

Effect of addition of Dexmedetomidine 0.5 MCG/ML with 0.2% Ropivacaine and 0.2% Ropivacaine alone in epidural labour analgesia: a randomized comparative study

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Abstract

Introduction: The pain of childbirth is the most painful experience for many women and maternal request is a sufficient indication for providing her pain relief during labour. The McGill pain questionnaire ranks labour pain scale between cancer pain and amputation of a digit. Labour pain is associated with maternal physiological responses, which are not necessarily beneficial to the foetal well-being. Maternal hyperventilation causes an increase in oxygen consumption, plasma catecholamine concentrations, hypertension and tachycardia. **Materials and Methods:** This prospective, comparative study was conducted at Department of Anaesthesia, Shimoga Institute of Medical Sciences, Shimoga during the period of August 2017 to September 2019, written consent was obtained from all parturients in the study. The sample size obtained was 19 for each group which was rounded up to 30 for each group. So final sample size estimated was 60. **Results:** Looking at figure-1, Demographic and obstetric variables were comparable in both the groups and with no statistical significance which was calculated by independent sample t-test with Levene's test for equality of variances. To assess the neonatal status APGAR score (table 1) at 1 and 5 mins was evaluated. It was found that there was NO statistically significant difference in mean APGAR score at 1 min (p=1.000) and 5 mins (p=0.309). **Conclusion:** Epidural labour analgesia is considered to be a gold standard for pain management during labour, when ropivacaine along with dexmedetomidine is used. Many studies have been conducted to prove the use of dexmedetomidine in obstetric anesthesia in optimal doses. This wonder drug provides excellent maternal satisfaction and good progress of labour with minimal side effects to mother and foetus.

Keywords: childbirth, APGAR, Epidural labour analgesia, ropivacaine.

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Introduction

The pain of childbirth is the most painful experience for many women and maternal request is a sufficient indication for providing her pain relief during labour. The McGill pain questionnaire ranks labour pain scale between cancer pain and amputation of a digit. Labour pain is associated with maternal physiological responses, which are not necessarily beneficial to the foetal well-being[1]. Maternal hyperventilation causes an increase in oxygen consumption, plasma catecholamine concentrations, hypertension and

tachycardia. In addition, maternal hyperventilation may reduce foetal oxygenation, resulting in abnormal foetal heart rate patterns and an increased operative delivery. Superficially, obstetric anaesthesia appears to be a simple field with a limited range of interest, but it is a deceptively demanding subspecialty[2]. The dynamic events of normal labour require that the muscles concerned with delivery retain their power and coordination to the full. Attempts to alleviate pain during labour have been made by different researcher & scientists that ranged from psychological, pharmacological, physical or combination of these techniques but all with limited success[3]. In mid-nineteenth century labour analgesia was popularized across Europe and America after John snow administered Chloroform to Queen Victoria for birth of her 8th child, Prince Leopold (1853)[4]. Several

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methods have been practiced & developed since then for labour analgesia. The contemporary goal of providing maternal labour analgesia is the relief of the suffering and the pain of labour and delivery, while minimizing effects on maternal safety, awareness, motor functions, and progress of labour and foetal well-being. Regional anaesthetic techniques are especially well suited for achieving this goal. Over the past ten years there have been remarkable changes in the field of obstetric anaesthesia[5]. Not only newer techniques such as combined spinal-epidural, continuous epidural infusions, walking epidurals and patient controlled epidural analgesia (PCEA) are now available, Epidural analgesia for labour was maintained either by intermittent boluses or by continuous infusion of the local anaesthetics[6]. Each technique had its own advantages and disadvantages though the purpose remains the same: a painless labour and a healthy neonate. Of all labour analgesia techniques, epidural analgesia is the most effective form of analgesia and has become the “gold standard” in obstetric care. Ropivacaine has been used commonly for epidural labor analgesia, because of less motor block and stable haemodynamics. dexmedetomidine, an alpha 2-agonist for alpha 2-adrenergic receptors, possesses properties of analgesia and sedation without any respiratory depression effect and enhances their effects without increasing the incidence of side effects when added to local anesthetic agents. It has a opioid sparing effect and hence included in labour analgesia to reduce the side effects caused by opioid when added to local anaesthetics. We wanted to compare efficacy, safety, quality of analgesia, total drug requirement, effect on the course and duration of labour, neonatal outcome, maternal satisfaction and adverse events if any, of ropivacaine 0.2% + 0.5mcg/mL of dexmedetomidine with that of 0.2% of ropivacaine alone, for epidural labour analgesia[7].

