Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE4, 2023

Original Research Article

Effects of dexmedetomidine as an adjuvant to levobupivacaine in patients undergoing lower limb surgeries under subarachnoid block

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Abstract

Background & Methods: The aim of the study is to study Effects of dexmedetomidine as an adjuvant to levobupivacaine in patients undergoing lower limb surgeries under subarachnoid block. A full assessment of history, clinical examination, and revision of investigations was conducted preoperatively for all patients. Baseline vitals, Sensory and Motor block with analgesi a requirement were recorded. All patients were kept nil per oral overnight. Patients were preloaded with Ringer's lactate solution 15 ml/kg.

Results: Mean duration of sensory block in group Levobipivacaine was 112.28 min and in group Dexmedetomidine with levobupivacaine was 204.74 min. Prolong duration occur in the dexmedetomiine with levobupivacaine group. In the present study there was a significant difference in duration of motor block across the two groups. In group Levobipivacaine mean duration of motor block was 156.51 min, and in group Dexmedetomidine with levobupivacaine was 249.77 min.

Conclusion: Dexmedetomidine may be used as an adjuvant to intrathecal hyperbaric Levobupivacaine in elective lower limb orthopaedic surgery to prolong the duration of motor and sensory block when compare to use hyperbaric Levobupivacaine alone.

Keywords: dexmedetomidine, levobupivacaine, lower limb & subarachnoid block.

Study Design: Observational Study.

1. INTRODUCTION

Spinal anesthesia is a form of regional anesthesia which involves injection of a local anesthetic into the subarachnoid space and commonly used for lower abdominal, perineal, and lower limb surgery[1]. It provides several advantages such as ease of administration, low cost, decreased risk of pulmonary aspiration, elimination of the need for intubation, reduced intraoperative blood loss, decrease in perioperative cardiac dysrhythmia, post-operative hypoxic episode, and also arterial and venous thrombosis [2]. Various adjuvants such as phenylephrine, epinephrine, clonidine, magnesium sulphate, neostigmine, and opioids have been used to prolong the duration of action of bupivacaine [3].

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Dexmedetomidine is a specific α-2 adrenergic agonist. It has been extensively used as premedication for sedation in the Intensive Care Unit and for awake fibreoptic intubation [4]. It was first used intrathecally in humans for transurethral resection of prostate. It prolongs both sensory and motor block and has nociceptive action for both visceral and somatic pain. It is being evaluated now as a potential adjuvant to local anaesthetic agents. This research is designed to study the efficacy of such combination in our setup and compare the results with the previous studies done at other institutions[5].
Regression of motor block occur earlier with Levobupivacaine as compared to Bupivacaine. A common problem during lower limb orthopaedic surgeries under spinal anesthesia is post-operative pain intrathecally opioids act synergistically with local anaesthetics[6]. They improve the quality of intraoperative anaesthesia, permit lower doses of local anesthetics, provide faster onset of surgical block and prolong the duration of postoperative analgesia.

2. MATERIAL AND METHODS

Present study is conducted at Sri Aurobindo Institute of Medical Science, Indore for 01 Year on 100 patients. To evaluate the hemodynamic stability, duration of motor and sensory blockade, post op analgesia requirement while using intrathecal dexmedetomidine as an adjuvant to hyperbaric Levobupivacaine for lower limb orthopaedic surgery.
A full assessment of history, clinical examination, and revision of investigations was conducted preoperatively for all patients.In all patient routine monitor applied (ECG, NIBP, SPO2) Baseline vitals recorded. All patients were kept nil per oral overnight. Patients were preloaded with Ringer's lactate solution 15 ml/kg. Under a sterile technique, spinal anesthesia was performed with the patient in sitting position with 25G Quincke needle in L3–L4 intervertebral space using midline approach.we gave 3 ml hyperbaric levobupivacaine in each group and we used 5mcg dexmedetomidine in dexmedetomidine with levobupivacaine group.

Inclusion Criteria

1. Patient aged between 18 to 60yrs of either sex.
2. ASA 1 and 2
3. Patient posted for elective lower limb orthopaedic surgeries.
4. Height 150-180 cm.
5. Weight 50-70 kg.

Exclusion Criteria

1. History of allergy to study drugs.
2. Patient refusal.
3. Patients using alpha 2-adrenergic receptors antagonists, calcium channel blockers, angiotensin-converting enzyme inhibitor.
4. Patient having absolute contraindication to spinal anaesthesia.

