e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(5); 204-207

Original Research Article

Effect of the Magnesium Sulfate in Ultrasound Guided Quadratus Lumborum Block for Post-Operative Analgesia after Abdominal Surgeries

Bhupendra Buda[1], Meenakshi Pandey[2], Shakti Prakash Mishra[3], Arpita Jena[4], Kamala Kanta Pradhan[5]

[1]Assistant Professor, Department of Physiology, SCB Medical College, Cuttack, Odisha, India
[2]Assistant Professor, Department of Anesthesiology, Government Medical College, Sundargarh, Odisha, India
[3]Director, Food Safety, Health & Family Welfare Department, Odisha, India
[4]Assistant Professor, Department of Anesthesiology, SCB Medical College, Cuttack, Odisha, India
[5]Associate Professor, Department of Anesthesiology, Government Medical College, Sundargarh, Odisha, India

Received: 01-02-2026 / Revised: 15-03-2026 / Accepted: 21-04-2026
Corresponding author: Dr. Arpita Jena
Conflict of interest: Nil

Abstract

Aim: Quadratus lumborum block (QLB) has proven to be an effective analgesic technique in various abdominal surgeries. Magnesium sulfate as an adjuvant in different nerve blocks has been well studied. The aim of this study was to assess the efficacy of magnesium sulfate as an adjuvant to ropivacaine in an ultrasound-guided QLB for postoperative analgesia in abdominal surgeries.

Methods: This study was done in 70 patients posted for abdominal surgeries who were divided into two groups of 35 each. QLB was given bilaterally in group RS with 40 ml of 0.375% ropivacaine with 4 ml saline and in group RM with 40 ml of 0.375% ropivacaine with 10% magnesium sulfate 4ml.Patients were operated under general anesthesia and were examined for pain at different time points postoperatively. Time required for first analgesic demand was our primary aim. Secondary aim was total rescue analgesia (paracetamol) required in 24 hrs, pain scores, nausea, vomiting, sedation and any other complications.

Results: The time required for first analgesic demand was 15.9± 1.8hrs in RM group and 11.2± 0.9 hrs in group RS which was statistically significant. The total paracetamol consumption in 24 hours was1.7± 0.5 gm in group RM and 3.1± 0.9 gm in group RS, the difference being significant.

Conclusion: Magnesium sulfate as an adjuvant to ropivacaine in quadratus lumborum block prolong duration of postoperative analgesia after abdominal surgeries. It not only improves the visual analogue scale (VAS) score but also decreases the rescue analgesic consumption without any complications.

Keywords: Quadratus Lumborum Block, Magnesium Sulphate, Postoperative, Analgesia.

DOI: 10.25258/ijcpr.18.5.32

Introduction

Abdominal blocks like transverse abdominal plane (TAP) block and transmuscular quadratus lumborum block (QLB) are commonly used for postoperative analgesia.[1] Earlier trials on TAP blocks have not shown any positive results as it only blocks somatic pains, without blocking visceral pain as local anesthetics fails to spread to the paravertebral space.

Local anesthetics block the nerves transmitting visceral pain in the thoracic paravertebral space which includes T4–L1 dermatomes.

In QLB, local anesthetics spread between the psoas major and the quadratus lumborum to the fascial interspace posterior to the transverse fascia. QLB was first described by Borglum et al [2] who concluded that QLB could provide better postoperative analgesia compared to TAP block. In few cadaveric trials of the QLB, dye was seen spreading in the paravertebral space which surrounds the somatic nerves, and the thoracic sympathetic trunk.[3] In literature many studies have concluded that QLB can provide good postoperative analgesia in abdominal surgery but it has its own limitations.[4]

Magnesium plays an important role in the physiological function of the human body. A large number of studies have reported the safety and effectiveness of adding magnesium sulfate to local

anaesthetics in various regional anesthesia techniques.[5] Therefore, we have done a prospective randomized controlled trial to compare the analgesic efficacy of combining magnesium sulfate with ropivacaine in QLB.

Methods

This is a prospective randomised double-blind trial which was undertaken after approval from our Institutional ethics committee. Informed consent was obtained from all patients. A total of 70 patients aged between 30 to 70 years with ASA (I/II) posted for abdominal surgeries under general anaesthesia were included in our study. Patients having history of allergy to local anaesthetics, coagulopathy, chronic renal failure, BMI >25kg/m^2, block site infection and cardiorespiratory diseases were excluded. All the patients were randomly split sequentially into group RS and group RM using a computer-generated random numbers. The allocated sequence was put in sealed opaque envelopes and were opened in the operation theatre. Group RS received ropivacaine with saline in QLB and group RM received ropivacaine with Magnesium sulfate in QLB. Study drug was prepared by an investigator who was blinded to the study. The anaesthesiologist who administered the blocks and recorded pain characteristics were blinded to the group allocation.

