

Comparison Of Epidural Dexmedetomidine And Neostigmine Used As Adjuvant To Ropivacaine In Lower Limb Surgeries

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ABSTRACT

INTRODUCTION: Various adjuvants including α -2 adrenergic agonist have been used to prolong the action of local anaesthetics in epidural anaesthesia. Now a days dexmedetomidine is most commonly used adjuvant in epidural anaesthesia but still it may produce side effects like hypotension and bradycardia. There is limited study on efficacy of epidural dexmedetomidine and neostigmine used as adjuvant to ropivacaine in lower limb surgeries.

MATERIALS AND METHODS: This was a prospective, randomised and single blind study conducted on 100 patients divided in 2 groups viz. Group RD and RN. This study was conducted in Department of Anesthesia, Mahatma Gandhi Memorial Medical College, Jamshedpur, Eastsingbhum, Jharkhand from December 2016 to December 2017. Group RN received 15 mL of 0.75% ropivacaine with 5 microgram/kg Inj. Neostigmine while Group RD received 15 mL of 0.75% ropivacaine with 1 microgram/kg of Inj. Dexmedetomidine.

RESULTS: Dexmedetomidine emerged as superior drug when compared to neostigmine as an adjunct with epidural ropivacaine 0.75% for patients undergoing lower limb surgery because it provides faster onset of anaesthesia, better intraoperative and postoperative analgesia and prolonged duration of motor and sensory blockade without significant increase in adverse effects.

CONCLUSION: Dexmedetomidine is a superior additive to ropivacaine compared to neostigmine. Dexmedetomidine provides prolonged postoperative analgesia, earlier onset of sensory and motor block with minimal side effects.

KEY WORDS: Dexmedetomidine, Neostigmine, epidural ropivacaine.

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I. Introduction:

Epidural analgesia is one of the common method of postoperative pain management. It provides hemodynamic stability, reduce perioperative stress response, enables early mobilization and reduce incidence of thromboembolic events.¹ Bupivacaine is the most common local anesthetic agent used in epidural route but due to its cardiac side effects ropivacaine is being used more now a days. Ropivacaine produces lesser motor blockade compared to bupivacaine thus making it suitable for postoperative pain management.² Various additives have been used for extending the duration of epidural block to prolong the effect of ropivacaine which helps in reducing total required dose of ropivacaine. These include drugs like opioids, midazolam, neostigmine and α 2 adrenergic agonists like clonidine and dexmedetomidine which have their own side effects.³ Dexmedetomidine is a highly selective α 2 adrenergic agonist with analgesic, anxiolytic, sedative, perioperative sympatholytic and anti hypertensive properties. It also enhances action of local anaesthetics and increases the duration of post operative analgesia, but it can produce side effects like bradycardia and hypotension.⁴ N-methyl-D-Aspartate (NMDA) receptor antagonist plays a significant role in blocking central hypersensitivity and pain. As an NMDA receptor antagonist, ketamine may be used as additive to local anaesthetic agents for post operative pain relief. Epidural ketamine produces analgesia at spinal cord level without systemic side effects.⁵ There is very little information in literature regarding use of ketamine in epidural route. Hence, we have done this study to compare ropivacaine with dexmedetomidine and ropivacaine with neostigmine in epidural anesthesia for lower abdominal and lower limb surgeries. The primary outcome of our study was to find out duration of postoperative analgesia and the secondary outcome of our study was to compare sensory and motor block characteristics, hemodynamics and side effects.

II. Materials And Methods:

This is a prospective, randomized and single blinded study conducted on 100 patients divided in 2 groups viz. Group RD and RN.

Inclusion Criteria:

- Patients of grade ASA I and II,
- Scheduled for elective lower abdominal and lower limb surgery
- Age between 20 to 50 years.

Exclusion Criteria:

- Patient refusal,
- Patients with significant cardiovascular disease, renal failure, hepatic dysfunction and chronic pulmonary disease, obesity (BMI>30 Kg/m2),
- Patients with known contraindications to epidural anaesthesia drug,
- History of allergy or sensitivity to any of the study drugs.

The enrolled patients were randomized in two groups of 50 each (n=50) using random number table. Medications were prepared in a 15-ml syringe labelled as “study drug” to maintain blinding. All physicians, patients, nursing staff, and data collector were blinded to the patient group assignment. Group-RN (n=50)- Received 15 mL of 0.75% ropivacaine with 5 microgram/kg inj. Neostigmine. Group-RD (n=50)- Received 15 mL of 0.75% ropivacaine with 1 microgram/kg of injection Dexmedetomidine.

The patients were visited a day before surgery for preanaesthetic check-up and standard pre-operative advice was given. On the day of surgery, patients were wheeled in operation theatre and non-invasive monitors like pulse oximeter, non-invasive blood pressure (NIBP) and ECG were attached. The baseline parameters were recorded. Inside the Operation Theatre, 18 G IV access was secured and Ringer’s lactate was commenced @ 5-8 mL/minute. Patients were made to sit and under strict aseptic precautions, 18G Tuohy needle was inserted into L2-L3 interspinal epidural space. Epidural space was confirmed by loss of resistance method and catheter was inserted and fixed between 9 and 10 cm mark. After institution of test dose (3 mL inj. Xylocaine 0.5% with adrenaline, haemodynamic parameters were be recorded at baseline (T0), immediately after study drug is given (T1), every 5 minutes there after till 15 minutes and then every 15 minutes thereafter till end of surgery. Other parameters such as onset and height of sensory block and onset of motor block were also recorded. Sensory blockade was assessed using pinprick sensation in mid-axillary line bilaterally. The onset of sensory block was considered at T10 and surgical procedure was initiated after establishment of adequate surgical analgesic effect with level of up to T7-T8 dermatome Patients who experienced pain in the intra op period were excluded from the study, while the Modified Bromage scale was used to measure motor blockade.

