ORIGINAL ARTICLE

Combined Intra-peritoneal and Incisional Infiltration versus Bilateral Ultrasound Guided Quadratus lumborum Block using Bupivacaine Plus Magnesium Sulphate in Abdominal Hysterectomy

Maged M. S. Alansary [a], Abd Elmonsef A. M. Sedek [b], Ahmed M. M. El Garhy [a], Ahmed M. M. Al wakel [a,*]

[a] Department of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt
[b] Department of Orthopedic Surgery, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Abstract

Background: ***Frequent gynecological surgery is a hysterectomy, which often causes agonizing, chronic discomfort.***

Aim of the Work: Compare the combined intraperitoneal instillation and incisional infiltration with the bilateral ultrasound-guided QL2 block following abdominal hysterectomy.

Patients and Methods: ***This planned, double-blind, randomized experiment was a survey that took place in Al-Azhar University Hospitals, Obstetrics and Gynecology Department, on 70 females undergoing abdominal hysterectomy, divided into two equal groups. Group (IP): A volume of 30 mL solution consisting of 50 mg of bupivacaine 0.25% (20 mL) plus 1 g of magnesium sulfate (10 mL) was instilled intraperitoneally, then the same doses and volume were infiltrated into the abdominal wall after closure of the abdominal incision. Group (QLB): Bilateral QL2 block with a volume of a 30 mL solution consisting of 50 mg of bupivacaine 0.25% (20 mL) plus 1 g of magnesium sulfate (10 mL) in each muscle.***

Results: ***Group QL noticed a lot more time to begin seeking analgesia than group IP (P <0.05). At baseline, PACU, 12 hours, and 24 hours, there were no significant variations in the concentrations of cortisol and glucose between the two groups (P>0.05). Group QL reported a significantly lower hospital stay than group IP (P <0.05).***

Conclusion: ***The ultrasound-guided QL block decreased lengths of hospital stay and give better postoperative pain control compared to IP group with a delay in request analgesia for the initial time.***

Keywords: Titanium Elastic Nailing System ; Intramedullary Fixation; Middle third clavicular Fractures

1. Introduction

Numerous internal and external factors have influenced medical development throughout history, starting about 3,000 years ago with the Ancient Egyptians, who used local analgesia to perform male circumcision. The mid-Islamic era marked the height of Egyptian medical history and lasted for eight centuries. Prior to amputating the upper and lower limbs, Avicenna (Ibn Sina), the foremost physician in the Islamic world, employed refrigerated analgesia. Up until the start of the 19th century, the book (Al Canon fi Altib) served as the accepted medical textbook. When Carl Kuler employed the local analgesic cocaine in the 19th century, this history was altered.[1]

The hysterectomy's historical background demonstrates its profound origins in ancient societies, especially in Egypt and Greece, where the practice was entwined with cultural notions of women's identity and health.[2]

In relation to anticipating cervical stump carcinoma, Richardson carried out the initial complete abdominal hysterectomy in 1929, removing the cervix. In the late 1940s, with a lower risk of bladder and ureter injury, supra-cervical hysterectomies were recommended to counter peritoneal inflammation and peritoneal Infection with vaginal bacterial flora.[3]

Accepted 15 June 2025.
Available online 31 July 2025

* Corresponding author at: Anesthesia, Intensive Care and Pain Management, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt.
E-mail address: ahmedelwakil.622@azhar.edu.eg (A. M. M. Al wakel).

https://doi.org/10.21608/aimj.2025.446658

Since hysterectomy is presently the second most popular procedure on women, after sections, the number of surgeries performed has skyrocketed due to its greater safety.[4]

Because it blocks transduction, transmission, and modulates afferent nerve nociceptive stimulant, regional anaesthesia is extremely effective in avoiding neuro-hormonal activating, winding upward, and central sensitizing of the central nervous system (CNS).[5]

Rafael Blanco 4 in the beginning, descriptive quadratus lumborum (QL) blocking in 2007. Its painkiller ability and longer-lasting effect have been attributed to the local anaesthetic agent excursion to the thoracic paravertebral and extradural region, which provides supplementary sympatholytic action in the thoracolumbar fascia, which can relieve visceral pain.[6]

To our knowledge, magnesium sulfate administration regimens involve a loading dose of 30–50 mg/kg.[7] for an average weight of 70 kg, the total dose was 2100 mg. new dosage formulations and delivery methods for regional nerve blocks have been developed recently and this is the first clinical trial analyzing the effects of another magnesium regimen, To assess the analgesic effect with bupivacaine, we used a total dose of 2 grams as a single bolus adjuvant to local anesthetics.

