Original Research Paper

Volume-8 | Issue-4 | April-2018 | PRINT ISSN No 2249-555X

Anesthesiology

A COMPARATIVE STUDY OF ANALGESIC EFFICACY OF INTRATHECAL DEXMEDETOMIDINE 5mcg AND 10mcg AS ADJUVANTS TO BUPIVACAINE IN SPINAL ANESTHESIA FOR LOWER LIMB ORTHOPAEDIC SURGERIES

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ABSTRACT

Background: Dexmedetomidine a selective α2 adrenergic agonist is gaining popularity as adjuvant to spinal anesthesia
Aim: The purpose of study was to compare two different doses of dexmedetomidine in terms of onset of action, duration of sensory and motor block, hemodynamic effects and adverse effects
Methods : 60 patients were recruited and randomly divided into 2 groups.
Group A- Dexmedetomidine 5mcg.
Group-B: Dexmedetomidine 10mcg and received 5mcg and 10 mcg respectively in combination with bupivacaine through intrathecal route. Duration of spinal anaesthesia, sedation score and complications were noticed and recorded in both groups.
Results: There was an increase in duration of sensory block with increase in dose as it was 6.12 ± 1.2 in Group B and 6.02 ± 0.5 in Group A. However neither statistical nor clinical significance between the 2 groups was observed (P>0.05). On other hand there was neither statistical nor clinical significance regarding onset, recovery time or complications.
Conclusion: Dexmedetomidine 5mcg seems to be an attractive alternative when compared to 10 mcg as an adjunct to spinal bupivacaine in lower limb orthopaedic surgeries.

KEYWORDS :

INTRODUCTION

Spinal anesthesia provides excellent analgesic effect by inhibiting nociceptive transmission from peripheral to central nervous system .The advantages of spinal anesthetic agents includes blunting the stress response to surgery, decrease of intraoperative blood loss, lower incidences of thromboembolism and reduction in pulmonary complications. However due to relatively short action of duration of currently available local anesthetics, these advantages can be limited. Various adjuvants have been used with local anaesthetics for prolongation of intraoperative and postoperative analgesia like opioids, clonidine, midazolam. Dexmedetomidine is a new highly selective alpha 2 adrenergic agonists provides stable hemodynamic conditions and good quality of intraoperative and post operative analgesia with minimal side effects. Pre-emptive analgesic and decrease the incidence of post operative nausea and vomiting. Different doses of intrathecal dexmedetomidine from 2.5 to 15 mcg have been stride to prolong duration of spinal anesthesia.

In this randomized controlled double blind study we strived to explore the effective analgesic dose of dexmedetomidine that will prolong the duration of spinal anesthesia to a clinical significance with minimal adverse side effects.

METHODS

After obtaining approval from the institutional ethics committee and informed written consent 60 adults patients between 20 and 60years of age and ASA physical status 1,2 with body mass index 40kg/m2 or below, presenting for lower limb orthopaedic surgeries were enrolled in this prospective randomized double blinded study done between April 2017 and February 2018.

Exclusion criteria were any gender below age of 20 and above 60 years, Body Mass Index >40kg/m2, patients refusal, coagulopathy, allergy to used drugs, patients on alpha 2 adrenergic antagonists, calcium channel blockers, ACE-Inhibitors or with arrhythmias, heart blocks.

All patients that were included were randomized using computer generated random number table to 2 groups.

Group A: To receive 5mcg dexmedetomidine

Group B: To receive 10 mcg dexmeditomidine and the procedure was double blinded to both the patients and the one who made follow up (technician and intern)

Before surgery patients were given instructions to use a 10 points verbal rating scale (VRS) with 0 Indicating no pain and 10 indicating the worst imaginable pain. Demographic variables such as age, gender, weight were recorded. An 18G intravenous line was inserted and 15ml/kg of lactated Ringer's solution was given to each patient and monitors were connected and baseline values of blood pressure, heart rate, and oxygen saturation (spo2) recorded. Sedation was assessed using Ramsay sedation score and baseline sedation score was noted with patients in sitting position. Back sterilized with povidone iodine and rubbing alcohol. Lumbar puncture was performed at L3-L4 interspace or L4-L5inter space.

