

Ambulatory Labor Analgesia with Patient-controlled Analgesia Pump: An Observational Study

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ABSTRACT

Aim: Providing labor analgesia has always been a challenge, more so because of controversies and myths associated with labor. This study was done to observe the effect of patient-controlled epidural labor analgesia on incidence of conversion to cesarean section, maternal satisfaction, maternal complication and neonatal outcomes.

Materials and methods: A total of 25 consenting ASA grade I–II parturients in active labor with a cervical dilatation of 3–5 cm were randomly selected for the study. The labor analgesia was given after putting epidural catheter in L2/L3 intervertebral space and then parturient were put on continuous infusion of ropivacaine 0.1% with PCA pump after bolus dose of ropivacaine 0.2% with 25 µg fentanyl. The parturients were observed for the incidence of instrumental delivery and incidence of conversion to cesarean section along with duration of labor, maternal satisfaction score and fetal outcome.

Results: The rate of cesarean sections was 8.3% in labor analgesia parturients. Only one forceps delivery was done in labor analgesia parturients. No neonatal deaths were noted in labor analgesia parturients. No major maternal complications like hypotension or bradycardia were encountered. The mean satisfaction score was 3.88/5 in study group.

Conclusion: Patient-controlled labor analgesia with low dose ropivacaine infusion with PCA pump provides excellent maternal satisfaction for patients undergoing normal vaginal delivery along with decrease in cesarean section rate and good fetal outcome.

Clinical significance: Patient-controlled labor analgesia using PCA pump is a novel technique and it provides nearly painless vaginal delivery to the parturient along with excellent fetal outcome and with minimal maternal side-effects.

Keywords: An observational study, Fentanyl, Patient-controlled labor analgesia, Patient-controlled analgesia pump, Ropivacaine.

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INTRODUCTION

“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 joy of childbirth is always accompanied with a fear of pain. A painful birth experience can lead to subsequent infertility and hence pain-free vaginal delivery must be given utmost importance in the provision of maternity care.

Women in pain do not need an “indication” for pain relief in labor. According to the American Society of Anesthesiology (ASA) “in the absence of a medical contraindication, maternal request is a sufficient medical indication for pain relief during labor.”

The pain of childbirth is the most severe pain that most women endure in their lifetimes.

The International Association for the Study of Pain (IASP) declared 2007–2008 the Global Year against Pain in Women, with the slogan “real women, real pain.”

Key points presented in the fact sheets published by IASP related to:

- The importance of treating pain within the pregnant population and the substantial public health impact if pain is neglected.
- The alarmingly high rate of acute or chronic pain after delivery.
- Labor pain as a clinical model for studying acute pain.

In the field of obstetric anesthesia, there have been profound advances and pain alleviating techniques improved over time during active stage of labor while at the same time increasing the maternal and fetal safety.

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Newer techniques such as combined spinal-epidural analgesia, bolus epidural analgesia, intermittent epidural analgesia, continuous epidural infusions, walking epidurals and patient controlled epidural analgesia (PCEA) are now available.

Epidural analgesia remains a gold standard for providing pain relief during labor^{1,2} and is one of the most popular technique of labor analgesia worldwide.

Advantages of PCEA for labor pain:

- Tailor-made dosing of local anesthetic as per patient’s need.
- Avoidance of unnecessary doses of local anesthetics and hence avoiding toxicity of local anesthetics.

At our institute, at present, no labor analgesia for vaginal deliveries is provided. The reason behind this is the myth that it

increases rate of instrumental deliveries. Our study is to compare the incidence of instrumental deliveries and cesarean section in labor analgesia parturient and parturient with no labor analgesia as well as fetal outcome in labor analgesia parturient.

AIMS AND OBJECTIVES

To observe the effect of labor analgesia on:

- Mode of deliveries.
- Incidence of instrumental deliveries.
- Incidence of conversion to cesarean sections.
- Maternal hemodynamics.
- Maternal satisfaction score.
- Maternal visual analog scale (VAS) score.
- Fetal outcome.
- Any adverse events.