2. Patients and methods

Study Design: The department's ethics committee approved this planned, double-blind, randomly selected experiment, which took place on 70 female ASA I and II patients in the obstetrics and gynecology department of AL-Azhar University Hospitals, undergoing an elective abdominal hysterectomy.

Inclusion criteria: Age range: 40–65 years. ASA physical status I and II, body mass index (BMI) < 30 kg/m2.

Exclusion criteria: Patient refusal, Patient with coagulation disorders, Infection at the site of injection, Patient's sensitivity to the used drugs, Patients on chronic analgesic medication, like NSAIDs
(Celebrex),Opioids(morphine),Anticonvulsants (pregabalin),Antidepressants(Duloxetine) and muscle relaxants (baclofen).

Sample Size Calculation: Results from a previous study (Yousef, 2018) Epi Info Statical utilized to determine the sample size by Considering confidence level of 95%, power of 90%, and the estimated effect size of the VAS as 4/10 for (Group IP)and 4/10 for (Group QL), the representative sample should be at least 30 patients in each group. Estimating a 15% drop out during follow-up, 35 patients were recruited per group.

Randomization and blindness: The Sample was randomized by the closed envelope method into two equal groups: group IP, which underwent combined intraperitoneal instillation and incisional infiltration, and group QLB, which underwent bilateral ultrasound-guided QL2 block. Data was collected by an independent person who is unaware of the group allocation. Following an explanation of the study's objectives, a secret code number to safeguard participant privacy and data confidentiality, a review of their investigations, a physical examination, and a collection of their medical history, all patients were required to provide written informed consent.

Anesthetic Technique: After entering the preparation area, a peripheral vein was punctured with an 18-gauge intravenous (IV) cannula, in addition to basic monitoring, which included electrocardiography (ECG), non-invasive blood pressure (NIBP) monitoring, and pulse oximetry. The patients received 20 milliliters per kilogram of Ringer's lactate solution. All patients underwent the same spinal anesthesia procedure, which involved sterilizing the area with an antiseptic solution and administering 20 mg of 0.5% hyperbaric bupivacaine and 25 mg of fentanyl in the L3-4 or L4-5 interspaces. After removal of the uterus with or without the adnexa and securing of all bleeding vessels/ structures, the patients were assigned to receive either combined intraperitoneal instillation and incisional infiltration or bilateral ultrasound-guided QL2 block.

Technique of Combined Intraperitoneal and incisional infiltration (IP): After removal of the uterus with or without the adnexae and securing of all bleeding vessels/structures, the surgeon withdrew a volume of 30 mL solution consist of 50 mg of bupivacaine 0.25% (20 ml) plus 1g Magnesium Sulphate (10 ml), under complete aseptic condition, the volume was spread over the operative site, then after closure of the abdominal incision the volume of 30 mL solution consist of 50 mg of bupivacaine 0.25% (20 ml) plus 1g Magnesium Sulphate (10 ml), was delivered by the surgeons' moving needle technique, which involved aspirating to prevent intravascular injections and injecting 2-3 ml every 1-2 cm as the needle pushed through the subcutaneous tissue.

Technique of US-guided posterior QLB: A Bilateral ultrasound-guided QL block was done after the procedure. A sterile convex (curved array) ultrasonography probe with a sterile sheath was used to perform the block following local sanitation with povidone-iodine. At the level of the L2–3 lumbar vertebrae, the probe was positioned transversely between the iliac crest bone and the lower edge of the thoracic cage.

