

Original Article

Comparison of Analgesia in Subcutaneous Infiltration of Ropivacaine and Magnesium Sulfate for Postoperative Pain Control of Cholecystectomy

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Abstract

Background: The purpose of this study was to compare the effect of analgesia of Ropivacaine and magnesium sulfate as subcutaneous infiltration at the site of surgical cutaneous cholecystectomy in the postoperative period.

Materials and Methods: To achieve the research goals, 80 patients referred to Shohada Tajrish Hospital in Tehran in 2016, which were randomly divided into two groups: Ropivacaine and magnesium sulfate. Patients in both groups had similar anesthetic procedures and all of them were monitored standard were recorded within 24 hours of operation. Overall morphine dose was also recorded for postoperative pain.

Results: The findings showed that there was a significant difference between the two groups in the Ropivacaine group in the next hours despite the no significant difference in age, sex, BMI, duration of operation and pain scoring at first and third hours. In addition, the comparison of the number of requests for at least one dose of morphine in the Ropivacaine group is significantly lower. In addition, the comparison of the number of requests for at least one dose of morphine in the Ropivacaine group is significantly lower. The occurrence of PONV is also higher in the magnesium sulfate group, but this difference is not significant.

Conclusion: Local injection of Ropivacaine reduced acute pain after open cholecystectomy surgery in comparison to local injection of magnesium sulfate. In addition, the use of Ropivacaine is associated with a significant reduction in the need for intravenous morphine for analgesia.

Keywords: Magnesium sulfate, Ropivacaine, VAS, Open cholecystectomy

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Introduction

Cholecystectomy is a surgical procedure for the removal of gallbladder and a common therapeutic treatment for Gallstone symptoms and other pathologies¹, and in 2011, the 8th surgery in the operating room was in the United States and in 2011

it was the eighth surgery in the US operating room². Cholecystectomy can be done either open or laparoscopic. Open cholecystectomy is done with a surgical incision of 12-8 cm and under the edge of the ribs on the right side³ and the pain after this, is a common problem for patients.

Reducing postoperative pain will facilitate functional

recovery, the length of hospital stay and reducing postoperative morbidity and uncontrolled pain after surgery, causing chronic postoperative pain⁴. Despite the major complications of high-dose opiates such as respiratory supplements, ileus, nausea and vomiting, they are still the main drug for controlling postoperative pain, and, on the other hand, reducing the dose of opiate can increase the amount of postoperative pain. Substitutes for opiates are non-steroidal anti-inflammatory drugs (NSAIDs), which also have side effects including reduced homeostasis, renal dysfunction and gastrointestinal bleeding. Different methods have been used to control postoperative pain in abdominal surgery. Among the peripheral nervous block⁵, injection of Ropivacaine into the peritoneum, and the effect of local infiltration of tramadol, Ropivacaine, Lidocaine in the subcutaneous site of surgery, have been considered in some studies. Magnesium sulfate is an auxiliary drug in controlling pain by antagonizing the calcium channel in the NMDA receptor^{6,7}. Also, magnesium is a safe and inexpensive drug that can reduce postoperative pain and reduce pain relief^{8,9}. In general, upper abdominal surgery causes more pain than lower abdominal surgery, which usually lasts for 48 to 72 hours and is considered to be moderate to severe pain in severity¹⁰⁻¹². Although today laparoscopic cholecystectomy is most commonly done by laparoscopy, but some cases of this operation are performed in certain circumstances. Postoperative analgesia plays an important role in the recovery of the patient, since the inflammatory mediators released after surgical trauma have a deleterious effect on the functioning of the organs of the body and the recovery of the patient after surgery^{13,14}. Complications due to lack of adequate control of pain during the postoperative period include the release of neuroendocrine hormone and cytokines, which in the cardiovascular system leads to hypertension, tachycardia, dysrhythmia, and ultimately myocardial schizoids¹⁵ and reduces FRC in the pulmonary system^{16,17}, increased respiratory rate of hypoxemia, Hypercapnia, and pneumonia in susceptible individuals. In the GI system, control of the GI reflex¹⁸ and the decrease in the activity of the immune system¹⁹, and all of these complications postoperative pain control is necessary. Various techniques have

been proposed to eliminate postoperative pain. High levels of opiates are often needed to control severe postoperative pain, which is associated with multiple side effects²⁰. Lesion infiltration with local anesthetics is an easy and effective method for controlling postoperative pain that has recently been used extensively²¹⁻²³. But the effect of this method is not clear enough to control postoperative pain. The two groups of magnesium sulfate and Ropivacaine were compared in this way.