MATERIALS AND METHODS

Ethical Consideration

After obtaining approval from the institutional ethics committee and after taking informed written consent from all parturients, present study was initiated and conducted.

Study Duration

1.5 years (January 2018–May 2019)

Study Subjects

A total of 25 consenting parturients admitted in the obstetric labor room were selected for the study by using simple random sampling.

Inclusion Criteria

Full-term (37–42 weeks) parturients of ASA class I and II having fixed cephalic presentation, with cervix dilated 3–5 cm and in active labor were enrolled for the study.

Exclusion Criteria

Parturients with bleeding dyscrasia, spinal deformities, morbid obesity and having allergy to local anesthetics and opioids; parturients on anticoagulants; hypotensive parturient and parturients not giving written informed consent were excluded from the study.

Parturients were explained regarding the possible risks and complications and written informed consent of the parturient was taken.

A complete preanesthetic evaluation of all parturients was carried out. After securing I.V. line with 18G cannula, 500 mL of 0.9% normal saline or lactated Ringer’s lactate was infused intravenously to all parturient. Parturient were connected to multichannel monitor, displaying ECG, SpO₂ and NIBP.

Parturients were placed in the left lateral position when cervix was 3–5 cm dilated and with aseptic precautions inside OR, midlumbar epidural space L3–L4/L4–L5 was identified by using a loss of resistance (LOR) technique with a 16–18G Tuohy needle and an epidural catheter (B. Braun, perifix 16G or 18G catheter, Melsunghen) was placed 4–5 cm in the epidural space and directed upwards. Test dose of 4 mL 0.15% ropivacaine was administered. After 5 minutes, if hypotension (>20% decrease in baseline BP) or motor blockade was not observed, then loading dose of 10 mL 0.15% ropivacaine with 25 µg fentanyl was administered followed by infusion of 0.1% ropivacaine at the rate of 6 mL/hour was started. Further demand dose of 8 mL aliquots with lockout interval of 10 minutes in

patient-controlled analgesia (PCA) was self-administered by the parturient.

The parturition was observed for hemodynamics, motor blockade using modified Bromage score, sensory blockade using pin-prick method, VAS before labor analgesia and every half an hour till delivery, duration of labor and mode of delivery, maternal satisfaction score, fetal APGAR score, number of PCA demanded and any adverse events like hypotension, bradycardia, high spinal anesthesia, etc.

OBSERVATION AND RESULTS

In the labor analgesia parturient, modes of deliveries were observed and were divided into assisted vaginal deliveries, cesarean sections and instrumental deliveries (Table 1 and Fig. 1).

Hemodynamics of the labor analgesic parturient were observed in the form of mean arterial pressure and were recorded before epidural catheter insertion and after 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 4 hours and 5 hours after epidural catheter insertion (Table 2 and Fig. 2).

In the labor analgesic parturient, maternal satisfaction score was recorded and were divided into classes and plotted (Table 3 and Fig. 3).

Table 1: Mode of deliveries in labor analgesic parturient

	<i>Assisted vaginal deliveries</i>	<i>Cesarean sections</i>	<i>Instrumental deliveries</i>
Parturient with labor analgesia	22 (80%)	2 (8%)	1(4%)