In the operation theatre, IV access was established using an 18-gauge IV cannula and ringers lactate was started. Electrocardiograph (ECG), non-invasive blood pressure (NIBP) monitor, and pulse oximeter were attached and base line data were recorded. Ultrasound (US) guided QLB was given as described by Jodan.[12]IV midazolam 0.03mg/kg and fentanyl 1mcg/kg was administered. Then all patients were put in the left and right lateral decubitus position and block was given. A low-frequency 18–6 MHz curvilinear ultrasound transducer was put just above the anterior and posterior iliac crest and below the rib cage. Structures like the transverse process, vertebral body, erector spinae muscle, quadratus lumborum muscle, and the psoas muscle making up the "shamrock" sign was identified.[6] Tip of the needle was directed between the psoas muscle and the quadratus lumborum muscle and 22 ml of either of 0.375% ropivacaine with normal saline was injected into the interfascial plane on each side as per the allocated group. All the patients were tested for successful block and patients with successful block were allowed for surgery after administering general anaesthesia as per institutional protocol. The pain was measured by the Visual Analogue Score (VAS) [7] on the scale of 0-10 (0 - no pain and10 - worst imaginable pain). Complications like pruritus, sedation, nausea, and haemodynamic abnormalities were assessed in both the groups at 20min, 40min, 1hrs,3hrs, 6hrs,9hrs, 12hrs,15hrs, 18hrs,21hrs and 24 hours after the surgery. Rescue analgesia (IV paracetamol15mg/kg) was given when VAS score>4.Severity of PONV was measured on the 4-pointscore (0 - absent, 1 - mild, 2 - moderate and 3 - severe or vomiting). Patients were evaluated for the level of sedation by using a 4- sedation scale (1-awake,2- response to verbal command, 3 - response to touch, 4 - deeply sedated and response to pain). Primary outcome was the time required for first analgesic request. Secondary outcome was total dose of paracetamol required in 24 hours, VAS scores, and any other complications. Sample size was calculated after doing a pilot study.

Assuming 50% increase in the time of request for analgesia request as significant, keeping the power of the study at 80% and significance level of 95%, a total of 30 subjects were required in each group. Keeping in mind about possible dropouts we have included 35 patients in each group. Continuous data was analysed for normality using the "Kolmogorov Smirnov test" of normality. Normal distributed data was represented as mean ± SD and was assessed using the student's t-test. Non normally distributed data was analysed using the Mann-Whitney U-test. A P value < 0.05 was considered significant.

Results

A total of 70 patients posted for abdominal surgeries were included in the study. The demographic profile and duration of surgery were comparable in both the groups. (Table1) The mean time to first analgesic request 15.9± 1.8 hrs hours in group RM and 11.2± 0.9 hours in group RS.($P < 0.05$) The total dose of paracetamol consumed in 24 hours was1.7± 0.5 gm in group RM and 3.1± 0.9 gm in group RS.($P < 0.05$) (Table 2)At different time intervals, VAS scores were significantly lower in the Group RM compared to the group RS. ($p < 0.05$) (Table 3) There was no remarkable difference regarding PONV score, and sedation between the two groups. (Table 4)

Table 1: Descriptive variables of groups.

Variables	Group RM(n=35) (Mean±SD)	Group RS(n=35) (Mean±SD)	P value
Age(years)	56.13±12.65	54.78±11.98	0.226
Female: Male(n)	30:5	31:4	0.274
ASA I/II (n)	19/16	18/17	0.239
Surgical time (mins)	90.35±16.55	92.39±15.74	0.112
BMI (kg/m^2)	23.4±2.14	22.5±2.17	0.218

Table 2: Total analgesic consumption in 24 hrs and time to first analgesia request

Parameters	Group RM (n=35) (Mean±SD)	Group RS(n=35) (Mean±SD)	P value
Total analgesic consumption (Paracetamol in gm)	1.7± 0.5	3.1± 0.9	0.014
Time to 1st rescue analgesia request (hrs)	15.9± 1.8	11.2± 0.9	0.019

