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A COMPARATIVE STUDY OF PATIENT CONTROLLED EPIDURAL ANALGESIA VS CONTINUOUS EPIDURAL INFUSION IN LABOUR ANALGESIA USING ROPIVACAINE WITH FENTANYL

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ABSTRACT

Background: Epidural analgesia is considered to be most effective tool for labour analgesia. Epidural drugs are administered either by bolus, continuous infusion or by patient controlled pumps. Historically, intermittent bolus dosing of local anaesthetic by the clinician (anaesthetist, nurse or midwife) was used. However this technique had a number of drawbacks including inconsistent analgesia, potential toxicity and concerns about sterility each time the clinician opened the system to administer a bolus. PCEA has not been broadly used for labour analgesia in India and there are no reports of the comparison between PCEA and CEI for Indian parturient using Ropivacaine with Fentanyl. So this study was selected and initiated to evaluate the difference between these two commonly employed labour analgesia techniques in Indian parturients undergoing labour at a tertiary care hospital. **Methods:** Epidural catheter of 16/18 G was inserted at L2-3 or L3-4 space, a 10 ml loading dose of study drugs solution (0.1% Ropivacaine + 2 mcg/ml of Fentanyl) was injected. After achieving initial pain relief, parturients were randomized in to PCEA or CEI group using closed envelop technique. Parturients in PCEA group received background continuous infusion of study drug solution at 6 ml/hr and patient controlled demand bolus of 6 ml with a lockout period of 20 minutes. Parturients in CEI group received continuous infusion of 10 ml/hr with a clinician initiated bolus of 7 ml on parturients request. Clinician initiated bolus were given after an interval of 30 minutes. **Results:** After the initial pain relief was achieved parturients were assessed for pain relief using VAS score. In both groups, VAS score was comparable during both stages of labour. Mean VAS score in PCEA group was 2.21 (S.D-0.602) and in CEI group was 2.27 (S.D-0.711) with P value of 0.664. The incidence of motor blockade as assessed using Bromage scale was comparable in both groups. One parturient in PCEA group experienced mild motor blockade (Grade II- assigned a score of 1 out of total 3), which regressed within two hours during labour only. The mean Bromage score in PCEA group was 0.008 (S.D-0.05) and in CEI group it was 0.000 (S.D-0.000) with P value of 0.322, signifying an insignificant difference. **Conclusions:** Findings of our study was consistent with those of previous studies that PCEA provides superior labour analgesia as compared to CEI in terms of decreased requirement of local anaesthetics and lesser intervention by Anaesthesiologist.

KEYWORDS: Epidural Analgesia, Ropivacaine, PCEA, CEI.

INTRODUCTION

Labour is a defining event in women life associated with joy, apprehension and labour pain. The level of pain experienced and effectiveness of pain relief may influence a woman's satisfaction with labour and delivery and may have immediate and long term emotional and psychological effects.

Since the historical use of ether for labour analgesia in 1847, various pharmacological and non pharmacological methods for labour analgesia have evolved, each having its own merits and demerits. But even today the hunt by medical science continues to find an ideal method for labour analgesia. To date neuraxial/regional analgesia remains the gold standard method for labour analgesia.

Epidural analgesia is considered to be most effective tool for labour analgesia. The choice of drugs and dosage varies from institution to institution. Epidural drugs are administered either by bolus, continuous infusion or by patient controlled pumps. Historically, intermittent bolus dosing of local anaesthetic by the clinician (anaesthetist, nurse or midwife) was used. However this technique had a number of drawbacks including inconsistent analgesia, potential toxicity and concerns about sterility each time the clinician opened the system to administer a bolus. Continuous epidural infusion (CEI) of local anaesthetics was introduced into common clinical practice in the 1980s. While the technique circumvented a number of difficulties, it was not ideal. Many patients still required clinician initiated top-ups and experienced unacceptably dense motor block in the lower extremities. Although many combinations of infusion rates and various concentrations of local anaesthetics and additives have been investigated, these problems persist. Patient-Controlled Epidural Analgesia (PCEA) for relief of labour pain was first described by Gambling in 1988. This technique allowed the patient to control the dose of epidural medication as labour and pain patterns changed. It also allowed for individualization of the drug dosage by the patient, allowing her to trade off therapeutic effects (e.g. complete pain relief) and side effects (e.g. motor block). However the equipment needed for PCEA may be more expensive than CEI.

PCEA has not been broadly used for labour analgesia in India and there are no reports of the comparison between PCEA and CEI for Indian parturient using Ropivacaine with Fentanyl.

So this study was selected and initiated to evaluate the difference between these two commonly employed labour analgesia techniques in Indian parturients undergoing labour at a tertiary care hospital.

OBJECTIVES were to assess -
Difference in Total Drug Requirement using Mean Hourly consumption of drugs
Patient satisfaction level for quality of analgesia using VAS score
Difference in motor blockade using Bromage scale

MATERIALS AND METHODS
This study is a Randomized Control Study conducted at a tertiary level teaching hospital. Duration of study was from January 2014 to December 2014. Based on previous study by Saito M et al, sample size was calculated after consultation with biostatistician of institute. Number of patients required to be enrolled in each group came out to be 7.

