients in labor were given epidural analgesia using 0.2% ropivacaine and fentanyl when cervix was equal or more than 3 cm dilated. Pain was assessed by VAS score. Analgesia was effective if VAS was less than 3. Any time during the labor if patient complains of pain and VAS score >3 then rescue analgesia as top-up dose was given. All patients were monitored for pulse, BP, sensory effect, motor effect and VAS score till delivery of baby.

This study has shown that use of epidural analgesia with ropivacaine with fentanyl had no significant effects on the duration of active phase of first stage or duration of second stage of labor. The operative delivery rates were not found to be increased. It provided excellent analgesia with no motor block and minimal side effects. There was very low incidence of maternal or fetal complications. No neurological sequels occurred with epidural analgesia as seen with spinal analgesia/anesthesia. Apgar score of all neonates was normal at 1 minute and at 5 minutes. Acceptability by mothers was good because the patients remained fully conscious and pain free. Careful patient evaluation, meticulous technique during epidural catheter placement and appropriate dosing of medication minimize the risk of serious complications from epidural analgesia.

Thus a combination of fentanyl with 0.2% ropivacaine when used for epidural analgesia had proved to be excellent in relieving labor pains in terms of rapid onset and prolonged duration of

analgesia, no motor block, less requirement of top ups, excellent analgesia with minimal side effects to mother and no adverse neonatal outcome.

References

1. Van Zundert and Ostheimer: Pain relief and anaesthesia in obstetrics, 1st edition 1996.pp.31-32.
2. Nancarrow C, Rutten AJ, Runciman WB, et al. Myocardial and cerebral drug concentrations and the mechanisms of death after fatal intravenous doses of lidocaine, bupivacaine, and ropivacaine in the sheep. *Anesth Analg* 1989;69(3):276-83.
3. Zaric D, Nydahl PA, Philipson L, Samuelsson L, Heierson A, Axelsson K. The effect of continuous lumbar epidural infusion of ropivacaine (0.1%, 0.2%, and 0.3%) and 0.25% bupivacaine on sensory and motor block in volunteers: a double-blind study. *Reg Anesth* 1996;21(1):14-25.
4. Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK. Effect of low-dose mobile versus traditional epidural techniques on mode of delivery: a randomised controlled trial. *Lancet* 2001;358(9275):19-23.
5. Nageotte MP, Larson D, Rumney PJ, et al. Epidural analgesia compared with combined spinal-epidural analgesia during labor in nulliparous women. *N Engl J Med* 1997; 337:1715-9.
6. Cohen Shaill, Amar David, Pantuck B Carol, et al. Epidural analgesia for labor and delivery. Fentanyl Sufentanil? *Can J Anaesth* 1996;43(4)341-6.
7. Rujuta et al. Epidural analgesia during labor- Bupivacaine 0.125%+ fentanyl 20 mcg versus bupivacaine 0.125%+ Butorphanol 1 mg. Sept-Oct-2006.
8. Gould D. et al. Visual Analogue Scale (VAS). *Journal of Clinical Nursing* 2001;10:697-706.
9. Mc Cormack HM, Horne DJ, Sheather S. Clinical application of visual analogue scales: a critical review. *Psychol Med* 1988 Nov;18(4):1007-19.
10. Terrance W. Breen, Shapiro T, Glass B et al. Studied one group only Fentanyl and second group received ultra-low dose bupivacaine, epinephrine and fentanyl in labor analgesia. *Techniques in regional anaesthesia and pain management* 1993;5:9-13.
11. Paddalwar S, Nagrale M, Chandak A, Shrivastava D, Papalkar J. A randomized, double-blind, controlled study comparing Bupivacaine 0.125% and Ropivacaine 0.125%, both with Fentanyl 2 µg/ml, for labor epidural

- analgesia. *Indian J Pain* 2013;27:147-53.
12. Chora I and Akhlak Hussain A. Compared 0.1% Ropivacaine-Fentanyl with 0.1% Bupivacaine-Fentanyl epidurally for labor analgesia. *Advances in Anaesthesiology* volume 2014, Article ID 237034, 4 pages.
 13. Price C, Lapreniex L, Brosnan C, et al. Regional anaesthesia in early active labor: Combined spinal epidural versus epidural anaesthesia, 1998;53:951-55.
 14. Rolfsend OK, Skogvoll et al: Epidural bupivacaine with sufentanil or fentanyl during labor. *Eur J. Anaesth* 2002 Nov;19(11):812-8.
 15. Joupilla R, Joupilla P, Kariner JM, et al. Segmental epidural analgesia in labor-related to the progress of labor, fetal malposition and instrumental delivery. *Acta Obstet Synaecol Scand* 1979;58:135-39.
 16. Bernard JM, Le Roux D, Vizquel L, et al. The dose-range effects of sufentanil added to 0.125% bupivacaine on the quality of patient-controlled epidural analgesia during labor. *Anaesth Analg* 2001;92:184-8.
 17. Salim Raed, Nachum Zohar, Moscovici Lavee and Shalev Elizier: Continuous compared with intermittent epidural infusion on progress of labor and patient satisfaction. *Obstetrics and gynaecology* 2005Aug;106(2):301-06.
 18. Russel R and Reynolds F. Epidural infusion for nulliparous women in labor: A randomized double blind comparison of fentanyl/bupivacaine and sufentanil/bupivacaine. *Anaesthetis* 1993;48:856-61.
 19. Rashmi et al. Epidural analgesia for labor-bupivacaine versus bupivacaine 0.125% with fentanyl 2 mcg/ml. Nov 1999.
 20. Karhade SS and Sardesai SP. Studied 0.2% Ropivacaine with fentanyl in the management of labor analgesia. *Anaesth Essays Res* 2015 Jan-Apr;9(1):83-87.
 21. Yance MK, Pierce B, Schweitzer D, et al. Observations on labor epidural analgesia and operative delivery rates. *Am. J. Obs. Gynaecol* 1999;180:353-9.
 22. Dahl V, Hagen I, Koss KS, Nordentoft J, et al. Bupivacaine 2.5 mg/ml versus bupivacaine 0.625 mg/ml and sufentanil 1 microg/ml with or without epinephrine 1 microg/ml for epidural analgesia in labor. *Int J Obstet Anesth.* 1999;8(3):155-60.
 23. Purdie NL, McGrady EM. Comparison of patient-controlled epidural bolus administration of 0.1% ropivacaine and 0.1% levobupivacaine, both with 0.0002% fentanyl, for analgesia during labor. *Anaesthesia.* 2004;59(2):133-37.
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