Regarding the high prevalence of cholecystectomy surgery and the adverse effects of pain on the body and quality of life of patients, and the use of opiates and systemic analgesics after surgery is associated with complications and because of repeated appearances with dissatisfaction of patients with epidural analgesia, it seems that the choice of local analgesia is preferable in some cases. The cost-effectiveness and availability of used drugs is another reason to choose it.

In a case control study by Demiroglu et al⁶, which is done in Turkey, the effect of using systemic and regional magnesium sulfate on the amount of tramadol was studied in patients undergoing laminectomy surgery and observed that tramadol consumption was significantly lower in group B than in the other two groups. In another study by Praveen Donadi et al²². In India in 2014, postoperative analgesia was evaluated solely in combination infiltration of magnesium sulfate and Bupivacaine in comparison with Bupivacaine. In the combined group, less pain medications and lesser side effects were used. In the year 2016, Sandeep Kundra et al¹³, reviewed the effect of magnesium sulfate as an auxiliary in analgesia produced by Ropivacaine in subcutaneous infiltration in cesarean surgery. Infiltration of magnesium sulfate prolongs the effect of local anesthetic analgesic without causing significant side effects.

Methods

Statistical population and sampling method: This prospective double blind randomized study was performed on patients aged 30-70 years with ASA class 1 and 2 undergoing open cholecystectomy during a 6 month period in Shohadaye Tajrish Hospital, Tehran, Iran. The objectives and procedure of the study was explained to all the selected subjects and they were asked to sign the written informed consent form. In

addition, the Ethics Committee of the local university approved the study protocol (ethical code: SBMU.MSP.REC.1397.402). The therapist undertook to avoid any disruption to the patient's treatment process and to maintain ethical issues throughout and after the operation. Eventually none of the patients experienced complications from anesthetic procedures. Patients were divided into two groups A and B after being identical. Criteria for entering the study: Age from 30 to 70 years, ASA Class I, II and Patients under open cholecystectomy. Out-of-study criteria: Operation longer than 2 hours and the amount of bleeding over MABL requires the administration of stimulant drugs or the prevention of sympathetic mobility.

Implementation of the research: Patients in both groups had anesthetics similar to Lidocaine 1 mg, Propofol 1-1 mg, fentanyl 3-3 mg, midazolam 0.02, and Atracurium 0.5 mg / kg. Also, in all patients, the monitoring method was the same IBP, ECG, EtcO₂, T and SPO₂. All patients received pre-oxygenation and received 5 cc normal saline / kg and received the same degree of weight loss and anesthetic induction, and were given with an appropriate tract tube size. To maintain anesthesia, a mixture of N₂O, O₂ and Sevoflurane was used based on the patient's need and no other opiates or other analgesic was prescribed during the surgery and the fluid was treated as standard. Before closing the skin cut in group A, 5 cc of Ropivacaine 0.5% with 5 cc of normal saline was infiltrated subcutaneously (10 cc total) and in group B 10 cc magnesium sulfate 20% infiltrated subcutaneously. The pain score at 24, 12, 6, 3, and 1 hours was measured by VAS method. For patients with VAS above 3, morphine 2 mg / 70 kg was

injected. All side effects (nausea, vomiting, dizziness ...) were recorded within 24 hours of operation and the overall dose of morphine for pain relief.

Reliability and validity: All quantitative variables were expressed as mean ± standard deviation and qualitative variables as numbers (percentages). To compare the quantitative variables between the two groups, t-student and Mann-Whitney nonparametric test were used.

Statistical analysis: All statistical tests were performed at a significant level of 5% in two domains. For data analysis, SPSS 21 was used (Table 1 and Table 2 and Figure 1-8).

Results

In this study, we compared the effect of magnesium sulfate and Ropivacaine as infiltration in cholecystectomy surgery cut prior to closing the surgical site and the results showed that Ropivacaine is more effective than magnesium sulfate in reducing postoperative pain and decreasing morphine consumption in 24 hours after surgery. Cholecystectomy has moderate and severe pain after surgery. In both groups, postoperative pain was increased at 1 and 3 hours, with no significant difference between the two groups. This increase is probably due to an increase in inflammatory cytokines in the surgical site.