Materials and methods

This prospective, comparative study was conducted at Department of Anaesthesia, Shimoga Institute of Medical Sciences, Shimoga during the period of August 2017 to September 2019, written consent was obtained from all parturients in the study. The sample size obtained was 19 for each group which was rounded up to 30 for each group. So final sample size estimated was 60. Reference article for sample size calculation is made based on the study conducted by Zhao Y et al Total of 60 parturients of age group 20-35yrs., Heights in cm: >150 cms, full term singleton vertex presentation, previous normal vaginal delivery, consented for the study, Primigravida and multigravida

of physical status ASA grade II, foetus having normal heart rate pattern before induction of Epidural, Cervical dilatation of 3-5 cms were included in group and divided in 2 group using computer generated randomization technique. Group RS received 0.2% ropivacaine epidurally as bolus dose of 8 mL followed by intermittent top ups as and when required and Group RD received 0.2% ropivacaine with 0.5 mcg/mL of dexmedetomidine epidurally 8 mL as bolus dose followed by intermittent top ups as and when required. A complete history of each patient was obtained, and clinical examination was done. Routine investigations along with coagulation profile was obtained and noted. All baseline parameters like Heart Rate, Blood Pressure, ECG, SpO₂, Foetal Heart Rate were recorded. Lignocaine sensitivity test was done. Intravenous access was achieved with 18G intravenous cannula. Preloading was done with ringer lactate solution 10mL/Kg. With Patient in sitting position, her back was cleaned, painted and draped, to achieve and maintain asepsis. A 2 ml Lignocaine 2% of solution was injected locally in L3-L4 space into the skin and subcutaneous tissue. An 18G epidural needle was advanced up to interspinous ligament. A 10cc loss of resistance syringe with 2mL of air in it was attached at the hub of the needle after removing the stylet. The needle was then advanced slowly until loss of resistance felt. An 18G epidural catheter was threaded through the needle and secured in the epidural space with 5cms of length into the epidural space. Following this, needle was removed, and catheter strapped firmly to the back of the patient with an adhesive tape. Distal end of the catheter was covered with a sterile gauge piece and a cover. During this whole procedure care was taken not to advance either the needle or the catheter during contractions as chance of piercing the dura or a blood vessel is maximum during contractions. After fixing the catheter patient was made to lie down with a wedge placed on her left side to avoid aortocaval compression. After negative aspiration for blood and CSF a test dose of 3mL of 2% Lignocaine with adrenaline was administered to confirm epidural placement of the catheter. Maternal heart rate every 5mins in initial half an hour after the drug was administered and thereafter every 30 minutes. Maternal hypotension was considered if fall in blood pressure was 20% or more in comparison to baseline value and it was treated with increased rate of intravenous fluids and if needed injection ephedrine 6mg bolus. Bradycardia (less than 50 beats/minute). It was treated with atropine given in bolus of 0.6mg. The intensity of pain was assessed using a 10 cm visual analogue scale. All patients were made familiar with VAS scoring

system earlier. The patient was asked to point to the position on the line between 1-10 cm to indicate how much pain they were currently feeling. The far-left end indicates 'NO PAIN' and the far-right end indicates 'WORST PAIN'. 0-no pain, 1-3-mild pain, 4-7 moderate pain, 8-10 severe pain. Pain scale was assessed every 5mins after the drug was given and thereafter every 30 minutes on a scale of 0-10. Sensory level was assessed by absence of sensation to pin prick. Foetal heart rate was monitored by obstetrician by using Foetal Doppler. Incidence of motor blockade, hypotension, bradycardia, nausea, vomiting, motor blockade were also looked for and appropriately treated. Neonatal status was assessed by APGAR score at 1 min and 5 mins. Using parameters of Heart rate,

Respiratory rate, Color of the skin, muscle tone and grimace response to stimulus <7 considered significant. The assessment of maternal satisfaction was done by asking the parturient about pain relief and acceptance of this technique in view of rural myths and belief.

