Original Research Article

An observational study to evaluate dexmedetomidine and preservative free ketamine for epidural analgesia for lower limb orthopaedics surgery

Surendra Raikwar[1], Rajni Thakur[2], Shaifali Khandelwal[3*], Shikha Mehrotra[4]

[1]Professor, Department of Anaesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India
[2]Associate Professor, Department of Anaesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India
[3]Junior Resident 3rd Year, Department of Anaesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India
[4]Professor and Head, Department of Anaesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India

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Abstract

Background: The technique of epidural anesthesia and analgesia have become widespread following their introduction and acceptance by the patients in surgical and obstetric practice. Adjuvants to bupivacaine have been used to enhance good quality perioperative and postoperative anesthesia and analgesia. **Aim**: The aim of the study is to evaluate the effect of post operative analgesia after epidural dexemedetomidine and preservative free ketamine for lower limb orthopaedics surgery. **Method**: This prospective, single centre, observational study includes 60 patients of ASA grade 1 and 2 for lower limb orthopaedics surgeries. Each group was given 14 mg 0.5% hyperbaric bupivacaine via spinal anaesthesia. Group A received bolus dose 1 µg/kg dexmedetomidine diluted to 5 mL in normal saline (NS) and Group B received bolus dose 0.5 mg/kg ketamine diluted to 5 mL in NS through epidural catheter. The epidural infusion was started 1 h after starting surgery. Group A received bupivacaine 0.125% with dexmedetomidine (1 µg/mL) and Group B received bupivacaine 0.125% with PF ketamine (0.5 mg/mL). **Result**: Time of receding of sensory and motor blockade was more with dexmedetomidine than with preservative free ketamine ($p<0.05$). Also the requirement of rescue analgesia needed is less with dexmedetomidine (2.2±0.52) than with ketamine (3.4 ±0.47) and the difference was statistically significant ($P = 0.0001$). **Conclusion**: Dexmeditomedine was to be more effective and superior as compared to preservative free ketamine as an adjuvant to enhance effect of bupivacaine for epidurals.

Keywords: epidural, analgesia, dexmedetomidine, preservative free ketamine

Introduction

Lower Limb orthopaedic surgeries are intensely painful, so post-operative analgesia is an integral part of patient care for early rehabilitation and mobility. Local anaesthetics with epidural additives ideally should provide stable haemodynamics and prolonged analgesia. We conducted a study of continuous epidural infusion of bupivacaine plus dexmedetomidine comparing with bupivacaine plus preservative-free (PF) ketamine in patients undergoing lower limb surgeries to assess the quality of post-operative analgesia.

Materials and methods

We undertook prospective, single centre, observational study of patients undergoing lower limb orthopaedic surgery and was conducted in department of Anaesthesiology, GMC Bhopal and assessing duration of post operative analgesia after epidural dexemedetomidine and preservative free ketamine for lower limb orthopaedics surgery. Institutional ethics committee approval was obtained. Written informed consent was obtained and patient related confidentiality was maintained.

For this analysis we included all 60 patients of ASA grade 1, 2 posted for lower limb orthopaedic surgery with age ranging from 18-60 years undergoing combined spinal with epidural anaesthesia. Patient refusal, ASA grade III and IV, patients on anti-coagulation treatment (INR >1.5), patients with infection at the site of injection, with coagulopathy, bleeding diathesis, congenital abnormalities of lower spine and meninges, spine/neurological deformity, history of allergy to local anesthetics or alpha-2 adrenergic agonists, any drug allergy, uncontrolled systemic illness like diabetes mellitus, hypertension, uncorrected hypovolemia, any severe liver or kidney diseases were excluded from analysis.

After pre-anaesthetic checkup and a written informed consent a common standard anaesthetic regimen was followed for all the patients who included lignocaine sensitivity test. Relevant patient data recorded during the initial assessment included clinical history, height, weight, maternal age and urgency of surgery, thorough physical and systemic examination, routine investigation which includes complete blood count, urine (routine and microscopy), blood sugar, renal function test, serum electrolytes, X-ray chest PA view, ECG and any special investigation if required was done for the study. BMI was noted, NBM (nil by mouth) status was confirmed and anti-aspiration prophylaxis was taken.