At 6, 12, and 24 hour, pain scores decreased in both groups, probably due to the reduction of inflammatory response and the pain relief block, and the reduction of pain scores in the Ropivacaine group was significantly lower than that of magnesium sulfate. Magnesium sulfate is an antagonist of the NMDA receptor that has

Table 1: Demographic information and patient base.

	Ropivacaine	Magnesium sulfate	P-Value
Age	42.2±18.4	40.8±16.3	0.289
Gender (woman, man)	(17, 23)	(19, 21)	0.532
BMI(KG/M ²)	29.2±2.5	28.6±2.1	0.430
Surgery Duration (min)	110±24	105±20	0.411

Table 2: Comparison of postoperative analgesia in different hours between two groups.

Duration after surgery	Ropivacaine	Magnesium sulfate	P-Value
1	1.8±0.9	2±0.8	0.250
3	2.6±1.4	2.9±1.2	0.227
6	3.1±1.1	3.9±1.5	0.004
12	2.9±1	3.5±1.2	0.029
24	2.7±1.2	3.3±1.2	0.023

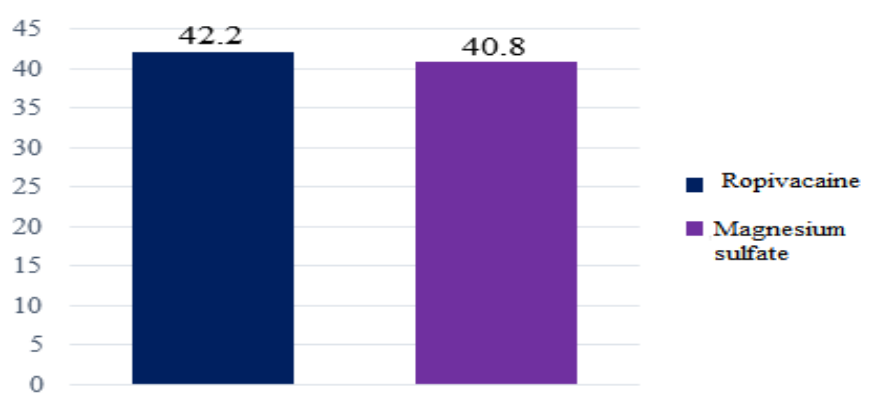


Figure 1. Comparison of mean age (p = 0.289).

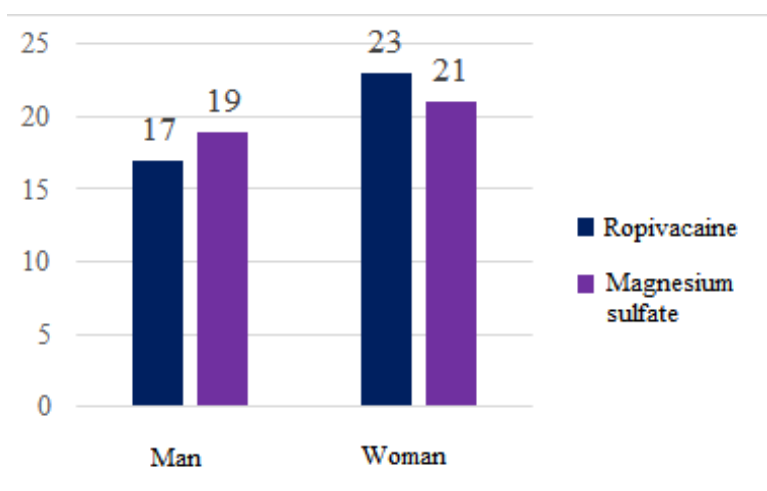


Figure 2. Gender Distribution (p = 0/531).