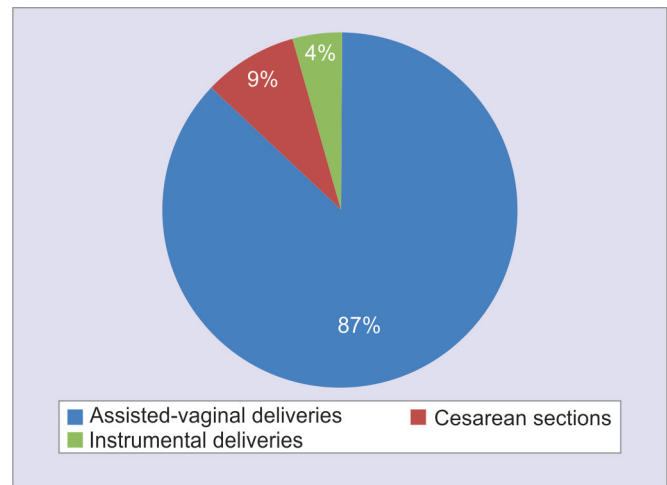


Fig. 1: Mode of deliveries in labor analgesic parturient

Table 2: Mean arterial pressure trend in labor analgesia parturient

<i>Timing</i>	<i>Mean arterial pressure (mm Hg)</i>
Before epidural catheter insertion	94.5
After 5 minutes of epidural catheter insertion	93.2
15 minutes	85.4
30 minutes	82.5
1 hour	80.6
2 hours	70.4
3 hours	68.4
4 hours	66.4
5 hours	67.7

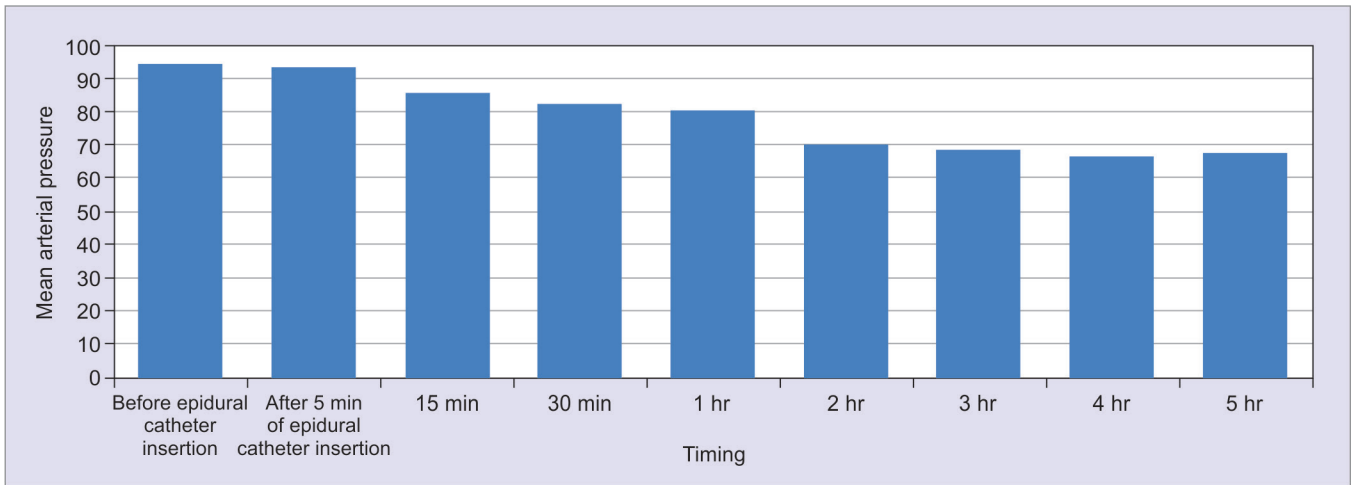


Fig. 2: Mean arterial pressure trend in labor analgesia parturient

Table 3: Maternal satisfaction score in labor analgesia parturient

Maternal satisfaction score	Number of labor analgesia parturient
<2	2
3	4
3.5	4
4	2
4.5	5
5	8

