Journal of Cardiovascular Disease Research

ISSN:0975-3583,0976-2833 VOL14,ISSUE03,2023

ORIGINAL RESEARCH

Comparison of intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement

[1]Dr. Sachreet Kaur, [2]Dr. Gurwant Kaur

[1]Assistant Professor, Department of Anaesthesia, Sri Guru Ramdas Institute of Medical Sciences and Research Amritsar, Punjab, India
[2]Consultant Anaesthetist and Intensivist, Vasundhra Hospital, Jodhpur, Rajasthan, India

Corresponding Author
Dr. Sachreet Kaur
Assistant Professor, Department of Anaesthesia, Sri Guru Ramdas Institute of Medical Sciences and Research Amritsar, Punjab, India

Received: 10 March, 2023 Accepted: 16 April, 2023

Abstract
Background: Lower limb surgeries may be performed under local, regional (spinal or epidural) or general anesthesia, but neuraxial blockade is the preferred mode of anesthesia. The present study was conducted to compare intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement.
Materials & Methods: 60 ASA physical status I and II patients aged 18–45 years, of either genderscheduled for total hip replacementsurgery under spinal anesthesiaof both genderswere divided into 3 groups of 20 each. Group I received 15 mg hyperbaric bupivacaine and 0.1 ml (10 μg) DXM, group II received 15 mg hyperbaric bupivacaine and 0.1 ml (50 mg) Mg and 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 times of sensory blocks and motor blocks were compared.
Results: The mean height in group I was 157.4 cm, in group II was 160.2 cm and in group III was 158.4 cm. The mean weight was 64.2 kgs in group I, 63.8 kgs in group II and in group III was 61.5 kgs. The mean BMI was 22.3 Kg/m^2 in group I, 24.0 Kg/m^2in group II and in group III was 23.1 Kg/m2. The difference was non-significant ($P > 0.05$). The mean onset of sensory block (hour) was 2.3, 6.1 and 4.8, onset of motor block (hour) was 3.4, 7.2 and 4.9, regression time of sensory block (mins) was 312.4, 248.4 and 198.6 and regression time of motor block (mins) was 340.6, 232.6 and 184.8 in group I, II and III respectively. The difference was significant ($P < 0.05$).
Conclusion: Intrathecal DXM supplementation of spinal block is a good alternative to intrathecal Mg as it produces earlier onset and prolonged duration of sensory and motor block
Key words: dexmedetomidine, magnesium sulfate, bupivacaine

Introduction

Lower limb surgeries may be performed under local, regional (spinal or epidural) or general anesthesia, but neuraxial blockade is the preferred mode of anesthesia.[1] Spinal block is still the first choice because of its rapid onset, superior blockade, low risk of infection as from catheter *in situ*, less failure rates and cost-effectiveness, but has the drawbacks of shorter duration of block and lack of postoperative analgesia.[2]

Orthopaedic surgeries done under spinal anaesthesia have shown to reduce total blood loss by 30% to 50%. Anaesthetic benefits of regional blocks are most evident in the postoperative phase.[3] Residual block protects the patient from initial postoperative pain and requirement of opioids is reduced. Regional anaesthesia has also been demonstrated to reduce perioperative mortality, pulmonary complications, risk of aspiration and deep vein thrombosis by 30% to 50%.[4]

Dexmedetomidine (DXM) is a highly selective a-2 agonist drug, is approved as an intravenous sedative and co-analgesic drug. Its use is often associated with a decrease in heart rate and blood pressure. Intrathecal and epidural characteristics of DXM have been studied in animals.[5]Antinociceptive of Mg effects appear to be relevant not only to chronic pain but it also determines, in part, the duration and intensity of postoperative pain. The addition of magnesium sulphate to bupivacaine in subarachnoid block improved postoperative analgesia in an orthopaedic setting.6The present study was conducted to compare intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement.