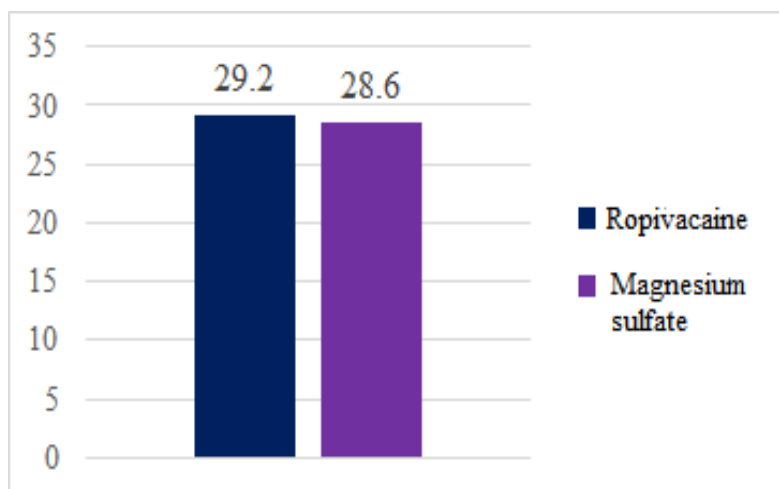


Figure 3. Comparison of mean BMI in kg / m2 (p = 0.0430).

been shown to increase the analgesic effect of opiate, which is probably due to limiting NMDA receptor-dependent processes. Pastor hypothesized that the analgesic effect of magnesium sulfate in reducing postoperative pain was not due to an antagonist of the

NMDA receptor. In fact, due to the block of the calcium channel, it prevents central sensitization to the stimuli of the nociceptive peripheral nerves.

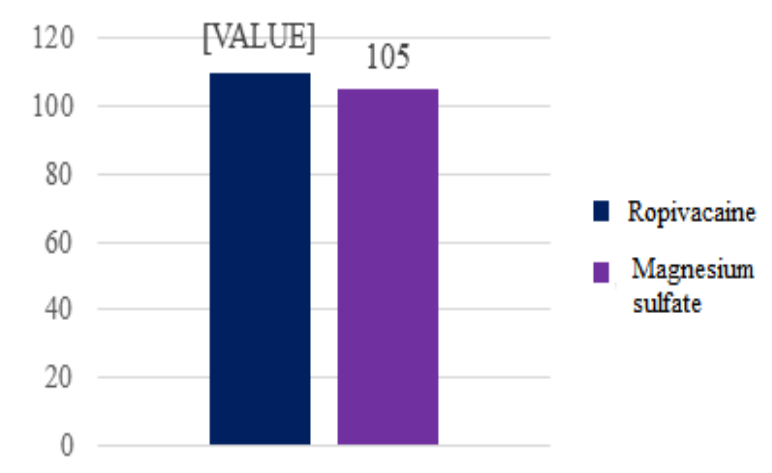


Figure 4. Comparison of surgical duration in minutes ($p = 0.419$).

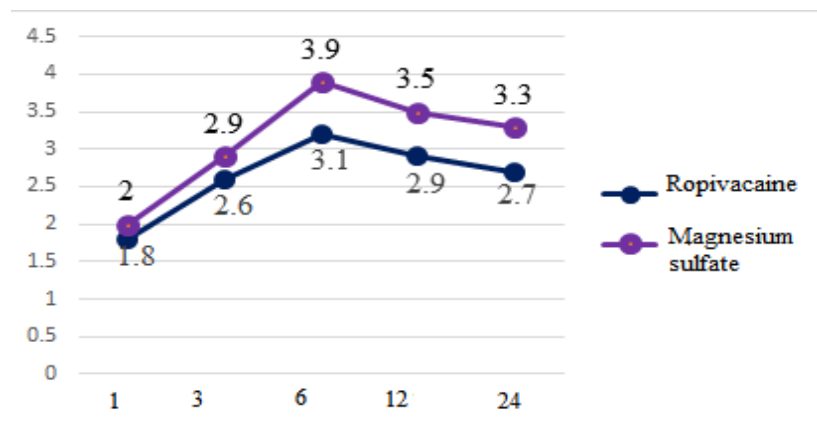


Figure 5. Comparison of pain intensity in patients, the difference in the last three cases was significant ($p < 0.05$).