Following aspiration to ensure the needle tip

was positioned correctly in the middle layer of the thoracolumbar fascia, 1-2 milliliters of sterile saline were administered to confirm the site by hydro-dissection. Injection volumes of 30 mL solution consist of 50 mg of bupivacaine 0.25% (20 ml) plus 1g Magnesium Sulphate (10ml), in each Quadratus lumborum muscle (QL2 block) and the hydro-dissection of the injectate in the targeted place of lumbosacral fascia and adjacent structure was real-time portrayed.

Postoperative Evaluations: Postoperative analgesia will be provided by paracetamol 1g every eight h with Injection ketorolac 30mg (0.3 mg/kg) intravenously when patient numeric pain scale exceed 4, in patients with severe postoperative pain that cannot be adequately controlled with non-opioid analgesics will be given pethidine 50mg (0.5 mg/kg) intra muscular, postoperative pain was evaluated using numeric pain scale (NPRS) in 2hr., 4hr., 8hr., 12hr., and 24 hr. hours postoperatively, Glucose and cortisol levels was measured, First time of analgesia, Dose of analgesia consumption during first 24 hours of postoperative period was recorded, Postoperative Functional Recovery: Time to drink (h), Time to sit (h), Time to eat (h), Time to walk (h), Length of hospital stay (d), Side effects and complications was recorded.

Statistical analysis: The software SPSS v26 (IBM Inc., Chicago, IL, USA) was used for statistical analysis. The normality of the data distribution was assessed using histograms and the Shapiro-Wilks test. Using an unpaired Student's t-test, quantitative parametric variables were compared between the two groups and displayed as mean and standard deviation (SD). The Mann-Whitney test was used to analyze quantitative non-parametric data, which were displayed as the median and interquartile range (IQR). The chi-square test or, when applicable, Fisher's exact test was used to analyze the qualitative variables, which were displayed as frequency and percentage. It was deemed statistically significant when the two-tailed P value was less than 0.05.

3. Results

The obtained from the studies of this work were tabulated and illustrated as graphs, histograms and curves.

Table 1. Demographic data and duration of the surgery of the studied groups.

		GROUP QL (N=35)	GROUP IP (N=35)	P VALUE
AGE (YEARS)	Mean ± SD	52.54 ± 6.81	51.86 ± 6.73	0.673
	Range	40 - 65	42 - 64	
WEIGHT (KG)	Mean ± SD	84.2 ± 3.39	83.69 ± 5.02	0.617
	Range	78 - 90	74 - 95	
HEIGHT (CM)	Mean ± SD	170.06 ± 3.47	169.91 ± 4.27	0.878
	Range	163 - 175	164 - 185	
BMI (KG/M²)	Mean ± SD	28.13 ± 1.11	27.99 ± 1.47	0.654
	Range	26.06 - 29.62	24.54 - 29.14	
ASA PHYSICAL STATUS	I	16 (45.71%)	18 (51.43%)	0.632
	II	19 (54.29%)	17 (48.57%)	
DURATION OF SURGERY (MIN)	Mean ± SD	95.11 ± 13.79	94.83 ± 13.13	0.930
	Range	80 - 130	80 - 120	

BMI: Boby mass index, ASA: American society of anesthesiologists.

In table (1) the age, weight, height, BMI, ASA physical status and duration of surgery were statistically analyzed. They were insignificantly different between both groups.

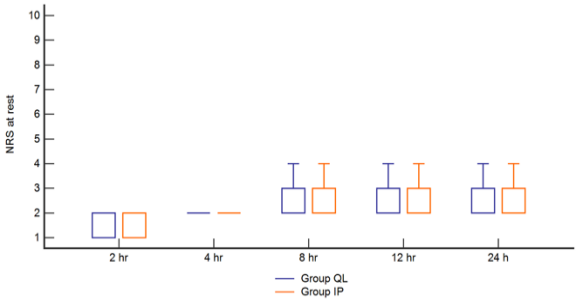

Figure 1. NRS at rest of the studied groups.