Standard preanesthetic assessment was done and procedure was explained to the patient. After intravenous access, application of standard monitors, preloading with ringer lactate and premedication combined spinal-epidural (CSE) anaesthesia was performed using CSE set at L3-L4 interspace. A 16G epidural catheter was inserted and fixed such that 5 cm remained in the epidural space 14 mg hyperbaric bupivacaine was injected in subarachnoid space. At the start of the surgery, Group A received bolus dose 1 µg/kg dexmedetomidine diluted to 5 mL in normal saline (NS) and Group B received bolus dose 0.5 mg/kg ketamine diluted to 5 mL in NS through epidural catheter. The epidural infusion was started 1 h after starting surgery. Group A received bupivacaine 0.125% with dexmedetomidine (1 µg/mL) and Group B received bupivacaine 0.125% with PF ketamine (0.5 mg/mL). Haemodynamics were monitored from the pre-operative period up to 24 h post-surgery.

*Correspondence
Dr. Shaifali Khandelwal
Junior Resident 3rd Year, Department of Anaesthesiology, Gandhi Medical College, Bhopal, Madhya Pradesh, India
E-mail: khandelwalshaifali13@gmail.com

Parameters monitored

Receding time for sensory block: pain sensation to pin-prick perceived at L5

Receding time for motor block: Modified Bromage scale in non-operated limb

Number of times rescue analgesia needed.

Changes in haemodynamics were defined as: HR <60/min or >110/min, systolic blood pressure (SBP) >150 mmHg or <90 mmHg and diastolic blood pressure (DBP) >100 mmHg or <60 mmHg. Rescue analgesia requirement was noted and side effects if any were addressed accordingly.

Statistical Analysis

Mean and standard deviation of the quantitative variables like age, duration of surgery, systolic blood pressure, diastolic blood pressure and heart rate for both groups, were determined. Categorical variables were compared between groups via Chi-Square testIndependent sample t test was used to compare percentage changes in mean heart rate, systolic and diastolic blood pressures between groups. $p<0.05$ was considered significant.

Results

Demographic profile was comparable among both groups which included 30 in each group of which all of them completed the study with no dropouts.

We observed that change in HR, SBP and DBP between groups was statistically insignificant.

Receding time for sensory block (pain sensation to pin-prick perceived at L5) in Group A was 10.2 ± 4.5 h and in Group B was 7.5 ± 3.5 h. The mean duration of sensory block was compared between the groups and the difference was statistically significant (P = 0.01).

Receding time for motor block (Modified Bromage scale in non-operated limb) in Group A was 6.8 ± 3.53 h and in Group B was 4.2 ± 2.1 h. The mean duration of motor block was compared between the groups and the difference was statistically significant (P = 0.001).

Also the number of times rescue analgesia needed for Group A is2.2±0.52 and for Group B is 3.4 ± 4.7 and the difference was statistically significant (P = 0.0001).

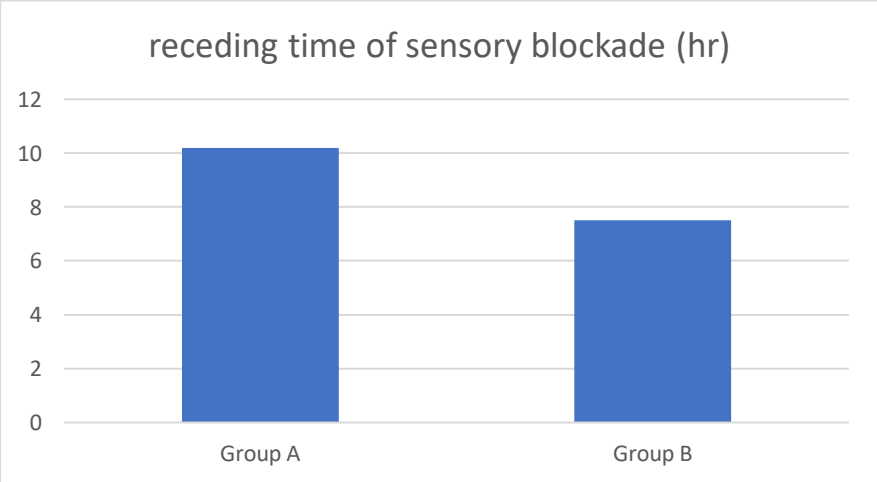
Discussion

Epidural infusion maintains steady concentration of drug in CSF thus leading to leading to lesser incidences of breakthrough pain.