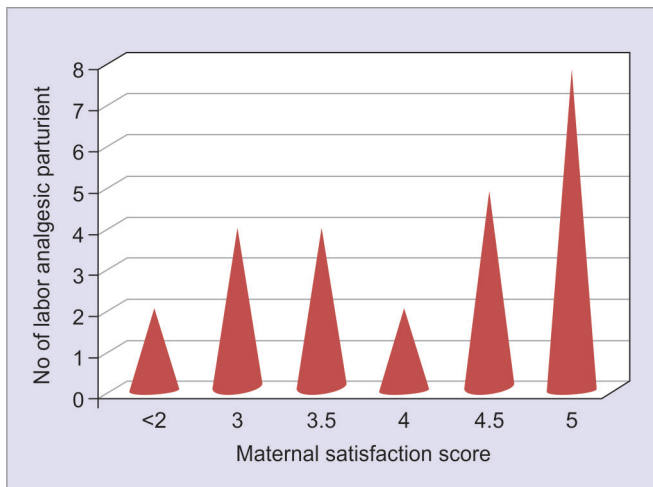


Fig. 3: Maternal satisfaction score in labor analgesia parturient

Mean VAS scores of the labor analgesic parturient were observed just before epidural catheter insertion, immediately after epidural catheter insertion, 5 minutes, 10 minutes, 15 minutes and then every 15 minutes till 1 hour after epidural catheter insertion, then every 30 minutes till 5 hours after epidural catheter insertion (Table 4 and Fig. 4).

In the neonates born to the labor analgesic parturient, APGAR score (appearance, pulse, grimace, activity and respiration) were noted at 5 minutes after birth and were plotted (Table 5 and Fig. 5).

DISCUSSION

Physiologically, labor pain can be divided into visceral pain and somatic pain. During the 1st stage of labor, visceral pain takes place

Table 4: Mean visual analog scale (VAS) score in labor analgesia parturient

Timing	Mean VAS score
Before epidural catheter insertion	7.5
Immediately after epidural catheter insertion	6.8
5 minutes	6.6
10 minutes	2.8
15 minutes	0.9
30 minutes	0.2
45 minutes	0
1 hour	0.3
1.5 hours	0.4
2 hours	0.4
2.5 hours	0.5
3 hours	0.6
3.5 hours	1.0
4 hours	1.2
4.5 hours	1.4
5 hours	1.6

due to distension and stretching of the lower uterine segment (LUS) and is conducted via T10-L1 spinal nerves. During the 2nd stage of labor, somatic pain takes place due to distension of pelvic and perineal structures and compression of lumbosacral plexus and is conducted via S2-S4 spinal nerves (Fig. 6).³

Composite of the average dilatation curve for labor in nulliparous women. The curve is based on analysis of data derived from a large, nearly consecutive series of women. The first stage is divided into a relatively flat latent phase and a rapidly progressive active phase. In the active phase, there are three identifiable component parts: an acceleration phase, a linear phase of maximum slope, and a deceleration phase (Redrawn from Friedman, 1978).

Labor pain leads to marked stimulation of respiration and circulation in mother, along with activation of sympathetic nervous system and mental disturbances leading to postpartum depression and post-traumatic stress disorder (PTSD).⁴

Lumbar epidural analgesia can be provided by two techniques—PCEA and continuous infusion epidural analgesia (CIEA). Lumbar epidural analgesia is the gold standard technique for sensory