In figure (1): NRS at rest at 2 hr., 4 hr., 8 hr., 12 hr. and 24 hr. were statistically analyzed. They were insignificantly different between both groups.

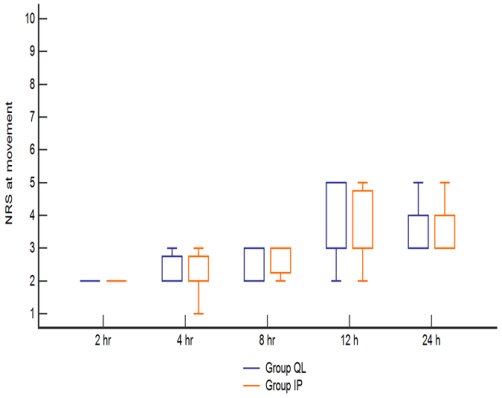

Figure 2. NRS at movement of the studied groups.

In figure (2): NRS at movement at 2 hr., 4 hr., 8 hr., 12 hr. and 24 hr. were statistically analyzed. They were insignificantly different between both groups.

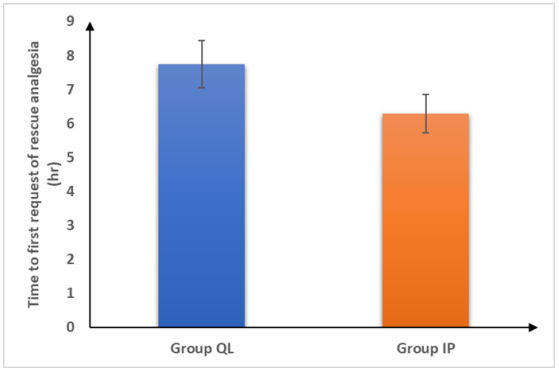

Figure 3. Time to first request of rescue analgesia of the studied groups.

In figure (3) the time to first request of rescue analgesia was statistically analyzed. They were significantly delayed in group QL than group IP (P value<0.001).

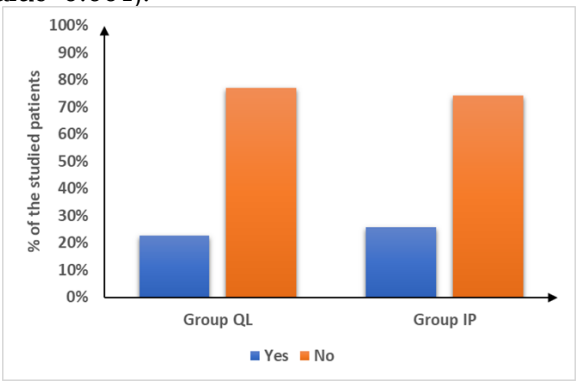

Figure 4. Total dose of pethidine consumption in the first 24 hours.

In figure (4) Total dose of pethidine consumption in the first 24 hours were statistically analyzed. They were insignificantly different between both groups.

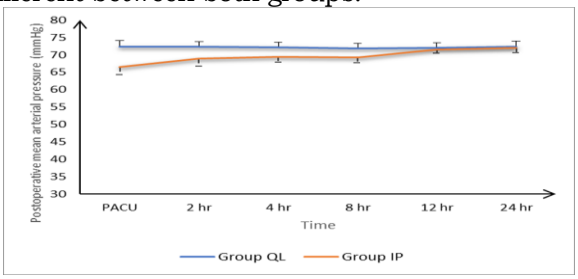

Figure 5. Postoperative mean arterial pressure of the studied groups.

In figure (5) postoperative mean arterial pressure was statistically analyzed. They were significantly lower at PACU, 2 hr., 4 hr. and 8 hr. in group IP than group QL (P value <0.001) and was insignificantly different at 12 hr. and 24 hr. between both groups.