However, a sample size of 50 patients was taken in each group.

INCLUSION CRITERIA
Consenting Primigravida parturients undergoing labour who requested for pain relief
Age between 18-35 yrs
Parturients in ASA I and II class

EXCLUSION CRITERIA
Parturients with a known history of allergy to the local anaesthetics.

Parturients with uncontrolled systemic illness, cardiac disease, eclampsia, pre-eclampsia, coagulopathies or any other disease for which parturient is in ASA III or above.

Spinal deformity, local dermatological condition. Any contraindication to the procedure or parturient unwillingness.

PRE PROCEDURAL REQUIREMENT
Parturients briefed and consent obtained.
Intravenous access obtained and parturient preloaded with 500 ml Lactated Ringer's solution.
Non invasive blood pressure, heart rate, oxygen saturation and VAS score recorded at starting and then at hourly interval.

LUMBAR EPIDURAL TECHNIQUE
Epidural catheter of 16/18 G was inserted at L2-3 or L3-4 space as per standard practice using LOR technique.

After careful aspiration to rule-out intravascular/ intrathecal injection, a 10 ml loading dose of study drugs solution (0.1% Ropivacaine + 2 mcg/ml of Fentanyl) was injected. After achieving initial pain relief, parturients were randomized in to PCEA or CEI group using closed envelop technique.

Parturients in PCEA group received background continuous infusion of study drug solution at 6 ml/hr and patient controlled demand bolus of 6 ml with a lockout period of 20 minutes.

Figure 1: GRASEBY-3300 PCA PUMP.

Parturients in CEI group received continuous infusion of 10 ml/hr with a clinician initiated bolus of 7 ml on parturients request. Clinician initiated bolus were given after an interval of 30 minutes.

Figure 2: EMCO INFUSION PUMP.

Parturients were monitored continuously and various parameters were observed. All the parameters were entered in the case report chart.

DATA ANALYSIS

Data collected was compiled and analyzed using appropriate statistical tests.

RESULTS

The study was conducted at a tertiary level teaching hospital to assess the superiority among two tools of labour analgesia. A total of 100 parturients who qualified, were enrolled in the study and randomized into Patient Controlled Epidural Analgesia (PCEA) or Continuous Epidural Infusion (CEI) groups using Closed Envelop Technique. Epidural Analgesia was started when patients requested for the pain relief. Most of the patients had cervical dilation of 03 cm to 05 cm when they requested for pain relief.

All baseline characteristics were comparable in both groups. Initial pain score was 5/10 to 7/10 in both groups. After initial pain relief was established, VAS score was 2/10 to 3/10 in most of the parturients.

QUALITY OF PAIN RELIEF

After the initial pain relief was achieved parturients were assessed for pain relief using VAS score. In both groups, VAS score was comparable during both stages of labour. Mean VAS score in PCEA group was 2.21 (S.D-0.602) and in CEI group was 2.27 (S.D-0.711) with P value of 0.664.

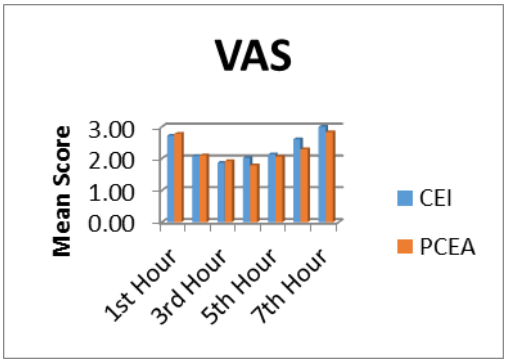

Figure 3: Pain Relief Score.

MOTOR BLOCKADE

The incidence of motor blockade as assessed using Bromage scale was comparable in both groups. One parturient in PCEA group experienced mild motor blockade (Grade II- assigned a score of 1 out of total 3), which regressed within two hours during labour only.

The mean Bromage score in PCEA group was 0.008 (S.D-0.05) and in CEI group it was 0.000 (S.D-0.000) with P value of 0.322, signifying an insignificant difference.

MEAN HOURLY DRUG REQUIREMENT

Mean Hourly Requirement was calculated by dividing total drug consumed by the total duration of infusion in hours. The Mean drug requirement in PCEA gr was 10.10 ml/hr (SD=2.78) whereas in CEI gr it was 14.34 ml/hr (SD=2.96). The P value was <0.001 which is significant.

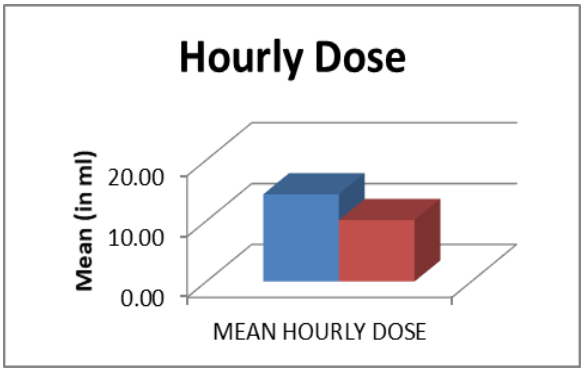

Figure 4: Hourly Drug Requirement.

