Section: Anaesthesia

Original Research Article

THE IMPACT OF ADDING MAGNESIUM SULFATE TO BUPIVACAINE VERSUS BUPIVACAINE ALONE IN FASCIA ILIACA COMPARTMENT BLOCK FOR POST OPERATIVE ANALGESIA FOR 24 HOURS IN PATIENTS UNDERGOING TOTAL HIP REPLACEMENT SURGERIES

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Received : 03/12/2022
Received in revised form : 19/12/2022
Accepted : 15/01/2023

Keywords:
Magnesium Sulfate, Bupivacaine, Fascia Iliaca Compartment Block, Total Hip Replacement Surgeries.

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DOI: 10.47009/jamp.2023.5.2.75

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (2); 362-364

Abstract

Background: Pain is the principal indication for hip replacement and is reliably relieved as early as possible after surgery. The present study was conducted to assess the impact of adding magnesium sulfate to bupivacaine versus bupivacaine alone in fascia iliaca compartment block for post operative analgesia for 24 hours in patients undergoing total hip replacement surgeries. **Materials & Methods:** Patients were randomly divided into two groups of 20 each: a bupivacaine group (group B) and a magnesium with bupivacaine group (group MB). Patents in group B received 35 ml of bupivacaine 0.25% and patients in group MB received 0.25% bupivacaine 30ml containing 250 mg of magnesium sulfate 5ml. Data were analyzed using the computer statistical software system SPSS version 16 (Statistical Packages for the Social Sciences, Chicago, Illinois, USA). **Results:** VAS was significantly lower at 1, 12 and 24 hours post-operative when group MB was compared to group B. At 4 h, 8h, 12h postoperatively both groups show significant association. After 24 hours pain was managed with opioid and non-opioid analgesics. Ramsay sedation score showed no statistically significant difference among the two groups. **Conclusion**: The study concluded that adding magnesium sulfate to bupivacaine in FICB in hip replacement procedures decreased the pain scores post-operatively.

INTRODUCTION

Total hip replacement (THR) is one of the most successful surgical procedures and has been identified as the "operation of the century".[1] Greater than one million operations are performed every year worldwide and this is anticipated to double within the next decade.[2] Systemic analgesia including both opioids and non-steroidal analgesia can have significant adverse effects especially in the elderly population due to age related changes in pharmacokinetics and pharmacodynamics.[3] The use of peripheral nerve blocks for pain management in this population can significantly reduce the morbidity and mortality without the side effects of systemic analgesics.[3]The fascia iliaca compartment block (FICB) is effective in producing the simultaneous blockade of both lateral cutaneous nerve of thigh, obturator nerve and femoral nerve.[4] The local anesthetics (LA) should spread between the iliacus muscle and the fascia iliaca.[5] A fascia iliaca compartment block (FICB) has been introduced by Dalens et al.[6] as a safe and reliable anterior approach to the lumbar plexus. FICB has been shown to provide good analgesia, facilitating patients' positioning for the spinal block,[7] and to improve pain control after surgery, but the effect is limited to the first few hours postoperatively.[6,8]

Magnesium is a physiologic cation that potentiates neuromuscular and peripheral nerve blockade. It has been shown to have antinociceptive effects in animal and human models. It blocks the NMDA receptors and their associated calcium channels preventing calcium influx.[9] Magnesium also prevents catecholamine release from the adrenal and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

peripheral nerve endings producing a sympatholytic action.[10] The present study was conducted to assess the impact of adding magnesium sulfate to bupivacaine versus bupivacaine alone in fascia iliaca compartment block for post operative analgesia for 24 hours in patients undergoing total hip replacement surgeries.