Dexmedetomidine is known to cause slight decrease in BP and modest reduction in HR while ketamine causes hypertension and tachycardia. This study did not find any significant difference in haemodynamic variables.Statistically significant difference was observed for requirement of rescue analgesia (P = 0.0001) Epidural dexmedetomidine causes prolonged post-operative analgesia and lowers consumption of local anaesthetic postoperatively. Studies with ketamine concluded that epidural ketamine is useful for post-operative pain relief and the superior dose is 0.5 mg/kg without much side effects.The study observed that dexmedetomidine with bupivacaine prolongs the duration of both sensory and motor blockade thus increasing the duration of post-operative analgesia. Furthermore, epidural ketamine as pre-emptive analgesic increased the time between first and second analgesic dose thus prolonging the duration of post-operative analgesia.

Table 1:Parameters assessed during study

Parameters	Group A	Group B	P
Gender (m/f)	21/9	19/11	0.405
Age (years)	44±12.2	42±13.6	0.5
Weight (kg)	56.4 ±8.2	57.6 ±6.28	0.5
No.of rescue analgesia	2.2±0.52	3.4±0.57	.0001*
Receding time of sensory blockade (h)	10.2±4.5	7.5±3.5	0.01*
Receding time of motor blockade(h)	6.8±3.53	4.2±2.1	0.001*
Change in HR			
(no change)	22	23	0.766
(change)	08	07	
Change in SBP			
(no change)	24	22	0.542
(change)	06	08	
Change in DBP			
(no change)	22	22	1.000
(change)	08	08	



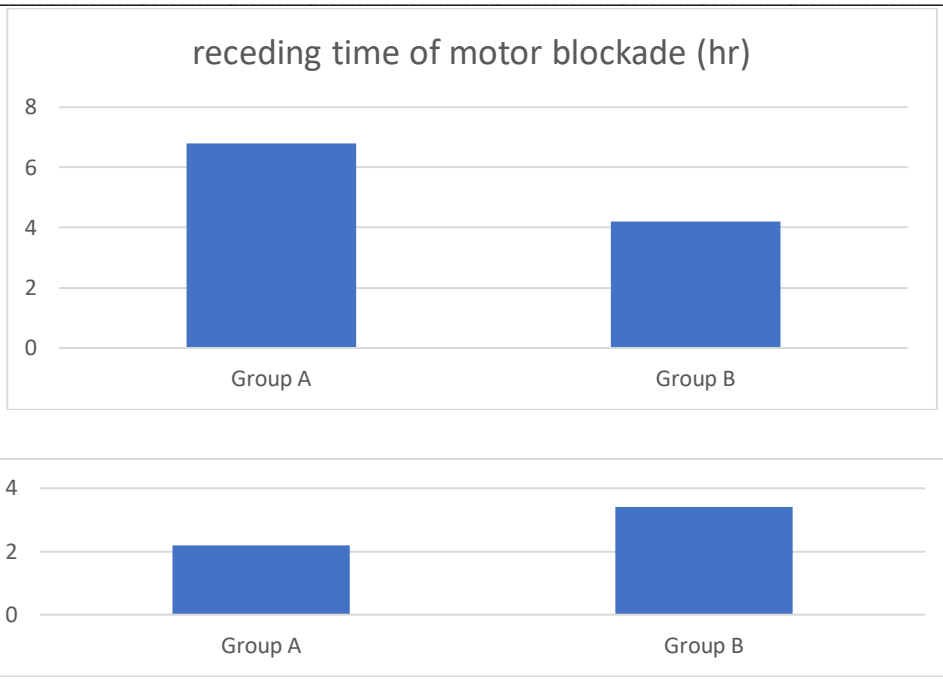


Fig 1:Requirement of rescue analgesia

Conclusion

In this study we found that Dexmedetomidine as an adjuvant to epidural bupivacaine infusion results in decrease in requirement of rescue analgesia, increase in duration of sensory and motor blockade with minimum haemodynamic alterations compared to PF ketamine as an adjuvant to epidural bupivacaine.

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