DISCUSSION

Childbirth is associated with pain and this sometimes decreases the joy of motherhood. The unprepared and untreated women feel pain due to uterine contractions which are associated with labour progression. The neuraxial analgesia is considered as gold standard for labour analgesia due to its efficacy in quickly relieving pain due to uterine contractions. Studies have established that Epidural Analgesia is suitable for most of the parturients.

Since introduction of Continuous epidural infusion (CEI) of local anaesthetics into common clinical practice in 1980s, a lot of work has been done till date on the labour analgesia using CEI technique, but most of the workers have demonstrated its efficacy in comparison to Intermittent Epidural Bolus techniques. While the technique has circumvented a number of difficulties, it is not ideal. Many patients still required clinician initiated top-ups and experienced unacceptably dense motor block in the lower extremities. Repeated epidural handling increases the risk of infections. Due to higher requirement of drugs there is increased incidence of opioid overdose which may lead to maternal and fetal complications. Although many combinations of infusion rates and various concentrations of local anaesthetics and additives have been used and investigated, these problems persist. Some authors have compared the potencies of different epidurally administered local anaesthetics, opioids and α2 agonists.

Patient-controlled epidural analgesia (PCEA) for relief of labour pain was first described by Gambling in 1988. Patient Controlled Analgesia via the epidural route has increased in popularity in last two decades due to its efficacy in providing adequate labour analgesia with less local anaesthetic requirement. The efficacy of PCEA is due to prompt administration of drug and alleviation of anxiety which is often associated with the anticipation of a return of pain.

This technique allowed the patient to control the dose of epidural medication as labour and pain patterns changed. It also allowed for individualization of drug dosage by patient, allowing her to trade off therapeutic effects (e.g. complete pain relief) and side effects (e.g. motor blockade). Thus PCEA has an advantage of less use of local anaesthetics. It also offers an additional benefit of possible reduction in risk of infection, as the frequency for opening the epidural infusion system for additional doses decreases. However, the equipment needed for PCEA may be more expensive than CEI. Also, more time is required to educate both the patient and staff about the appropriate use of the medication and equipment.

Drugs which are most commonly used in Epidural Analgesia are local anaesthetics alone or in combination with opioids or other additives like α2 agonists etc. Bupivacaine in low dose along with an opioid has been one of the most popular choices. Addition of the opioids allows reduction in dose and concentration of bupivacaine without adversely affecting the quality of analgesia. Reduction in dose of bupivacaine significantly reduces the incidence and severity of motor blockade. Opioid use has its own side-effects like pruritus and occasional neonatal respiratory depression.

This study was chosen to compare two commonly employed Epidural Analgesia techniques (PCEA vs CEI), using Ropivacaine with Fentanyl, in primigravida parturients undergoing labour at a teaching institute. All parturients who requested for pain relief and were fulfilling inclusion criteria were invited to participate in this study.

Findings of our study was consistent with those of previous studies that PCEA provides superior labour analgesia as compared to CEI in terms of decreased requirement of local anaesthetics and lesser intervention by Anaesthesiologist.

TOTAL DRUG REQUIRED AND MEAN HOURLY REQUIREMENT

The mean hourly requirement of local anaesthetic gives an indication of efficacy of EA technique. In our study results were similar to previous studies in respect to less total drug requirement in PCEA group as compared to CEI group. The mean hourly dose in PCEA group was 10.10 mg/h (S.D-2.78) as compared to 14.34 mg/h in CEI group. This was a significant difference ($P<0.001$). This shows that PCEA technique provide analgesia comparable to CEI technique with significantly less dose of local anaesthetic, thus reducing risk associated with higher dose of local anaesthetic.

QUALITY OF PAIN RELIEF

Quality of pain relief was assessed using visual analogue score. Both PCEA and CEI groups had adequate pain relief with no significant difference in our study.

MOTOR BLOCKADE

In our study, there was no significant difference in motor blockade between PCEA and CEI group.

CONCLUSION

The following conclusions were drawn from this study:

1. Patient controlled epidural analgesia and continuous epidural infusion, both are reliable and effective method of providing labour pain relief.
2. Using opioids along with local anaesthetics allow for lower concentrations of local anaesthetics thus reducing incidence of motor blockade.
3. PCEA provides similar quality of analgesia as provided by CEI but with lesser requirement of local anaesthetics and opioids.
4. Incidence of instrument assisted delivery and surgical intervention was comparable in both the groups.
5. There is no significant difference between PCEA and CEI groups in hemodynamic parameters and duration of first and second stages of labour.

CONFLICTS OF INTEREST

The authors have none to declare.

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