

ORIGINAL RESEARCH

Intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in patients undergoing total hip replacement

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ABSTRACT

Background: Lower limb surgery refers to surgical procedures performed on the lower extremities of the body, which include the hips, thighs, knees, legs, ankles, and feet. The present study compared intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement.

Materials & Methods: 90 patients selected for total hip replacement surgery under spinal anaesthesia were divided into 3 groups. Patients in group I received 15 mg hyperbaric bupivacaine and 0.1 ml (10 µg) dexmedetomidine, in group II received 15 mg hyperbaric bupivacaine and 0.1 ml (50 mg) magnesium sulfate and in group III received 15 mg hyperbaric bupivacaine and 0.1 ml normal saline as control. Parameters such as onset times of sensory blocks, motor blocks, regression time of sensory blocks and motor blocks were compared.

Results: The mean height in group I patients was 159.4 cm, in group II was 161.2 cm and in group III was 159.4 cm. The mean weight was 65.2 kgs in group I, 64.2 kgs in group II and in group III was 63.4 kgs. The mean BMI was 21.3 kg/m² in group I, 22.8 kg/m² in group II and in group III was 23.0 kg/m². The difference was non-significant (P > 0.05). The mean onset of sensory block was 2.4 minutes, 6.2 minutes and 4.9 minutes, onset of motor block was 3.5 minutes, 7.1 minutes and 4.7 minutes, regression time of sensory block was 321.4 minutes, 242.4 minutes and 194.2 minutes and regression time of motor block was 346.2 minutes, 236.4 minutes and 182.6 minutes in group I, II and III respectively. The difference was significant (P < 0.05).

Conclusion: In contrast to intrathecal Mg, intrathecal dexmedetomidine augmentation of spinal block results in faster onset and longer duration of sensory and motor block.

Key words: bupivacaine, dexmedetomidine, magnesium sulfate

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INTRODUCTION

Lower limb surgery refers to surgical procedures performed on the lower extremities of the body, which include the hips, thighs, knees, legs, ankles, and feet. These surgeries can be performed for various reasons, including medical conditions, injuries, and deformities that affect the lower limbs.¹ Although neuraxial block is the preferred kind of anaesthesia, lower limb procedures may also be carried out under local, regional (spinal or epidural), or general anaesthesia.² Because of its quick onset, superior blocking, minimal risk of infection from catheter in situ, lower failure rates, and cost-effectiveness, spinal block is still the preferred method, but it has the disadvantages of shorter block duration and the absence of postoperative analgesia.³ Dexmedetomidine (DXM), an authorized intravenous sedative and co-analgesic medication, is a highly selective α -2 agonist.⁴ When used, it frequently

causes a drop in blood pressure and heart rate. Animal studies on the intrathecal and epidural DXM features have been conducted.⁵ The antinociceptive effects of magnesium appear to be important not just to chronic pain but also to the length and severity of postoperative pain, to some extent. In a subarachnoid block containing bupivacaine and magnesium sulphate, postoperative analgesia was enhanced in an orthopaedic environment.⁶ The present study compared intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement.

MATERIALS & METHODS

The present study was undertaken at Maharani Laxmi Bai Medical College Jhansi from March 2017 to February 2018. The study was conducted on 90 ASA physical status I and II patients of either gender selected for total hip replacement surgery under spinal

anaesthesia of both genders. All patients gave their written consent to participate in the study. Data such as name, age, gender etc. was recorded. Patients were divided into 3 groups. Each group comprised of 30 patients. Patients in group I received 15 mg hyperbaric bupivacaine and 0.1 ml (10 µg) DXM, in group II received 15 mg hyperbaric bupivacaine and

0.1 ml (50 mg) Mg and in group III received 15 mg hyperbaric bupivacaine and 0.1 ml normal saline as control. Parameters such as onset times of sensory blocks, motor blocks, regression time of sensory blocks and motor blocks were compared. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I: Baseline characteristics

Parameters	Group I	Group II	Group III	P value
Height (cm)	159.4	161.2	159.4	0.72
Weight (Kgs)	65.2	64.2	63.4	0.93
BMI (Kg/m ²)	21.3	22.8	23.0	0.52

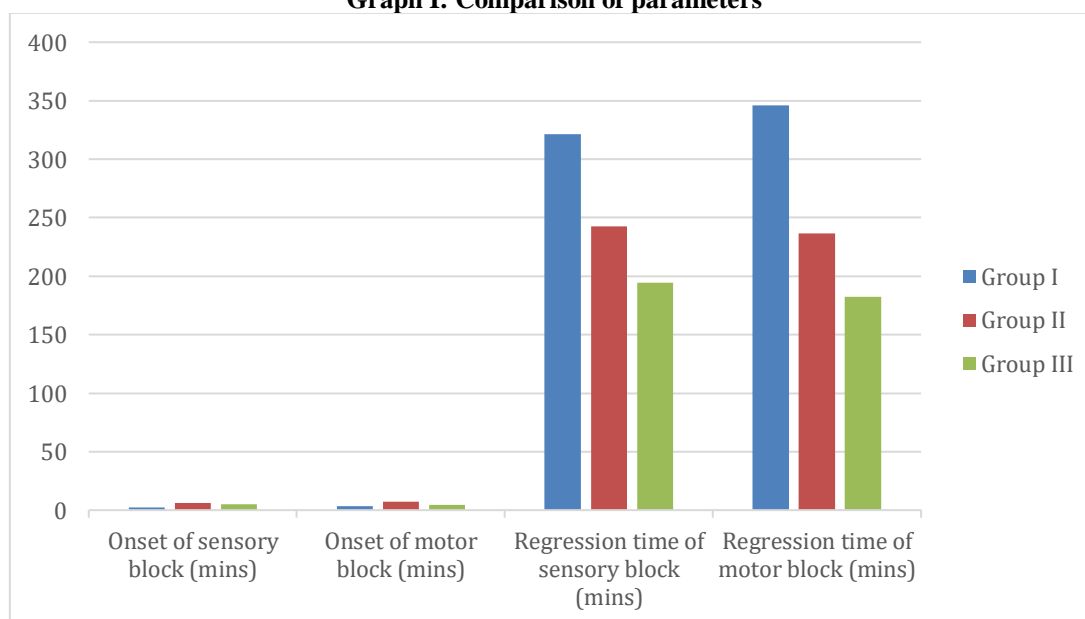
Table I shows that mean height in group I patients was 159.4 cm, in group II was 161.2 cm and in group III was 159.4 cm. The mean weight was 65.2 kgs in group I, 64.2 kgs in group II and in group III was 63.4 kgs. The mean BMI was 21.3 kg/m² in group I, 22.8 kg/m² in group II and in group III was 23.0 kg/m². The difference was non-significant (P > 0.05).