Results

Looking at figure-1, Demographic and obstetric variables were comparable in both the groups and with no statistical significance which was calculated by independent sample t-test with Levene's test for equality of variances. To assess the neonatal status APGAR score (table 1) at 1 and 5 mins was evaluated. It was found that there was NO statistically significant difference in mean APGAR score at 1 min ($p=1.000$) and 5 mins ($p=0.309$).

Table 1: Details of APGAR at Baseline and 5 Mins of the Study Population

APGAR	Group RS (N=30)		Group RD (N=30)		P Value
	Mean	SD	Mean	SD	
1 min	8.00	0.37	8.00	0.37	1.000
5 min	8.90	0.30	8.96	0.18	0.309

Table 2: Details of Duration of Labor (Mins) among the Study Population

Variable	Group RS (N=30)		Group RD (N=30)		P Value
	Mean	SD	Mean	SD	
Stage I	163.96	20.62	159.00	15.27	0.294
Stage II	35.93	8.62	37.23	8.79	0.566
Total	199.40	24.63	180.93	21.26	0.003

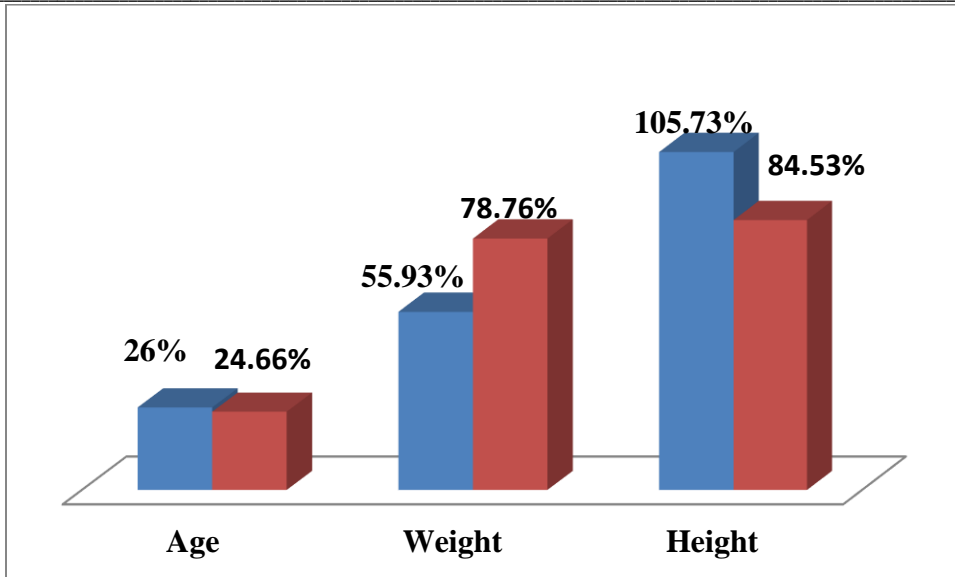


Fig 1: Details of Age (Years), Weight (kg) and Height (cm) of the Study Population