Group A received intrathecal 0.5% hyperbaric bupivacaine 15mg (3ml) with injection dexmedetomidine 5mcg (0.5ml of injection dexmedetomidine). Dexmedetomidine 100mcg/ml was diluted with normal saline to 5ml (10mcg/ml) and 0.5ml of this solution was added to 3ml of bupivacaine with a 1 ml syringe.

Group B received 3ml (15mg) of intra the cal 0.5% hyperbaric bupivacaine with injection dexmedetomidine 10mcg (0.5ml of injection of dexmedetomidine)

After injecting the drug, patients were kept in supine position immediately with continuous recording of vitals. Intra operatively heart rate, blood pressure (systolic, diastolic, mean) oxygen saturation (spo2), respiratory rate, were recorded every 2 minutes for the first 10mins then every 5mins till the end of surgery . The patients in both groups were looked for the following outcomes. Duration of spinal sensory blockade, the onset, duration of motor blockade, the level of sedation, hemodynamics, complications (hypotension, nausea, vomiting, allergy) any adverse effect specified by the patient.

Duration of the block was considered as the time from solid and stable sensory block to time of 2 segment regression using the skin prick every 5mins, while the onset of block was considered as the time elapsed from the needle withdrawl to the time with a full sensory block with stational sensory level.

Sensory block was assessed using loss of temperature discriminations to cold swab every 2mins till stable sensory level for 20mins

Motor block was assessed using Breen's Modification of bromage scale

1. Complete block ,unable to move feet or knees
2. Almost complete block able to move feet only

3. Partial block just able to move knees
4. Detectable weakness of hip flexion
5. No detectable weakness of hip flexion while supine, full flexion of knees
6. Able to partial knee bend in standing position

Sedation was assessed using Ram say scale
1. Patient anxious ,agitated or restless
2. Patient co operative, oriented and tranquil, alert
3. Patient responds to commands
4. Asleep, but with brisk response to light glabellar tap or loud auditory stimulus
5. Asleep, sluggish response to glabellar tap or loud auditory stimulus
6. Asleep no response.

Hypotension was considered as 20% reduction of the mean arterial pressure from the baseline and was treated with ephedrine increments 6mg each. Inj. diclofenac sodium 75mg intramuscular was administered when verbal rating scale was more than 4.

Bradycardia defined as heart rate of 50 beats/min or less was treated with boluses of 0.6mg injection atropine.

Statistical analysis

Data obtained were tabulated and analysed using statistical package for social science (SPSS 15.0 evaluation version). To calculate the sample size, a power analysis of α=0.05 & β=1.00 showed that 30 patients were needed per study group to detect an increase of 30 min difference between the median duration of spinal sensory block between the groups.

Results on continuous measurements are presented on mean ± standard deviation and results on categorical measurements are presented in a number. students t-test (two tailed, independent and Mann-whitney U-test were used to compare the parametric data between the groups. P<0.05 was considered statistically significant.

RESULTS

The group were comparable with respect to age, weight, height, sex distribution and duration of surgery (table1) .There was no difference between Group A &B in the maximum level of block achieved (T10)

Table 1 - Demographic data

Variables	Group A	Group B	P value
Age in years	43±18.3	44.9±14.4	>0.05
Weight in kgs	59±7	59.5±5.1	>0.05
Height in cms	159.5±6.3	162±60	>0.05
BMI	23.9±2.76	23.6±2.63	>0.05
Duration of block (mins)	150.7±3.2	143±3.4	>0.05

When compared, the time of the onset of both sensory and motor block was statistically insignificant in both groups. Duration of analgesia was slightly prolonged in Group B When compared with Group A but it is not statistically significant.