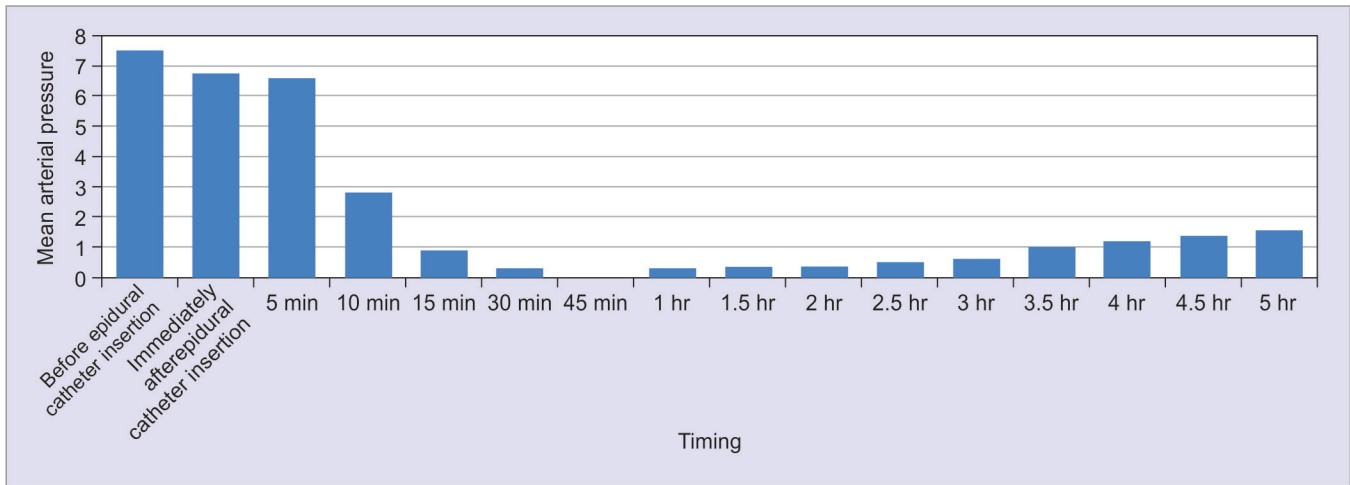


Fig. 4: Mean visual analog scale score in labor analgesia parturient

Table 5: APGAR score in the newborn born to the labor analgesic parturient

APGAR score	No. of newborn
9	7
8	8
7	10

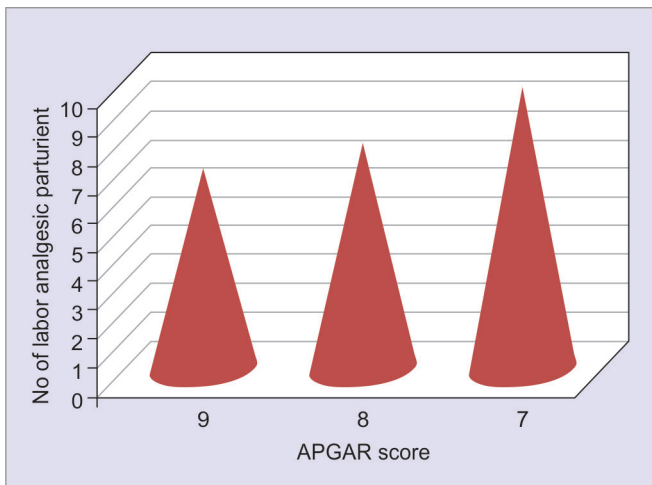


Fig. 5: APGAR score in the newborn born to the labor analgesic parturient

blockade during the 1st stage of labor without appreciable motor blockade and it can be extended to provide surgical anesthesia.⁵

Patient controlled analgesia pump is a novel method of drug delivery system which allows parturient a sense of self-control and self-esteem along with a positive experience in childbirth. Patient controlled analgesia pump has been used for demand only PCEA which results in lower VAS, shorter duration of effective analgesia, excellent maternal satisfaction and less local anesthetic consumption.⁶

Chestnut et al. studied 344 patients of labor analgesia in nulliparous women who were in spontaneous labor at term and concluded that, when compared with IV nalbuphine followed by early administration of epidural analgesia, early administration of epidural analgesia did not prolong labor, did not increase the incidence

of oxytocin augmentation and did not increase the incidence of operative delivery.⁷ In our study, we found the same results when epidural analgesia was administered in the early stage of labor.

Barbara et al. did not find any increment in cesarean section or instrumental deliveries in labor analgesia parturient,⁸ though in our study, rate of instrumental delivery has been found to be increased (although in minor proportion) and rate of cesarean section has shown significant reduction compared to parturient delivering without labor analgesia.

Cochrane et al. compared two different meta-analysis of randomized trials, comparing parturient with or without epidural analgesia and found out that epidural analgesia had no significant impact on the rate of cesarean section; in other words, there is no direct relationship of epidural analgesia and increased cesarean section in parturient undergoing labor analgesia.⁹

Agrawal et al. studied epidural analgesia by ropivacaine in 120 in Indian nulliparous women and found out that epidural analgesia results in shorter duration of 1st stage of labor and prolongs duration of 2nd stage of labor compared with parturient without labor analgesia.¹⁰ In our study, similar results were concluded.