Table II: Comparison of parameters

Parameters	Group I	Group II	Group III	P value
Onset of sensory block (mins)	2.4	6.2	4.9	0.04
Onset of motor block (mins)	3.5	7.1	4.7	0.01
Regression time of sensory block (mins)	321.4	242.4	194.2	0.05
Regression time of motor block (mins)	346.2	236.4	182.6	0.03

Table II, graph I shows that mean onset of sensory block was 2.4 minutes, 6.2 minutes and 4.9 minutes, onset of motor block was 3.5 minutes, 7.1 minutes and 4.7 minutes, regression time of sensory block was 321.4 minutes, 242.4 minutes and 194.2 minutes and regression time of motor block was 346.2 minutes, 236.4 minutes and 182.6 minutes in group I, II and III respectively. The difference was significant (P < 0.05).

Graph I: Comparison of parameters



DISCUSSION

It has been demonstrated that doing orthopaedic procedures under spinal anaesthetic can lower total

blood loss by 30% to 50%. The postoperative period is when regional blocks' anaesthetic advantages are most obvious.⁷ The need for opioids is decreased

thanks to residual block, which shields the patient from the first round of postoperative pain. Additionally, it has been shown that regional anaesthetic can lower the incidence of deep vein thrombosis, aspiration, pulmonary problems, and perioperative mortality by 30% to 50%.⁸ The antinociceptive effects of magnesium appear to be important not just to chronic pain but also to the length and severity of postoperative pain, to some extent.⁹ These effects essentially depend on the control of calcium influx into the cell, i.e., on calcium antagonistic natural physiological processes.^{8,9} Mg has the ability to halt central sensitization brought on by peripheral nociceptive stimulation since it is a non-competitive antagonist to NMDA receptors.¹⁰ The present study compared intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement. We found that mean height in group I patients was 159.4 cm, in group II was 161.2 cm and in group III was 159.4 cm. The mean weight was 65.2 kgs in group I, 64.2 kgs in group II and in group III was 63.4 kgs. The mean BMI was 21.3 kg/m² in group I, 22.8 kg/m² in group II and in group III was 23.0 kg/m². Kanazi et al¹¹ found in their study that the supplementation of bupivacaine (12 mg) spinal block with a low-dose DXM (3 µg) produces a significantly shorter onset of motor block and a significantly longer sensory and motor block than bupivacaine alone. Arcioni et al¹² also observed that intrathecal and epidural Mg potentiated and prolonged motor block. Shukla et al¹³ assessed the onset and duration of sensory and motor block as well as perioperative analgesia and adverse effects of dexmedetomidine and magnesium sulfate given intrathecally with 0.5% hyperbaric bupivacaine for spinal anaesthesia. Patients were randomly allocated to receive intrathecally either 15 mg hyperbaric bupivacaine plus 0.1 ml (10 µg) dexmedetomidine or 15 mg hyperbaric bupivacaine plus 0.1 ml (50 mg) magnesium sulfate or 15 mg hyperbaric bupivacaine plus 0.1 ml saline as control. The onset times to reach T10 dermatome and to reach peak sensory level as well as onset time to reach modified Bromage 3 motor block were significantly different in the three groups. The onset time to reach peak sensory and motor level was shorter in group D as compared with the control group C, and it was significantly prolonged in group M. We also found that patients in group D had significant longer sensory and motor block times than patients in group M, which was greater than in the control group C. We observed that mean onset of sensory block was 2.4 minutes, 6.2 minutes and 4.9 minutes, onset of motor block was 3.5 minutes, 7.1 minutes and 4.7 minutes, regression time of sensory block was 321.4 minutes, 242.4 minutes and 194.2 minutes and regression time of motor block was 346.2 minutes, 236.4 minutes and 182.6 minutes in group I, II and III respectively. When Dexmedetomidine and Magnesium Sulphate were administered intrathecally with 0.5% hyperbaric

Bupivacaine for spinal anaesthesia in 90 patients, Farooq et al¹⁴ assessed the start of sensory and motor block, level of sensory block, highest sensory level, and Bromage grade at time of onset. In comparison to the other two groups, the duration of the sensory and motor block was shorter in the dexmedetomidine group and longer in the magnesium group. In group dexmedetomidine, there was a greater degree of sensory blockage at the moment of onset and a greater degree of motor blockage than in the other two groups C.

CONCLUSION

Authors found that in contrast to intrathecal Mg, intrathecal dexmedetomidine augmentation of spinal block results in faster onset and longer duration of sensory and motor block.

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