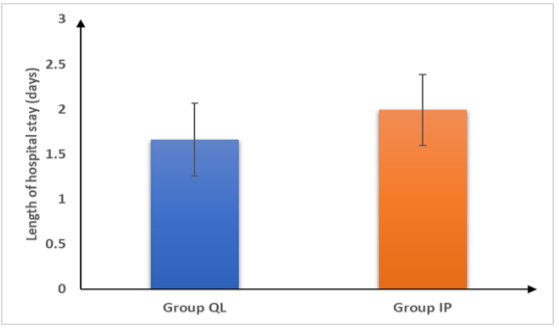

Figure (6): Length of hospital stay of the studied groups.

In figure (6) length of hospital stay was statistically analyzed. It was significantly lower in group QL than group IP (P value 0.001).

Table 2. Glucose level of the studied groups.

	GROUP QL (N=35)	GROUP IP (N=35)	P VALUE
BASELINE	115.71±8.4	118.83±5.85	0.076
PACU	166.77±12.73	166.06±9.99	0.795
12 HR	132.49±8.97	131.49±8.52	0.634
24 HR	126.06±8.08	125.23±10.49	0.712

In table (2) glucose level at baseline, PACU, 12 hr. and 24 hr. was statistically analyzed. It was insignificantly different between both groups.

Table 3. Cortisol level of the studied groups.

	GROUP QL (N=35)	GROUP IP (N=35)	P VALUE
BASELINE	483.09±35.8	471.4±31.91	0.154
PACU	844.43±44.65	840.63±43.46	0.719
12 HR	456.74±48.18	467.06±24.17	0.262
24 HR	465.83±19.78	464.57±33.64	0.849

In table (3) cortisol level at baseline, PACU, 12 hr. and 24 hr. was statistically analyzed. It was insignificantly different between both groups.

Table 4. Postoperative functional recovery and length of hospital stay of the studied groups.

		GROUP QL (N=35)	GROUP IP (N=35)	P VALUE
TIME TO ABILITY TO DRINK (HR)	Mean ± SD	2.62 ± 0.43	2.94 ± 0.56	0.008*
	Range	2 - 3.42	2.14 - 4.35	
TIME TO ABILITY TO SIT (HR)	Mean ± SD	2.7 ± 0.47	2.7 ± 0.47	0.999
	Range	2 - 3.55	2 - 3.55	
TIME TO ABILITY TO EAT (HR)	Mean ± SD	3.72 ± 0.46	4.06 ± 0.35	<0.001*
	Range	3.22 - 5	3.42 - 5	
TIME TO ABILITY TO WALK (HR)	Mean ± SD	3.96 ± 0.38	3.72 ± 0.46	0.019*
	Range	3.44 - 5	3.22 - 5	

In table (4) Time to ability to drink, sit, eat and walk were statistically analyzed. Time to ability to sit was insignificantly different between both groups. Time to ability to drink and eat was significantly earlier in group QL than group IP (P value=0.008 and <0.001 respectively). Time to ability to walk was significantly delayed in group QL than group IP (P value=0.019).

4. Discussion

No significant variance among the two groups was noted in demographic data, which included age, weight, height, BMI, and length of surgery. Similarly, no significant variance was noted among the intraoperative vital signs, which include heart rate, MABP, and SpO2. Postoperative MAP was significantly lower at

PACU, two hr., four hr., and eight hr. in group IP than group QL, which is within the normal range of mean blood pressure. The possible explanation for the significantly lower postoperative MAP for 12 hr., in this clinical context, following Intra-peritoneal absorption of bupivacaine combined with magnesium sulfate done under spinal anesthesia, is primarily attributed to several inter-related mechanisms. Firstly, vasodilation occurs as a highly vascular large surface area with rapid absorption of bupivacaine plus magnesium sulfate under spinal anesthesia, which induces dilatation of the blood vessels, resulting in decreased systemic vascular resistance (SVR) and contributing to lower blood pressure. Secondly, sympathetic nerve blockade plays a significant role by inhibiting the sympathetic nervous system, further promoting vasodilation and hypotension. Lastly, the pharmacological properties of using bupivacaine plus magnesium sulfate themselves, which vary in their vasodilator and negative inotropic effects, are essential in understanding the overall hemodynamic changes that result in hypotension.[8,9]

Similar to the current work by Naaz et al.,[10], the QL group and control group's MAP did not differ substantially with time. Furthermore, a randomized control trial was carried out on 120 patients who had laparoscopic sleeve gastrectomy by El Mourad and Arafa .[11] They stated that the intra-peritoneal group's heart rate and MAP were noticeably lower than those of the control group.