Table 3: Post-operative VAS scores

Times of Measurement	Group RM (n=35) (Mean±SD)	Group RS(n=35) (Mean±SD)	P value
20th min	1.25±2.14	1.4±2.25	0.213
40th min	1.89±2.19	1.45±1.38	0.241
1st h	1.48±1.4	1.16±1.45	0.261
3rd h	1.99±1.2	1.18±1.44	0.251
6th h	1.83±1.1	1.29±1.37	0.284
9th h	1.99±1.67	2.85±1.99	0.252
12th h	2.6±1.7	4.05±1.31	0.021
15th h	2.7±1.8	4.26±1.48	0.026
18th h	2.9±1.4	4.33±1.38	0.082
21st h	2.95±1.4	4.88±1.72	0.031
24th h	2.97±1.1	4.15±1.75	0.024

Table 4: Incidence of PONV and sedation

	Group RM (n=35)	Group RS (n=35)	P value
Nausea	5	4	0.231
Vomiting	4	5	0.251
Sedation	4	3	0.261

Discussion

Our study showed that use of magnesium sulfate as an adjuvant to ropivacaine for QLB resulted in lower VAS scores at both 12h and 24h post operatively, longer analgesia duration, and lesser paracetamol requirement as rescue analgesia. QLB is a superficial fascial block between the posterior abdominal wall muscles and is not technically difficult to perform. In our study we found that patients in the group RM had remarkably delayed time for first analgesia request, reduced the analgesia requirement in 24 hours and produced lower VAS scores compared to group RS. Abdominal wall blocks like TAP block have been used for postoperative analgesia in different abdominal surgeries. But there is controversy regarding its efficacy as the number of studies with poor efficacy is increasing. Most of the abdominal wall blocks, like TAP and fascia transversalis block, only affect somatic pain, not visceral pain. Spread of the local anaesthetic to the paravertebral space is mandatory for controlling visceral pain. In QLB, the local anaesthetic spreads between psoas major and quadratus lumborum, which block the ventral rami of the spinal nerve thereby controlling visceral pain.[8] Abduallah, et al [9] in their study opined that the use of QLB decreased post-operative analgesic consumption and post-operative pain score in patients undergoing total hip replacement. Xia et al,[10]in their study found that the combined TQLB and fascia iliaca compartment block produced prolonged postoperative analgesia after total hip arthroplasty. Zhu et al,[11]in their study opined that the ultrasound-guided QLB produced efficient postoperative analgesia in patients undergoing laparoscopic nephrectomy and it reduced the consumption of opoid postoperatively. Jadon et al,[12] opined that the ultrasound-guided QLB provided prolonged and effective postoperative analgesia after laparoscopic hysterectomy surgery. It not only reduced the fentanyl consumption but also improved the visual analogue scale (VAS) score postoperatively. Coppens et al,[13] in their study opined that QLB provided efficient postoperative analgesia when compared to controlled intravenous analgesia with morphine alone. In their study by Deng et al,[14] they found that the QLB provided better postoperative analgesia in comparison to transverses abdominal plane block in patients undergoing laparoscopic colorectal surgery.

The mechanism of action by which magnesium sulphate potentiates the analgesic effect of local anesthetics is still unclear. Magnesium is an N-methyl-D-aspartate (NMDA) receptor and calcium antagonist. Some studies have shown that the analgesic effects of magnesium are primarily based on the inhibition of calcium influx and the excitability of NMDA receptors, thus reducing the sensitivity to central or peripheral pain stimulation. Mukherjee et al. [15] in their trial, found that adding 150 mg magnesium sulfate as an adjuvant to 0.5% ropivacaine during brachial plexus nerve block resulted in longer duration of sensory and motor block and lesser demands of rescue analgesics without significant side effects. Ammar et al. [16]

reported that the addition of magnesium sulfate to bupivacaine during transverses abdominis plane (TAP) block significantly prolonged the duration of analgesia and reduced postoperative morphine requirements and frequency of nausea and vomiting. Though all above studies were in agreement with our study, we suggest further large-scale studies to validate our study findings.

Conclusion: Addition of magnesium sulfate to ropivacaine in QLB prolonged the duration of postoperative analgesia, decreased analgesic requirement and prolonged the time to first analgesia request without any side effects.