Tawhid et al. studied epidural analgesia in 1,449 parturient and found out that the rate of assisted vaginal delivery was significantly higher in the epidural analgesia group compared to the nonepidural analgesia group.¹¹

Agrawal et al. concluded after the study on 120 parturient that there is no significant difference in neonatal outcome in parturient undergoing labor analgesia.¹⁰

Vincent studied epidural analgesia in 1,500 parturient and reported good neonatal outcome and no significant adverse effects in neonates.¹²

Vallejo et al. studied epidural analgesia in 160 parturient and found out that no differences were noted in maternal outcome and APGAR scores in parturient who presented for elective induction in ambulatory analgesia parturient as compared to nonambulatory analgesia parturient.¹³

CONCLUSION

From our study, it can be concluded that:

- Epidural labor analgesia with low dose ropivacaine infusion with PCA pump does not increase rate of cesarean deliveries, though it may increase the rate of instrumental deliveries.

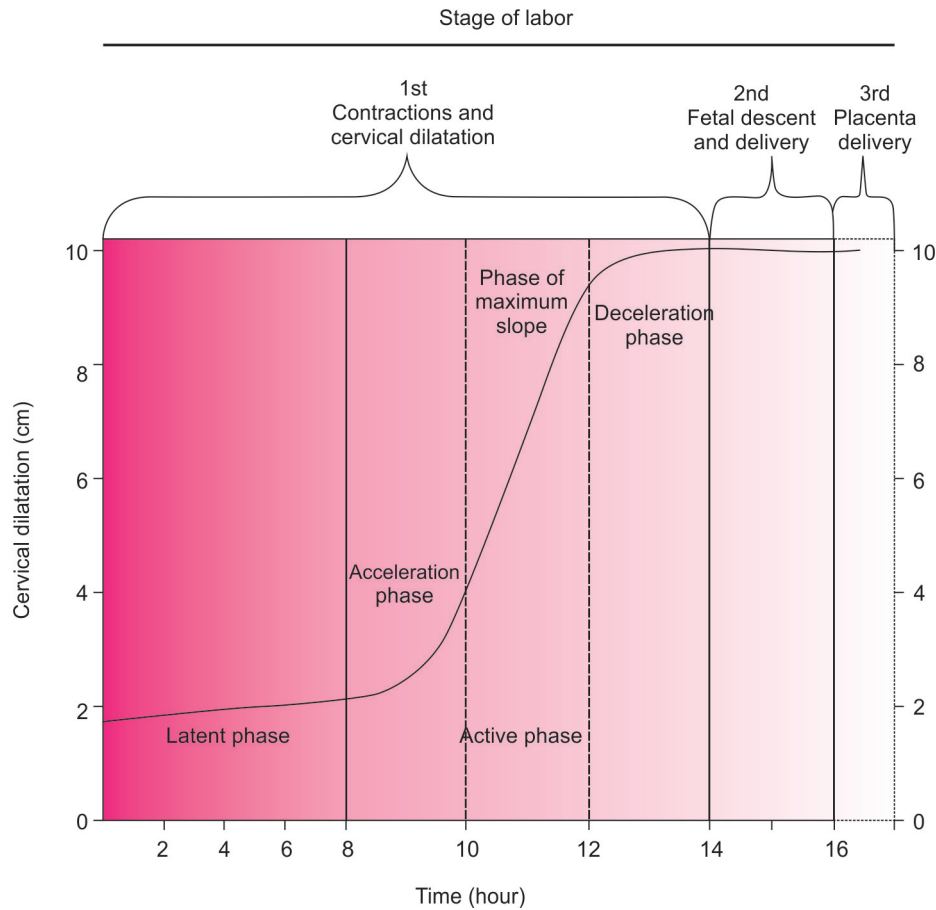


Fig. 6: Relation of stages of labor with the cervical dilatation

- Maternal satisfaction score is very high along with no major maternal complications.
- Fetal outcome was good and no fetal side effects were noted.

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