It has been proposed that the local anesthetic solution spreading along the thoraco-lumbar and endothoracic fascia to the paravertebral space, which is packed with adipose tissue, is the reason for a prolonged duration of action after QLB. Due to the low local tissue perfusion in adipose tissue, a local anesthetic absorbs into the bloodstream at a slow rate. The IP group's peritoneal cavity, on the other hand, has a large blood supply, which expedites the drug's absorption and clearance and shortens the duration of analgesia.

In a similar vein, Shukla et al.[12] found that group QL's delay in order to need analgesics was significantly extended rather than that of the TAP group. Furthermore, group QL took much longer than the control group to initially request rescue analgesia, according to Naaz et al.[10].

Additionally, Zahra et al.[13] showed that the magnesium group needed rescue analgesia less frequently than the bupivacaine group. The present work, NRS at rest and NRS at movement, showed insignificantly different time intervals between group QL and group IP. Similarly, Brandão et al.,[14] discovered that the QLB group's pain score was much lower than the control group's. According to a study by Peng et al.,[15] the magnesium group's pain score at 4 hours, 6 hours., and 12 hours. After surgery, the NRS score was significantly reduced in the intraperitoneal group compared to the control group, our results were supported by Dudam et al.,[16] who reported that the intraperitoneal group's NRS score was lower than that of the control group at all time intervals.

However, Borys et al.,[17] carried out a prospective, observational study on 233 women with singleton pregnancies who underwent c-section section to comparison the effectivity of TAP block and QLB. They reported that the QL block did not manage postoperative long-lasting pain, such as neuropathic pain. This difference may be attributed to dissimilar sample sizes and the fact that they didn't add mg sulfate while we did.

Basal serum glucose level and cortisol levels, which we measured before the start of surgery, were in the range of reference values. With the highest level at PACU, then return to near basal level at 12 hours. and 24hr.

The fact is that both techniques provided effective analgesia and reduced stress response, thereby minimizing the impact on glucose and cortisol metabolism. Additionally, the QLB may have reduced the systemic stress response by reducing nociceptive signals from being sent out, leading to a similar cortisol and glucose profile compared to intra-peritoneal instillation. [18]

Supporting our findings, Brandão et al.,[14] who reported that cortisol levels were in-significantly different at baseline, 4 hr, and 24 hr after the procedure between QLB. A meta-analysis done with Kahokehr et al., [19] which was conducted to investigate the use of Intra-peritoneal anesthetic ,They found that glucose levels and cortisol levels were reduced postoperatively.group and control group.

4. Conclusion

The ultrasound-guided QL block decreased length of hospital stay and gives better postoperative pain control compared to IP group with a delay in request analgesia for the initial time.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

Funding

No Funds : Yes

Conflicts of interest

There are no conflicts of interest.

