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Original Research

Intravenous dexmedetomidine in patients undergoing orthopedic lower limb surgeries under subarachnoid block

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ABSTRACT:
Background: For the majority of procedures involving the abdomen and lower limbs, regional anesthesia is the recommended method. Numerous adjuvants, including epinephrine, phenylephrine, magnesium sulfate, neostigmine, opioids, and clonidine, have been administered intrathecally to extend the duration of effect of bupivacaine. This study evaluated the effects of intravenous dexmedetomidine on spinal anesthesia with 0.5% hyperbaric bupivacaine. **Materials & Methods:** 120 patients patients planned for orthopedic lower limb surgeries under sub arachnoid block were divided into two equal groups of 860 patients each. Drugs for both groups prepared in two 50 ml syringes- one for loading dose (labelled L) and other for maintenance dose (labelled M). **Results:** Group I had 31 males and 29 females and group II had 32 males and 28 females. The difference was non- significant (P>0.05). The duration of onset of sensory blockade was 7.2 minutes in group I and 6.0 minutes in group II. The duration of onset of motor blockade was 3.4 minutes in group I and 3.0 minutes in group II. The duration of recovery from sensory blockade was 218.0 minutes in group I and 154.0 minutes in group II subjects. The duration of recovery from motor blockade was 216.5 minutes in group I subjects whereas it was 176.0 minutes amongst group II subjects. The sedation score was 2.4 in group I and 3.0 in group II. The post-operative pain in group I was 3.5 and in group II was 4.0. The difference was significant (P< 0.05). **Conclusion:** The effects of subarachnoid anesthesia with arousable sedation are prolonged by intrathecal dexmedetomidine.
Key words: dexmedetomidine, pain, subarachnoid anesthesia

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INTRODUCTION

For the majority of procedures involving the abdomen and lower limbs, regional anesthesia is the recommended method.[1,2] Numerous adjuvants, including epinephrine, phenylephrine, magnesium sulfate, neostigmine, opioids, and clonidine, have been administered intrathecally to extend the duration of effect of bupivacaine.α2-agonists work by activating inwardly rectifying G1-protein-gated potassium channels, which causes membrane hyperpolarization and ultimately lowers the firing rate of excitable cells in the central nervous system. Additionally, by decreasing calcium conduction into the cell, α2-agonists prevent the release of neurotransmitters. First, by stopping the neuron from firing, and second, by preventing the signal from propagating to its neighbour, these two systems reflect two quite different ways of affecting analgesia.[3]

Dexmedetomidine operates at both the spinal and supraspinal levels, specifically at laminae VII and VIII of the ventral horns of the spinal cord. It is delivered systemically and intrathecally and has anxiolytic, sedative, analgesic, and sympatholytic effects. Because of its calming and analgesic properties, this highly selective α2-adrenergic agonist is frequently used as a premedication during general anesthesia.[4] Despite the paucity of clinical data on the impact of intravenous dexmedetomidine on the length of spinal anesthesia's sensory and motor block, prior research has shown a synergistic interaction between intrathecal dexmedetomidine and local anesthetics.[5] This study evaluated the effects of intravenous

dexmedetomidine on spinal anesthesia with 0.5% hyperbaric bupivacaine.

MATERIALS & METHODS

The present study consisted of 120 patients planned for orthopedic lower limb surgeries under sub arachnoid block. Exclusion criteria was haemodynamically unstable patients, coagulation disorder, allergy to local anesthetic amides, infection at the site of lumber puncture, deformed spine and patient not giving consent.

Data such as name, age, gender etc. was recorded. Patients were divided into two equal groups of 60 patients each. Drugs for both groups prepared in two 50 ml syringes- one for loading dose (labelled L) and other for maintenance dose (labelled M). Sensory block was assessed by pinprick method at 2 min intervals until the maximum level of the block was achieved and at 5 min interval subsequently. The motor blockade was evaluated bilaterally by modified Bromage scale.Level of sedation was evaluated intra-operatively using Ramsey Sedation Score (RSS). The postoperative analgesia was noted with VAS Score. Total duration of analgesia, Systemic arterial blood pressure, heart rate, pulse oximetry and electrocardiography were recorded at base line, after subarachnoid block at 3 min interval until 20 min and then at 5 min interval until the end of surgery. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Gender	Group I	Group II	P value
Male	31	32	0.76
Female	29	28	

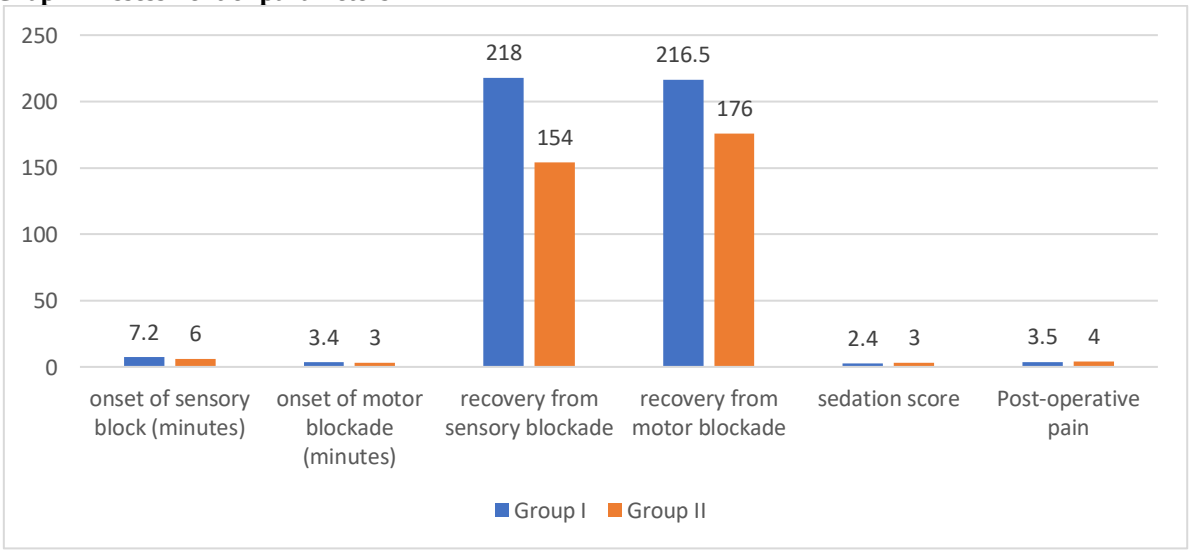
Table I shows that group I had 31 males and 29 females and group II had 32 males and 28 females. The difference was non- significant (P>0.05).