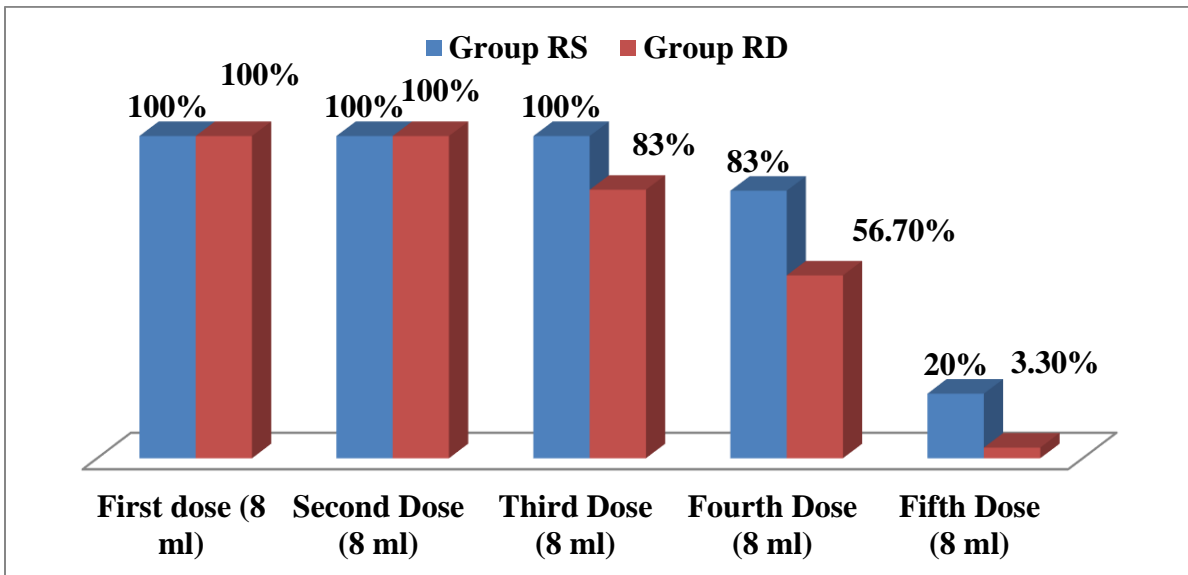


Fig 2A: Distribution of Bolus Requirement among the Study Population

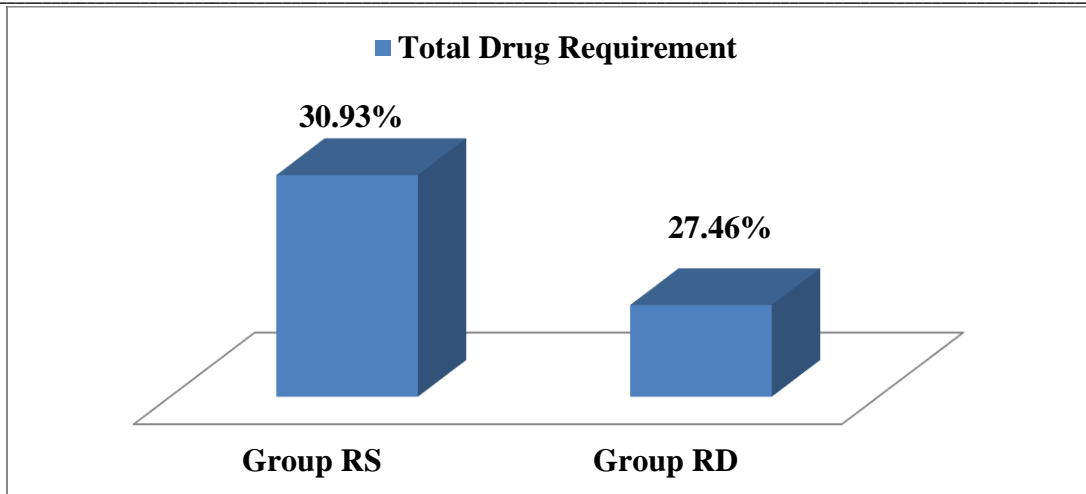


Fig 2B: Comparison of Mean Drug Requirement between the Two Groups

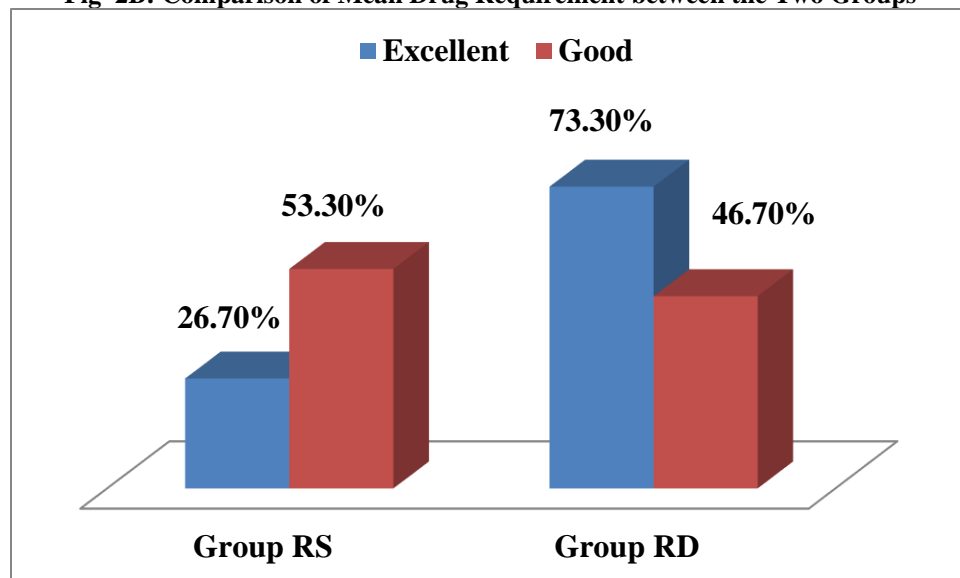


Fig 3: Comparison of Maternal Satisfaction between the Two Groups

Discussion

Labour analgesia is a challenging journey with gratifying end points. Any drug or intervention of the parturient is automatically experienced by the foetus. Labour analgesia has grown from chloroform to the queen in the 19th century to automated central neuraxial delivery devices of the 21st century. The search for an ideal technique or drug continues as it has to produce effective pain control to the mother without any effect on foetus. Ropivacaine has been introduced into obstetric anesthetic practice with the proposed advantage of causing less motor blockade. Previous studies proved that dexmedetomidine could extend the duration of local anesthetics when added as an adjuvant for epidural analgesia[8]. In our study, we found that

dexmedetomidine could decrease the total drug requirement when combined with ropivacaine for labor analgesia without increasing side effects. The present study compared the quality of analgesia, total drug requirement, effects on course and duration of labour, neonatal outcome (APGAR Score), adverse events if any and maternal satisfaction while using intermittent epidural bolus doses of 0.2% ropivacaine and 0.2% ropivacaine plus 0.5 mcg/ml dexmedetomidine. S. Fyneface-Ogan et al, studied the role of dexmedetomidine in labour outcome when added as adjuvant with intrathecal bupivacaine in comparison with fentanyl in bupivacaine. There was no significant difference in Apgar score and umbilical venous blood pH in both the group's also foetal heart rates and

maternal blood pressure were unchanged after injection of drug in both the groups. Similar trends of foetal heart rate were seen in our study. Yu et al in their in vivo study evaluated role of dexmedetomidine in cesarean section under general anaesthesia and its effects on foetus, placental transfer and foetal metabolism was noted to provide a reference for the