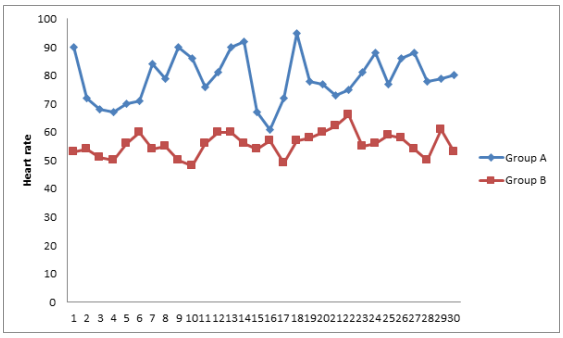
Table 2 - Sensory & motor block characteristics

Variable	Group A	Group B	P value
Onset of sensory blockade	6.0±1.5 min	5.8±0.8 min	>0.05
Onset of motor blockade	7.6±1.5 min	7.4±0.8 min	>0.05
Sensory recovery time	350±3.52 min	356±3.43 min	>0.05
Motor recovery time	380±3.42 min	386±3.52 min	>0.05
Duration of analgesia	5.89±0.5 hrs	6.08±1.26 hrs	>0.05
Time of rescue analgesia	6.02±0.5 hrs	6.12±1.2 hrs	>0.05

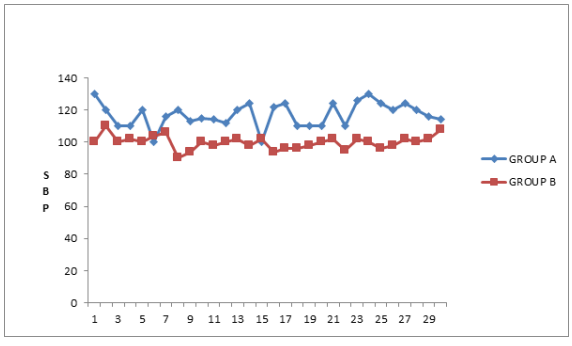
Variable	Group A	Group B
Heart rate	69.03±8.57	55.93±4.25
SBP	116±7.61	90.60±4.17
MAP	109.7±11.48	71.23±10.29

Intraoperative heart rate and blood pressure was comparable between the two groups, till patients in both groups were calm and cooperative and there was no undue sedation (sedation score >3).

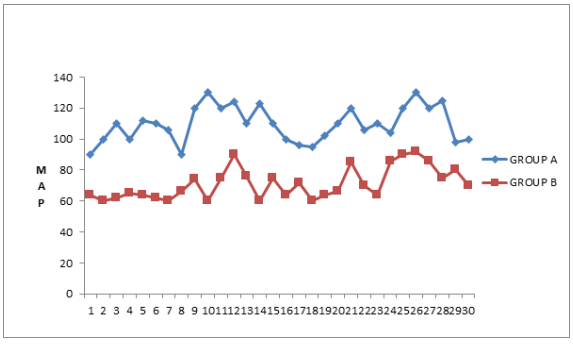
Graph showing comparison of heart rate between two groups



Graph showing comparison of systolic blood pressure between two groups



Graph showing comparison of mean arterial pressures between two groups



DISCUSSION

Intrathecal α2 adrenergic agonists prolong the motor and sensory block of local anesthetics. They act by binding to pre synaptic c-fibres and post synaptic dorsal horn neurons. A number of animal studies conducted using intrathecal dexmedetomidine at a dose range of 2.5 to 100mcg did not report any neurological deficits with its use. Five mcg dose of dexmedetomidine have been used in earlier studies and found to show prolongation of sensory and motor blockade.

Fukushima et al administered 2mcg/kg epidural dexmedetomidine for post op analgesia in humans but did not report any neurological deficits; small doses of intrathecal dexmedetomidine used in combination with bupivacaine in humans have been shown to shorten the onset of motor block and prolong the duration of motor and sensory block with hemodynamic stability and minimal sedation.

In our study hypotension is more in dexmedetomidine Group B than in Group A .The duration of motor and sensory blockade with slightly higher in Group B than Group A, but this is not statistically significant

The α2 adrenergic agents also have anti shivering property. We too did not find any incidence of shivering in the two groups. Dexmedetomidine 5mcg provides good quality of intra operative analgesia, hemodynamically stable conditions, minimal side effects and excellent quality of post operative analgesia.

CONCLUSION

Dexmedetomidine 5mcg seems to be an attractive alternative to 10mcg

dexmedetomidine as an adjuvant to spinal bupivacaine in lower limb orthopedic surgeries.

Increasing the dose to 10mcg has been associated with increasing incidence of adverse effects with mild prolongation of post operative analgesia which is not statistically significant.

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