3. RESULT

Table 1: Demographic Profile

Parameters	Dexmedetomidine with levobupivacaine	Levobupivacaine
Age	36.81±13.39	34.57±1.83
Gender		

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Male	78	67
Female	22	33
ASA		
01	91	95
02	09	05
Weight	62.18±1.61	63.34±2.75
Height	159.32±1.36	159.87±4.69
Duration of Surgery	96.54±18.28	92.37±67.83

Table 2: Comparison of Sensory and Motor block parameters across two groups

Parameters	**Dexmedetomidine with levobupivacaine**	**Levobupivacaine**
Onset of sensory block (in min)	8.79	10.32
Duration of sensory block (in min)	204.74	112.28
Onset of motor block (in min)	9.35	10.97
Duration of motor block (in min)	249.77	156.51
Time taken to achieve for maximum sensory block (in min)	14.57	16.13

Mean duration of sensory block in group Levobupivacaine was 112.28 min and in group Dexmedetomidine was 204.74 min. Prolong duration occur in the dexmedetomidine group. In the present study there was a significant difference in duration of motor block across the three groups. In group Levobupivacaine mean duration of motor block was 156.51 min, and in group Dexmedetomidine with levobupivacaine was 249.77 min.

Table 3: Frequency distribution according to first analgesic requirement in patients – Post operative period

Post-operative first analgesic requirement	**No. (%)**
Dexmedetomidine with levobupivacaine	
2 hr	03
4 hr	17
6 hr	30
Levobupivacaine	
2hr	41
4hr	29
6hr	53

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Table 4: Frequency distribution according to total analgesic requirement in 24 hr – Postoperative period

Number of doses in 24 hr.	No. (%)
Dexmedetomidine with levobupivacaine	
01	08
02	53
03	05
Levobupivacaine	
01	36
02	87
03	11

Table No. 5: Haemodynamic Parameter

Parameters	Levobupivacaine	Dexmedetomidine with levobupivacaine
Heart Rate (min)	120.7	118.5
BP Mean	52.7	59.3
Systolic BP (mm Hg)	75.8	66.7
Diastolic BP (mm Hg)	50.9	44.7

We have seen bradycardia & hypotension in 10-12 patients in dexmedetomidine with levobupivacaine group.

4. DISCUSSION

Subarachnoid block with levobupivacaine has been most extensively used for lower abdominal surgeries because of its simplicity, speed, reliability and minimal exposure to depressant drugs[7]. However, a single intrathecal injection of levobupivacaine alone provides analgesia for only 2 – 2.5 hours. Most patients require further analgesia during post-operative period.

Dexmedetomidine which is a specific α2 adrenergic agonist, being used in recent times as an additive to intrathecal hyperbaric levobupivacaine to prolong the quality and duration of analgesia. The mechanism for the prolongation of the duration of sensory and motor blockade produced by local anaesthetic is not clearly known[8]. It is attributed that α 2 adrenergic agonist (Dexmedetomidine) acts by binding to post synaptic dorsal horn neurons and to the C- fibres in the pre synaptic region. The prolonged analgesic action of intrathecal α2 agonist is by decreasing the release of Cfibres neurotransmitters and by causing hyperpolarisation of neurons in the post synaptic dorsal horn.

Kanazi GE et al [9] have used 3 μg dexmedetomidine in their study and said to have comparable equipotent effect with clonidine. The effects of dexmedetomidine on a dose related manner (control, 10 μg and 15μg) and confirmed the prolongation of duration of analgesia. Many studies have chosen 5μg of dexmedetomidine as an additive to intrathecal hyperbaric levobupivacaine and proven efficacy[10].

A study 2017 found that the postoperative analgesic requirement in first 24 hr was significantly lower in the dexmedetomidine with levobupivacaine group compared to

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levobupivacaine group and it was significantly lower in the dexmedetomidine group than levobupivacaine group ($p < 0.05$). Vidhi Mahendru et al in 2013[6], in both the studies there was no evidence of respiratory depression[11].

5. CONCLUSION

Dexmedetomidine may be used as an adjuvant to intrathecal hyperbaric Levobupivacaine in elective lower limb orthopaedic surgery to prolong the duration of motor and sensory block when compare to use hyperbaric Levobupivacaine alone.

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