References

1. Ansary ME, Steigerwald I, Esser S. Egypt: Over 5000 Years of Pain Management—Cultural and Historic Aspects. Pain Practice. 2003;3(1):84-87.
2. Haimov-Kochman R, Sciaky-Tamir Y, Hurwitz A. Reproduction concepts and practices in ancient Egypt mirrored by modern medicine. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2005;123(1):3-8.
3. Sutton C. Past, Present, and Future of Hysterectomy. Journal of Minimally Invasive Gynecology. 2010;17(4):421-435.
4. Othersen HB Jr. Ephraim McDowell: the qualities of a good surgeon. Ann Surg. 2004;239(5):648-650.
5. Lemke KA. Understanding the pathophysiology of perioperative pain. Can Vet J. 2004;45(5):405-413.
6. Naaz S, Kumar R, Ozair E, et al. Ultrasound Guided Quadratus Lumborum Block Versus Transversus Abdominis Plane Block for Post-operative Analgesia in Patients Undergoing Total Abdominal Hysterectomy. Turk J Anaesthesiol Reanim. 2021;49(5):357-364.
7. Shin HJ, Na HS, Do SH. Magnesium and Pain. Nutrients. 2020;12(8).
8. Kaarthika T, Radhapuram SD, Samantaray A, Pasupuleti H, Hanumantha Rao M, Bharatram R. Comparison of effect of intraperitoneal instillation of additional dexmedetomidine or clonidine along with bupivacaine for post-operative analgesia following laparoscopic cholecystectomy. Indian J Anaesth. 2021;65(7):533-538.
9. Blanco R, Børglum J. Truncal Blocks: Quadratus Lumborum Blocks. Analgesia in Major Abdominal Surgery. 2018:163-175.
10. Naaz S, Kumar R, Ozair E, et al. Ultrasound Guided Quadratus Lumborum Block Versus Transversus Abdominis Plane Block for Post-operative Analgesia in Patients Undergoing Total Abdominal Hysterectomy. Turk J Anaesthesiol Reanim. 2021;49(5):357-364.
11. El Mourad MB, Arafa SK. Effect of intravenous versus intraperitoneal magnesium sulfate on hemodynamic parameters and postoperative analgesia during laparoscopic sleeve gastrectomy-A prospective randomized study. J Anaesthesiol Clin Pharmacol. 2019;35(2):242-247.
12. Shukla U, Yadav U, Duggal J. A Comparative Study of Ultrasound-Guided Quadratus Lumborum Block and Transversus Abdominis Plane Block for Postoperative Analgesia Following Total Abdominal Hysterectomy. Cureus. 2023;15(3):e36412. Published 2023 Mar 20.
13. Zahra AA, Abo-Elenin KM, El-Fiky EM, Kasemy ZA, Helwa AM. Intra Peritoneal Instillation of Bupivacaine or Bupivacaine plus Magnesium Sulphate or Bupivacaine plus Dexamethasone on Post-Operative Pain after Laparoscopic Cholecystectomy: A Randomized Controlled Study. The Egyptian Journal of Hospital Medicine. 2021;84(1):2655-2662.
14. Brandão VGA, Silva GN, Perez MV, Lewandrowski KU, Fiorelli RKA. Effect of Quadratus Lumborum Block on Pain and Stress Response after Video Laparoscopic Surgeries: A Randomized Clinical Trial. J Pers Med. 2023;13(4):586.
15. Peng Q, Yang X, Li J, You Y, Zhao XC. The Effect of the Magnesium Sulfate in Ultrasound-Guided Quadratus Lumborum Block on Postoperative Analgesia: A Randomized Controlled Trial. Pain Ther. 2023;12(1):141-150.
16. Dudam N, Barsode S, Borse M, Agrawal S. Randomized control trial of intra-peritoneal instillation of bupivacaine versus placebo for post-operative analgesia after laparoscopic hysterectomy. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2022;11(10):2775-2780.
17. Borys M, Potrêæ-Studziñska B, Wiech M, et al. Transversus abdominis plane block and quadratus lumborum block did not reduce the incidence or severity of chronic postsurgical pain following cesarean section: a prospective, observational study. Anaesthesiol Intensive Ther. 2019;51(4):257-261.
18. Zhu Y, Li Z, Qin S, et al. Ultrasound-guided posterior quadratus lumborum block can reduce postoperative opioid consumption and promote rapid recovery in patients undergoing sutureless laparoscopic partial nephrectomy: A triple-blind, randomized, controlled study. Front Oncol. 2022;12:969452. Published 2022 Oct 6.
19. Kahokehr A, Sammour T, Soop M, Hill AG. Intraperitoneal use of local anesthetic in laparoscopic cholecystectomy: systematic review and metaanalysis of randomized controlled trials. J Hepatobiliary Pancreat Sci. 2010;17(5):637-656.