MATERIALS AND METHODS

The study was conducted to assess the impact of adding magnesium sulfate to bupivacaine versus bupivacaine alone in fascia iliaca compartment block for post operative analgesia for 24 hours in patients undergoing total hip replacement surgeries. Before the commencement of the study ethical approval was taken from the Ethical committee of the institute and informed consent was taken from the patients after explaining the study to them. Eligible patients were adults older than 18 years, American Society of Anesthesiologists physical status I–III. Patients with body weight less than 50 kg or more than 120 kg, height less than 150 cm, previous surgery in the affected hip, infection at the injection site, multiple fractures, peripheral neuropathy, uncooperative patients, use of analgesics within 8 h before the spinal block, and patients with contraindications to spinal anesthesia were excluded from the study. In the preinduction area, all patients were monitored with pulse oximetry and ECG, and noninvasive arterial blood pressure was determined. No premedication or sedation was given. Baseline data like blood pressure, heart rate (HR), respiratory rate (RR), oxygen saturation, and pain scores were recorded. Patients were randomly divided into two groups of 20 each: a bupivacaine group (group B) and a magnesium with bupivacaine group (group MB). All patients received FICB using the technique described by Dalens et al.[6] The test drug was injected in 5 ml increments after negative aspiration for blood. Patents in group B received 35 ml of bupivacaine 0.25% (a mixture of 17.5 ml bupivacaine 0.5% + 17.5 ml 0.9% saline) and patients in group MB received 0.25% bupivacaine containing 250 mg of magnesium sulfate (a mixture of 15ml bupivacaine 0.5% + 250 mg MgSO4 10% solution 5ml + 17.5 ml 0.9% saline). Patients with successful block were transferred to the operating room and after establishing a good anesthetic level, the surgery was performed. Arterial blood pressure, HR, and RR were recorded every 15 min. Postoperatively, patients' monitoring continued and pain intensity was assessed by a blinded observer at 1,4, 8, 12, and 24 h from the completion of FICB. Pain intensity using visual analogue scale (VAS): in which, the patient is told to mark the strength of pain he feels at one point along the length of a 10-cm line. The two ends of the scale represent "no pain" on the left end of the scale (0 cm) and the "worst pain" on the right end of the scale (10 cm). Sedation was defined as Ramsay Sedation Scale (RSS) score more than 3 (RSS 3 = patient responds to commands only).[11] Data were analyzed using the computer statistical software system SPSS version 16 (Statistical Packages for the Social Sciences, Chicago, Illinois, USA). Results are expressed as mean and SD, median, and range or numbers. A P value <0.05 was considered statistically significant.

RESULTS

In the present study, 40 patients underwent for total hip replacement surgeries. Patients were randomly divided into two groups of 20 each: a bupivacaine group (group B) and a magnesium with bupivacaine group (group MB). Patents in group B received 35 ml of bupivacaine 0.25% and patients in group MB received 0.25% bupivacaine containing 250 mg of magnesium sulfate. VAS was significantly lower at 1, 12 and 24 hours post-operative when group MB was compared to group B. At 4 h, 8h, 12h postoperatively both groups show significant association. Ramsay sedation score showed no statistically significant difference among the two groups. None of the 40 patients included in our showed any side effects or haemodynamic instability.

Table 1: VAS score

VAS score	Group B (n=20)	Group MB (n=20)	p-value
1 hr PO	1	0	>0.05
4 hr PO	4	2	<0.05
8 hr PO	4	2	<0.05
12 hr PO	3	2	<0.05
24 hr PO	3	2	>0.05

Table 2: Ramsay sedation score.

VAS score	Group B (n=20)	Group MB (n=20)	p-value
1 hr PO	1	1	>0.05
4 hr PO	2	2	
8 hr PO	2	2	
12 hr PO	2	2	
24 hr PO	2	2	

ISSN (O): 2687-5365; ISSN (P): 2753-6556

DISCUSSION

Total hip arthroplasty is an orthopedic procedure that involves the surgical excision of the head and proximal neck of the femur and removal of the acetabular cartilage and subchondral bone. An artificial canal is created in the proximal medullary region of the femur, and a metal femoral prosthesis, composed of a stem and small-diameter head, is inserted into the femoral medullary canal.[12]

In our study, VAS was significantly lower at 1, 12 and 24 hours post-operative when group MB was compared to group B. At 4 h, 8h, 12h postoperatively both groups show significant association. Ramsay sedation score showed no statistically significant difference among the two groups.

Magnesium also has an analgesic effect when given through intrathecal.[13,14], epidural.[15], or intra-articullar routes.[16] Magnesium has been suggested to exert an antinociceptive effect, presumably owing to its calcium channel antagonistic properties and its inhibitory effect on N-methyl-D-aspartate (NMDA) receptors.[17,18]

Ghareeb, S et al did a study to evaluate the analgesic effect of adding magnesium sulfate to bupivacaine in Fascia Iliaca Compartment Block (FI-CB). The study concluded that by adding magnesium sulfate to bupivacaine in FICB in skin grafting procedures decreased the pain scores post-operative, delayed the first request of analgesia and reduced the total analgesic consumption in the first 24 h post-operative without any significant side effects.[19]

Eid H, et al determine the effect of the addition of magnesium sulfate to bupivacaine on the duration of analgesia provided by FICB in patients undergoing surgery hip fracture. Patients who received magnesium had a longer time to first analgesic administration, lower pain scores on movement at 8, 12, and 24 h after the FICB, and lower tramadol consumption for postoperative pain. No complications related to FICB were reported. The addition of magnesium to bupivacaine for FICB significantly prolongs the duration of analgesia and reduces opioid demand, without side effects.[20]

In humans, magnesium sulfate has been used in the axillary sheath as an adjuvant along with prilocaine to prolong its effect.[21] This effect has not been achieved by the same dose of magnesium given intravenously.[21]

CONCLUSION

The study concluded that adding magnesium sulfate to bupivacaine in FICB in hip replacement procedures decreased the pain scores post-operatively.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556