III. Results:

The groups were comparable with respect to age, sex, height, weight, ASA physical status class, and duration of surgery. There was no significant difference in the type of surgery.

Parameter	Group RD(N=50) Mean±SD	Group RN(N=50) Mean±SD	P value
Age (years)	43.5±8.07	47.5±8.96	0.36
Sex	34:16	36:14	0.78
Weight (kg)	54.36±12.6	54.36±12.6	0.53
Height (cm)	154.5±8.25	156.76±9.57	0.40
BMI (Kg/mm2)	26.6±3.25	28.3±4.25	0.30
ASA(I/II)	38/12	37/13	1.0
Mean duration of surgery (min)	89.56±14.2	95.43±15.9	0.33

Table 1: Patient demographic characteristics

Parameter	Group RD(N=50) Mean±SD	Group RN(N=50) Mean±SD
Heart rate base per min	83.20±12.4	100.03±12.6
SBP base (mm hg)	130.26±10.7	130.43±12.0
DBP base (mm hg)	84.76±8.0	80.34±7.0
MAP base (mm hg)	80.70±6.4	81.67±4.8

Table 2: Baseline characteristics in both groups

Parameter	Group RD(N=50) Mean±SD	Group RN(N=50) Mean±SD
Pulse per min	80.20±9.3	85.63±10.9
Mean arterial blood pressure (per minute)	75.26±7.6	75.95±7.6
Systolic blood pressure (per minute)	116.76±9.4	114.34±4.0
Diastolic blood pressure (per minute)	75.05±6.3	74.67±5.9

Table 3: Intraoperative Mean of Haemodynamic Parameters of Both Groups

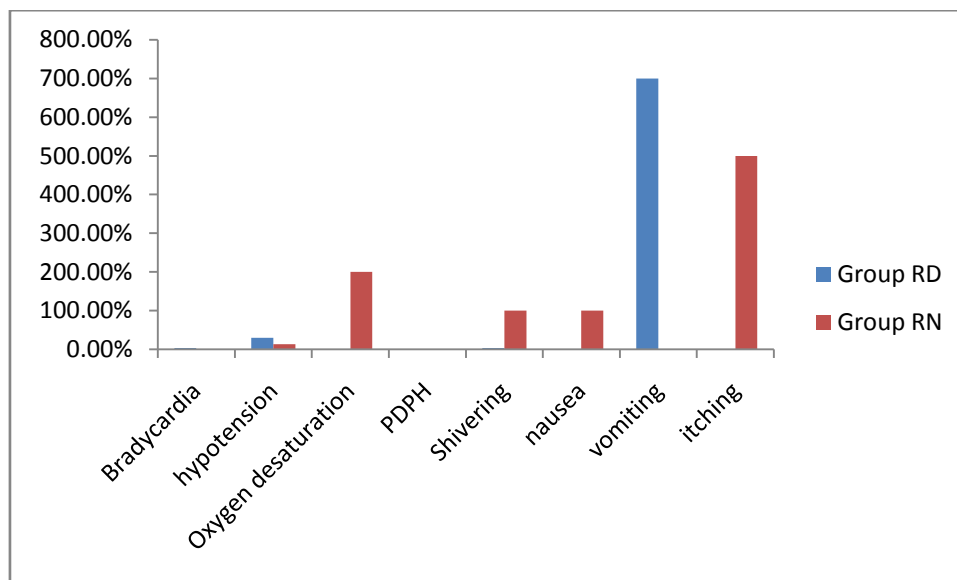


Figure 1: Adverse drug reactions in both groups

IV. Discussion:

Nowadays, a lot of adjuvants are used with local anesthetics in the epidural anesthesia. Primary aim of these adjuvants is to fasten the onset and prolong the sensory and motor block and produce adequate sedation, analgesia and patient satisfaction without any side effect. The pharmacologic properties of α -2 agonists like dexmedetomidine have been used extensively in various routes. Epidural administration of these drugs is associated with sedation, analgesia, anxiolysis, hypnosis and sympatholysis. The faster onset of action and prolonged duration of analgesia make it a very effective adjuvant to local anesthetics in regional anesthesia. But it can produce side effects like bradycardia and hypotension in some patients.⁹ Ketamine a (NMDA antagonist) can cause hypertension and tachycardia when used intravenously.¹⁰ We have compared epidural ketamine with dexmedetomidine to study the efficacy in prolonging the duration of analgesia and found that duration of analgesia was prolonged in group RD compared to group RK which was also supported by few other studies.

In our study, it was found that establishment of complete motor blockade was faster in Group RD when compared to Group RN ($p < 0.001$) which is statistically significant. Liu et al studied dose-response effects of spinal neostigmine added to bupivacaine spinal anaesthesia and found that the addition of 50 microgram neostigmine significantly increased the duration of motor block.

In our study, the duration of analgesia was significantly longer in Group RD when compared to Group RN ($p < 0.001$). However, from this it is observed that addition of additives like neostigmine and dexmedetomidine intensifies the motor blockade.

V. Conclusion:

Dexmedetomidine is a better adjuvant to neostigmine when used with epidural ropivacaine. It provides early onset of sensory and motor block and prolonged postoperative analgesia. Hemodynamics was stable in both groups. Side effects including sedation were comparable in both groups.

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