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Comparative study of epidural 0.75% ropivacaine with dexmedetomidine and 0.75% ropivacaine alone in lower limb and lower abdominal surgeries

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Abstract

Various adjuvants are being used with local anesthetics for prolongation of intra operative and postoperative analgesia in epidural block for lower limb and lower abdominal surgeries. Dexmedetomidine, the highly selective α_2 adrenergic agonist is a new neuroaxial adjuvant gaining popularity. The aim of the present study was to compare the hemodynamic, sedative and analgesia potentiating effects of epidurally administered dexmedetomidine when combined with ropivacaine. A double-blind, randomized prospective study was conducted on 60 ASA Grade I and II patients with age group 20-60yrs who were posted for lower limb and lower abdominal surgeries under epidural anesthesia. All patients were randomly allocated into two groups of 30 each using computer generated random numbers by simple randomization technique.

Keywords: Dexmedetomidine, Ropivacaine, Epidural

Introduction

Epidural anesthesia is one of the most common regional anesthetic techniques used for lower abdominal and lower limb surgeries. The advantages of epidural anesthesia being, it provides effective surgical anesthesia and can meet the extended duration of surgical needs, provides prolonged post-operative analgesia, reduces the incidence of hemodynamic changes ^[1].

Various adjuvants are being used with local anesthetics for prolongation of intra operative and postoperative analgesia in epidural block for lower abdominal and limb surgeries ^[2]. Dexmedetomidine, highly selective, α_2 adrenergic agonist is new neuroaxial adjuvant gaining popularity. Various adjuvants are being used with local anesthetics for prolongation of intra operative and postoperative analgesia in epidural block for lower limb and lower abdominal surgeries. Dexmedetomidine, the highly selective α_2 adrenergic agonist is a new neuroaxial adjuvant gaining popularity. The aim of the present study was to compare the hemodynamic, sedative and analgesia potentiating effects of epidurally administered dexmedetomidine when combined with ropivacain ^[3, 4].

Methodology

A double-blind, randomized prospective study was conducted on 60 ASA Grade I and II patients with age group 20-60yrs who were posted for lower limb and lower abdominal surgeries under epidural anaesthesia. All patients were randomly allocated into two groups of 30 each using computer generated random numbers by simple randomization technique. GROUP R patients-15ml of 0.75% Ropivacaine with 1ml normal saline. GROUP RD patients-15ml of 0.75% Ropivacaine with 0.6mcg/kg dexmeditomidine diluted with 1ml normal saline. Following variables were studied-onset and duration of sensory and motor block, duration of analgesia and duration of two segment regression. Student's unpaired t- test was applied for statistical data analysis and $P < 0.05$ is considered statistically significant.

Exclusion Criteria

- Patients with ASA 3 and above,
- Patient refusal
- Allergy to study drugs

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- Patients with altered coagulation profile
- Patients with neurological disorders
- Patients with spine deformities

Study Subjects

All patients were randomly allocated into two groups of 30 each using computer generated random numbers by simple randomization technique. GROUP R patients-15ml of 0.75% Ropivacaine with 1ml normal saline. GROUP RD patients-15ml of 0.75% Ropivacaine with 0.6mcg/kg dexmedetomidine diluted with 1ml normal saline

Procedure

- Patients has undergone routine pre-anaesthetic evaluation, a day before surgery.
- In the operating room, all patients were monitored with ECG, pulse oximeter, non-invasive blood pressure monitor.
- Baseline measurement of heart-rate (HR), noninvasive blood pressure and SpO₂ were recorded before the block was performed.

With the patients in sitting position under aseptic precautions, epidural space was identified by loss of resistance technique to air using 18G Tuohy needle via the midline approach at either L2-3 or L3-4 inter spinous space.

An epidural catheter was threaded and fixed at 3 cms inside the epidural space.

A test dose of 3 ml of 2% lignocaine with 1:200000 adrenaline was injected through the catheter after aspiration. After ruling out intrathecal and intravascular placement of the tip of the catheter, study drug was injected in increments of 5ml. The patients were turned to supine position after 1 min. Sensory blockade was assessed using a short bevel 22 gauge needle and was tested in the mid clavicular line on the chest, trunk and lower limbs on either side. Motor blockade in the lower limbs was assessed using modified Bromagescale. Assessment of sensory and motor blockade were done at the end of each minute with the patient in supine position after completion of the injection of 15ml of the study drug, which is taken as the starting time. The onset time for sensory and motor block, the maximum level of sensory block, intensity of motor block and sedation score were recorded.

Statistical Analysis

Student's unpaired t-test and ANOVA were applied for statistical data analysis P < 0.05 is considered statistically significant.

Results

Table 1: Baseline Characteristics

Block characteristics	Group-R (n=30) (M±SD)	Group-RD (n=30) (M±SD)	P Value
Mean Onset of sensory blockade (min)	10.04±2.5	7.26±1.4	<0.05
Mean Onset of motor blockade (min)	15.36±3.2	9.20±2.6	<0.05
Mean Duration of two segment regressions(min)	96.5±5.88	165.57±16.8	<0.05
Mean Duration of motor blockade (min)	139±14.2	218±9.87	<0.05
Mean Duration of analgesia(min)	198±24.08	300.5±26.11	<0.05

In our study, the drugs selected for epidural anaesthesia were Ropivacaine and dexmedetomidine. Ropivacaine, has structural similarity to bupivacaine. Without cardiotoxic effects of bupivacaine, has been introduced to Indian market recently.

Discussion

In this study, the hypothesis that dexmedetomidine interacts with ropivacaine for epidural administration, improving the characteristics of anaesthesia was assessed.

In our study, the drugs selected for epidural anaesthesia were Ropivacaine and dexmedetomidine. Ropivacaine, has structural similarity to bupivacaine. Without cardiotoxic effects of bupivacaine, has been introduced to Indian market recently. Dexmedetomidine has been studied by various authors as an adjuvant to epidural local anaesthetic. 13-20 Few studies have compared ropivacaine and dexmedetomidine for epidural anaesthesia in India.

Hence ropivacaine and dexmedetomidine combination was selected for our study to compare with ropivacaine alone. Presynaptic activation of alpha-2 Adrenoceptor in the locus ceruleus inhibits the release of nor-epinephrine and results in the sedative and hypnotic effects [4].

In addition, the locus ceruleus is the site of origin for the descending medullospinal noradrenergic pathway, known to be an important modulator of nociceptive neurotransmission [5]. Stimulation of alpha-2 adrenoceptors in this area terminate the propagation of pain signals leading to

analgesia. Postsynaptic activation of alpha-2 receptors in the CNS results in decrease in sympathetic activity leading to hypotension and bradycardia [6, 7].

According to the results, we found that there was a significant difference in the onset of sensory and motor block with the addition of dexmedetomidine to ropivacaine group compared to ropivacaine alone. It was found that, with the administration of dexmedetomidine, there was a significant increase in the duration of analgesia. There was also enhancement of the intensity of motor block and greater duration of blockade by dexmedetomidine.

Hence addition of dexmedetomidine to ropivacaine provides better operating and haemodynamic conditions, with significant postoperative analgesia without increasing the morbidity.

Conclusion

Addition of 0.6mcg/kg dexmedetomidine to 15ml of 0.75% ropivacaine for epidural anaesthesia of lower limb and lower abdominal surgeries will prolong duration of analgesia, motor blockade, time to two segment regression, with faster onset of sensory and motor blockade and is associated with minimal side effects like bradycardia and hypotension.

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