ISSN:0975-3583,0976-2833 VOL14,ISSUE03,2023

Materials & Methods

The present study consisted of 60 ASA physical status I and II patients aged 18–45 years, of either genderscheduled for total hip replacementsurgery under spinal anesthesiaof both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 3 groups of 20 each. Group I received 15 mg hyperbaric bupivacaine and 0.1 ml (10 µg) DXM, group II received 15 mg hyperbaric bupivacaine and 0.1 ml (50 mg) Mg and 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 times 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)	157.4	160.2	158.4	0.92
Weight (Kgs)	64.2	63.8	61.5	0.84
BMI (Kg/m^2)	22.3	24.0	23.1	0.12

Table I shows that mean height in group I was 157.4 cm, in group II was 160.2 cm and in group III was 158.4 cm. The mean weight was 64.2 kgs in group I, 63.8 kgs in group II and in group III was 61.5 kgs. The mean BMI was 22.3 Kg/m^{2}in group I, 24.0 Kg/m^{2}in group II and in group III was 23.1 Kg/m2. The difference was non- significant (P> 0.05).

Graph I Baseline characteristics

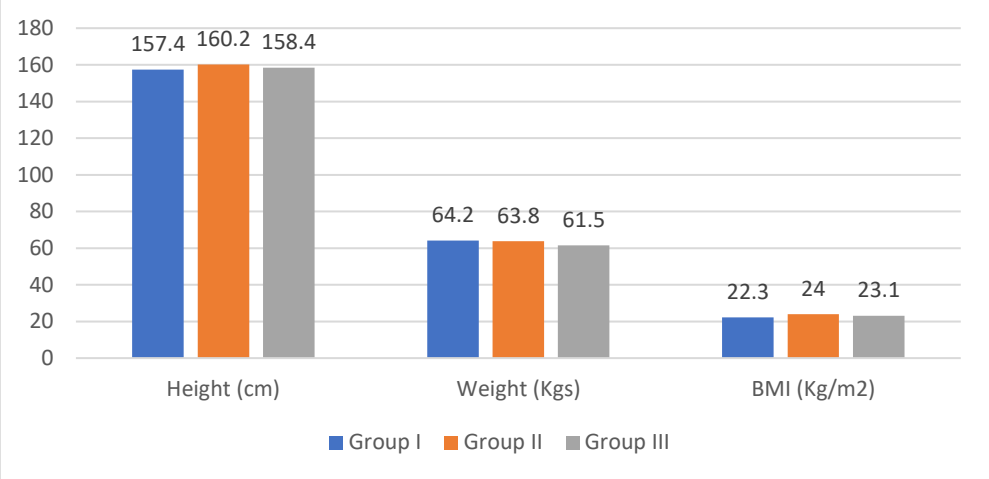

Table II Comparison of parameters

Parameters	Group I	Group II	Group III	P value
onset of sensory block (hour)	2.3	6.1	4.8	0.03
onset of motor block (hour)	3.4	7.2	4.9	0.02
regression time of sensory block (mins)	312.4	248.4	198.6	0.05
regression time of motor block (mins)	340.6	232.6	184.8	0.05

Table II shows that mean onset of sensory block (hour) was 2.3, 6.1 and 4.8, onset of motor block (hour) was 3.4, 7.2 and 4.9, regression time of sensory block (mins) was 312.4, 248.4 and 198.6 and regression time of motor block (mins) was 340.6, 232.6 and 184.8 in group I, II and III respectively. The difference was significant (P< 0.05).

Discussion

Antinociceptive of Mg effects appear to be relevant not only to chronic pain but it also determines, in part, the duration and intensity of postoperative pain.[7] These effects are primarily based on the regulation of calcium influx into the cell, i.e. natural physiological calcium antagonism.[8,9] Mg is a non-competitive antagonist to NMDA receptors and has the potential to prevent central sensitization from peripheral nociceptive stimulation.[10]The present study was conducted to compare intrathecal dexmedetomidine and magnesium sulfate as adjuvants to bupivacaine in total hip replacement.

We found that mean height in group I was 157.4 cm, in group II was 160.2 cm and in group III was 158.4 cm. The mean weight was 64.2 kgs in group I, 63.8 kgs in group II and in group III was 61.5 kgs. The mean BMI was 22.3 Kg/m^2 in group I, 24.0 Kg/m^{2}in group II and in group III was 23.1 Kg/m2. Farooq et al[11]evaluated the

ISSN:0975-3583,0976-2833 VOL14,ISSUE03,2023

onset of sensory and motor block, level of sensory block, highest sensory level and Bromage grade at time of onset, induced by Dexmedetomidine and Magnesium sulphate when given intrathecally with 0.5% hyperbaric Bupivacaine for spinal anaesthesia in 90 patients. Onset of sensory and motor block was shorter in group Dexmed as compared to other two groups, and prolonged in group magnesium as compared to other two groups. The level of sensory block was higher at the time of onset and grade of motor block was more in group Dexmed than other two groupsC.