clinical use of dexmedetomidine. The rate of placental transfer of dexmedetomidine was 0.76, as dexmedetomidine is retained in placenta and hence very negligible amount is transferable. In our study most significant findings were less total drug requirement in ropivacaine with dexmedetomidine group than in plain ropivacaine group[9]. Tao Zang et al concluded that dexmedetomidine is better than sufentanil in terms of analgesic effect and low drug requirement. Zang li et al investigated the effective median concentration EC50 of epidural ropivacaine for labour analgesia when combined with 0.5 mcg/mL of dexmedetomidine. The study inferred that effective analgesia was decided by VAS score <3 within 30 mins after epidural infiltration and next patient concentration of ropivacaine were divided by analgesic effect of previous patient under epidural anesthesia. EC50 of epidural ropivacaine for labour analgesia with or without 0.5mcg/mL dexmedetomidine were 0.062% and 0.0835% respectively that is the concentration of ropivacaine is decreased when combined with dexmedetomidine without any side effects[10]. In our study we found the duration of labour was less in RD group as compared to RS group. Similar study was performed by Wang Jun et al[14] where 0.1 % ropivacaine plus 0.5mcg/mL dexmedetomidine and 0.1 % ropivacaine with normal saline for labour analgesia was compared, setting background infusion of 10 mL/hr. after 1st bolus dose of 10 mL bolus drug of study group. They found that total duration of labour was shorter in ropivacaine plus dexmedetomidine group than plain ropivacaine group as dexmedetomidine intensifies contractions of uterus and helps in rapid progression of labour.

Conclusion

Epidural labour analgesia is considered to be a gold standard for pain management during labour, when ropivacaine along with dexmedetomidine is used.

Conflict of Interest: Nil

Source of support: Nil

Many studies have been conducted to prove the use of dexmedetomidine in obstetric anesthesia in optimal doses. This wonder drug provides excellent maternal satisfaction and good progress of labour with minimal side effects to mother and foetus.

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