Table II Assessment of parameters

Parameters	Group I	Group II	P value
onset of sensory block (minutes)	7.2	6.0	0.92
onset of motor blockade (minutes)	3.4	3.0	0.85
recovery from sensory blockade	218.0	154.0	0.01
recovery from motor blockade	216.5	176.0	0.02
sedation score	2.4	3.0	0.93
Post-operative pain	3.5	4.0	0.17

Table II, graph I shows that the duration of onset of sensory blockade was 7.2 minutes in group I and 6.0 minutes in group II. The duration of onset of motor blockade was 3.4 minutes in group I and 3.0 minutes in group II. The duration of recovery from sensory blockade was 218.0 minutes in group I and 154.0minutes in group II subjects. The duration of recovery from motor blockade was 216.5 minutes in group I subjects whereas it was 176.0 minutes amongst group II subjects. The sedation score was 2.4 in group I and 3.0 in group II. The post-operative pain in group I was 3.5 and in group II was 4.0. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

Hyperbaric bupivacaine is frequently used in subarachnoid blocks (SABs) for lower limb and abdominal procedures. To boost effectiveness and extend the duration of SAB, a variety of substances have been administered intrathecally as adjuvants to local anesthetics; the most often used of them are opioids and α2 agonists. Dexmedetomidine given intravenously has also been demonstrated to extend the duration of subarachnoid block-induced sensory and motor inhibition. Additionally, dexmedetomidine extended the duration of spinal anesthesia when administered intravenously before to spinal anesthesia or as a loading dose followed by continuous infusion throughout operation.[6]

We found that group I had 31 males and 29 females and group II had 32 males and 28 females. Singh et al[7]evaluated the efficacy of two different doses of dexmedetomidine as an adjuvant to isobaric ropivacaine, intrathecally.Ninety patients scheduled for lower abdominal surgery under spinal anesthesia were randomized into three groups to receive 2.5 ml of isobaric ropivacaine (0.75%, 7.5 mg/ml) added to 5 µg (10 µg/ml) or 10 µg (20 µg/ml) of dexmedetomidine or 0.5 ml of normal saline in group A, B or C, respectively. Block characteristics were compared as a primary outcome.Time to achieve desired block was least in group B and maximum in group C. The sensory-motor blockade remained significantly prolonged in group B compared to other groups. Hemodynamic parameters remained stable in all three groups.Among the investigated doses, dexmedetomidine augments the efficacy of intrathecal ropivacaine in a dose-dependent manner, without any untoward side effects.

We observed that the duration of onset of sensory blockade was 7.2 minutes in group I and 6.0 minutes in group II. The duration of onset of motor blockade was 3.4 minutes in group I and 3.0 minutes in group II. The duration of recovery from sensory blockade was 218.0 minutes in group I and 154.0 minutes in group II subjects. The duration of recovery from motor blockade was 216.5 minutes in group I subjects whereas it was 176.0 minutes amongst group II subjects. The sedation score was 2.4 in group I and 3.0 in group II. The post-operative pain in group I was 3.5 and in group II was 4.0. Reddy et al[8]compared and evaluated the efficacy of intravenous dexmedetomidine premedication with clonidine and placebo on spinal blockade duration, postoperative analgesia and sedation in patients undergoing surgery under bupivacaine intrathecal block.In this prospective, randomized, double-blind placebo-controlled study, 75 patients of the American Society of Anesthesiologists status I or II, scheduled for orthopedic lower limb surgery under spinal anesthesia, were randomly allocated into three groups of 25 each. Group DE received dexmedetomidine 0.5 µgkg(-1), group CL received clonidine 1.0 µgkg(-1) and placebo group PL received 10 ml of normal saline intravenously before subarachnoid anesthesia with 15 mg of 0.5% hyperbaric bupivacaine. Onset time and regression times of sensory and motor blockade, the maximum upper level of sensory blockade were recorded. Duration of postoperative analgesia and sedation scores along with side effects were also recorded. The sensory block level was higher with dexmedetomidine (T4 ± 1) than clonidine (T6 ± 1) or placebo (T6 ± 2). Dexmedetomidine also increased the time (243.35 ± 56.82 min) to first postoperative analgesic request compared with clonidine (190.93 ± 42.38 min, $P < 0.0001$) and placebo (140.75 ± 28.52 min, $P < 0.0001$). The maximum Ramsay sedation score was greater in the dexmedetomidine group than other two groups ($P < 0.0001$).

CONCLUSION

Authors found that the effects of subarachnoid anesthesia with arousable sedation are prolonged by intrathecal dexmedetomidine.

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