References

1. Shahi V, Verma AK, Agarwal A, Singh CS. A com parative study of magnesium sulfate vs dexmedetomidine as an adjunct to epidural bupi vacaine. J Anaesthesiol Clin Pharmacol. 2014;30(4): 538–42
2. Børglum J, Moriggl B, Jensen K, Lønnqvist P-A, Christensen AF, Sauter A, et al. Ultrasound-guided transmuscular quadratus lumborum blockade. BJA Br J Anaesth. 2013;111.
3. Walter CJ, Maxwell-Armstrong C, Pinkney TD, Conaghan PJ, Bedforth N, Gornall CB, et al. A randomised controlled trial of the efficacy of ultrasound-guided transversus abdominis plane (TAP) block in laparoscopic colorectal surgery. Surg Endosc. 2013;27: 2366–2372.
4. Rashid A, Gorissen KJ, Ris F, Gosselink MP, Shorthouse JR, Smith AD, et al. No benefit of ultrasound-guided transversus abdominis plane blocks over wound infiltration with local anaesthetic in elective laparoscopic colonic surgery: results of a double-blind randomized controlled trial. Color Dis. 2017; 19:681–689.
5. Mert T, Gunes Y, Guven M, Gunay I, Ozcengiz D. Effects of calcium and magnesium on peripheral nerve conduction. Pol J Pharmacol. 2003;55(1): 25–30.
6. Sauter AR. The “Shamrock Method” - a new and promising technique for ultrasound guided lumbar plexus blocks. BJA Br J Anaesth. 2013;111.
7. Oh TK, Yim J, Kim J, Eom W, Lee SA, Park SC, et al. Effects of preoperative ultrasound-guided transversus abdominis plane block on pain after laparoscopic surgery for colorectal cancer: a double-blind randomized controlled trial. Surg Endosc. 2017; 31:127–134.
8. He J, Zhang L, He WY, et al. Ultrasound-Guided Transmuscular Quadratus Lumborum Block Reduces Postoperative Pain Intensity in Patients Undergoing Total Hip Arthroplasty: A Randomized, Double-Blind, Placebo-Controlled Trial. Pain Res Manag. 2020;2020: 1035182.
9. Abduallah MA, Ahmed SA, Abdelghany MS. The effect of post-operative ultrasound-guided transmuscular quadratus lumborum block on post-operative analgesia after hip arthroplasty in elderly patients: A randomised controlled double-blind study. Indian J Anaesth. 2020;64(10):887-893.
10. Xia Q, Ding W, Lin C, Xia J, Xu Y, Jia M. Postoperative pain treatment with transmuscular quadratus lumborum block and fascia iliaca compartment block in patients undergoing total hip arthroplasty: a randomized controlled trial. BMC Anesthesiol. 2021 Jul 10;21(1):188.
11. Zhu M, Qi Y, He H, Lou J, Pei Q, Mei Y. Analgesic effect of the ultrasound-guided subcostal approach to transmuscular quadratus lumborum block in patients undergoing laparoscopic nephrectomy: a randomized controlled trial. BMC Anesthesiol. 2019 Aug 14;19(1):154
12. Jadon A, Ahmad A, Sahoo RK, Sinha N, Chakraborty S, Bakshi A. Efficacy of transmuscular quadratus lumborum block in the multimodal regimen for postoperative analgesia after total laparoscopic hysterectomy: A prospective randomised double-blinded study. Indian J Anaesth. 2021 May;65(5):362-368.
13. Coppens S, Rex S, Fieuws S, Neyrinck A, D'Hoore A, Dewinter G. Transmuscular quadratus lumborum (TQL) block for laparoscopic colorectal surgery: study protocol for a double-blind, prospective randomized placebo-controlled trial. Trials. 2020;21(1):581.
14. Deng W, Long X, Li M, et al. Quadratus lumborum block versus transversus abdominis plane block for postoperative pain management after laparoscopic colorectal surgery: A randomized controlled trial. Medicine (Baltimore). 2019;98(52):e18448.
15. Mukherjee K, Das A, Basunia SR, Dutta S, Mandal P, Mukherjee A. Evaluation of magnesium as an adjuvant in ropivacaine-induced supraclavicular brachial plexus block: a prospective, double-blinded randomized controlled study. J Res Pharm Pract. 2014;3(4):123–9
16. Ammar AS, Mahmoud KM, Kasemy ZA. Compar ison between adenosine and magnesium sulphate as adjuvants for transversus abdominis plane block: a prospective randomized controlled trial. Minerva Anestesiol. 2018;84(3):304–10.