We found that mean onset of sensory block (hour) was 2.3, 6.1 and 4.8, onset of motor block (hour) was 3.4, 7.2 and 4.9, regression time of sensory block (mins) was 312.4, 248.4 and 198.6 and regression time of motor block (mins) was 340.6, 232.6 and 184.8 in group I, II and III respectively. Shukla et al[12]evaluated 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 anesthesia.Patients were randomly allocated to receive intrathecally either 15 mg hyperbaric bupivacaine plus 0.1 ml (10 µg) dexmedetomidine (group D, n=30) or 15 mg hyperbaric bupivacaine plus 0.1 ml (50 mg) magnesium sulfate (group M, n=30) or 15 mg hyperbaric bupivacaine plus 0.1 ml saline (group C, n=30) as control. The onset time to reach peak sensory and motor level, the regression time for sensory and motor block, hemodynamic changes and side-effects were recorded.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.

The limitation the study is small sample size.

Conclusion

Authors found that intrathecal DXM supplementation of spinal block is a good alternative to intrathecal Mg as it produces earlier onset and prolonged duration of sensory and motor block

References

1. Tramer MR, Schneider J, Marti RA, Rifat K. Role of magnesium sulfate in postoperative analgesia. Anesthesiology1996;84:340-7.
2. Woolf CJ, Thompson WN. The induction and maintenance of central sensitization is dependent on N-methyl-d-aspartate acid receptor activation: Implications for the treatment of post-injury pain hypersensitivity states. Pain 1991;44:293-9.
3. Ko SH, Lim HR, Kim DC, Han YJ, Choe H, Song HS. Magnesium sulphate does not reduce postoperative analgesic requirements. Anesthesiology2001;95:640-6.
4. Kroin JS, McCarthy RJ, Von Roenn N, Schwab B, Tuman KJ, Ivankovich AD. Magnesium sulfate potentiates morphine antinociception at the spinal level. AnesthAnalg2000;90:913-7.
5. Buvanendran A, McCarthy RJ, Kroin JS, Leong W, Perry P, Tuman KJ. Intrathecal magnesium prolongs fentanyl analgesia: A prospective, randomized, controlled trial. AnesthAnalg2002;95:661-6.
6. Arcioni R, Palmisani S, Santorsola C, Sauli V, Romano S, Mercieri M, et al. Combined intrathecal and epidural magnesium sulfate supplementation of spinal anesthesia to reduce post-operative analgesic requirements: A prospective, randomized, double-blind, controlled trial in patients undergoing major orthopedic surgery. Acta AnaesthesiolScand2007;51:482-9.
7. Ozalevli M, Cetin TO, Unlugence H, Guler T, Isik G. The effect of adding intrathecal magnesium sulphate to bupivacaine fentanyl spinal anaesthesia. Acta AnaesthesiolScand2005;49:1514-9.
8. Bromage PR. A comparison of the hydrochloride and carbon dioxide salts of lidocaine and prilocaine in epidural analgesia. Acta AnesthesiolScandSuppl1965;16:55-69.
9. Martin E, Ramsay G, Mantz J, Sum-Ping ST. The role of the alpha2- adrenreceptor agonist dexmedetomidine in post-surgical sedation in the intensive care unit. J Intensive Care Med 2000;18:29-34.
10. Post C, Gordh T, Minor G, Archer T, Freedman J. Antinociceptive effects and spinal cord tissue concentrations after intrathecal injection of guanfacine or clonidine into rats. AnesthAnalg1987;66:317-24.
11. Farooq Z, Gupta N. Sulphate and dexmedetomidine used intrathecally as adjuvant to bupivacaine: a study. Int J Med Res Health Sci. 2017;6:42-6.
12. Shukla D, Verma A, Agarwal A, Pandey HD, Tyagi C. Comparative study of intrathecal dexmedetomidine with intrathecal magnesium sulfate used as adjuvants to bupivacaine. Journal of anaesthesiology clinical pharmacology. 2011 Oct 1;27(4):495-9.