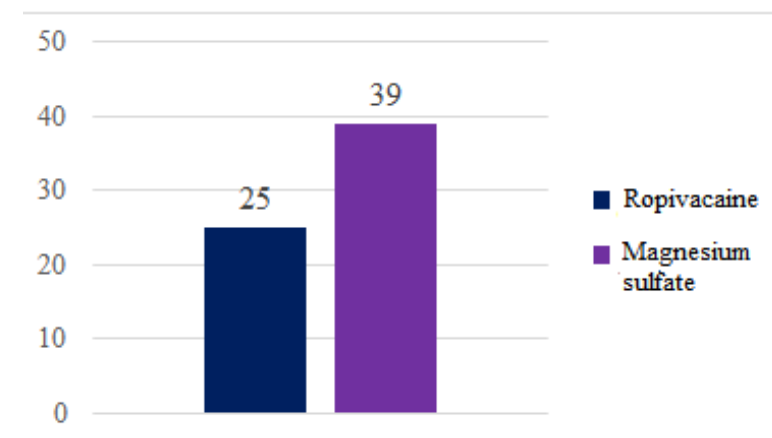


Figure 6. The number of patients requiring morphine for at least one time ($p = 0.001$).

Discussion

Although magnesium sulfate is considered as the only local anesthetic, it is clear that magnesium sulfate can reduce the morphine and its derivatives tolerance through antagonistic NMDA receptor. Magnesium

deficiency induces an increase in the sensitivity of the nociceptive ways in the spinal cord. Although our study showed that the morphine consumption and the frequency of application of morphine in the magnesium sulfate group were significantly higher in comparison to the Ropivacaine group, the higher the PONV level in

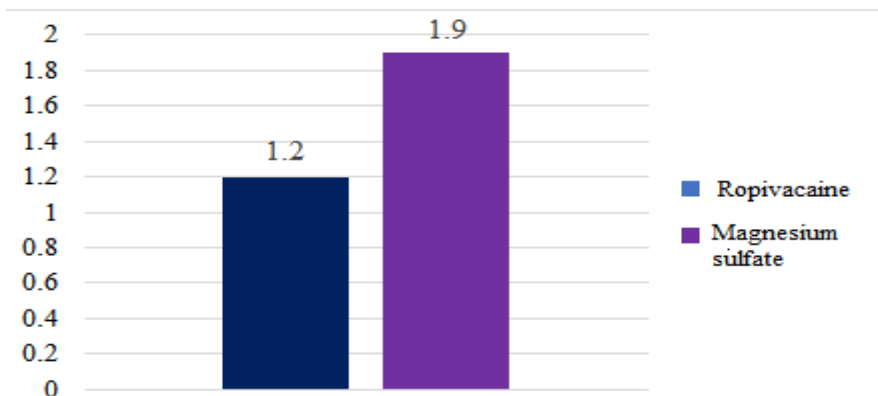


Figure 7. Comparison of the mean number of times required for morphine (p = 0.001).

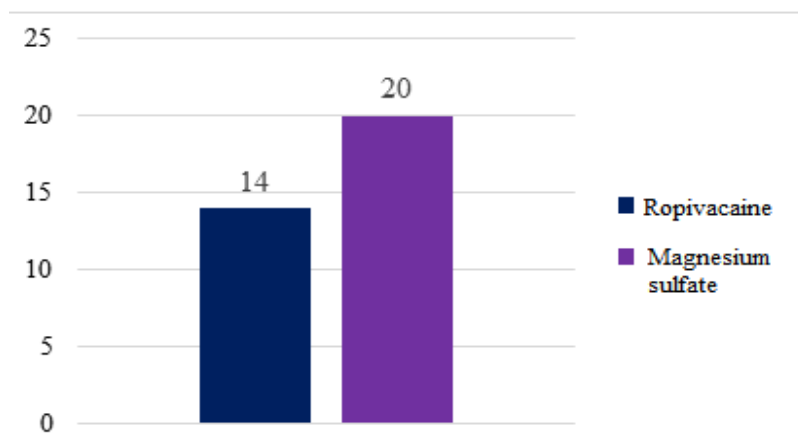


Figure 8. Comparison of the number of patients with PONV on the first day after surgery (p = 0.143).

the magnesium sulfate group than the Ropivacaine may be the same use of the opiate. In general, infiltration of Ropivacaine at the site of surgery is more effective than magnesium sulfate in controlling postoperative pain. Jing-Xian Sun et al investigated the effect of subcutaneous infiltration of Ropivacaine and placebo in postoperative analgesia in open Hepatectomy and concluded that the use of subcutaneous Ropivacaine in the surgical site reduced postoperative pain, response stress and improving recovery of the patient. The present study showed that topical injection of Ropivacaine reduced acute pain after open cholecystectomy restoration which is more than local magnesium sulfate injection. In addition, the use of Ropivacaine with this method is associated with a significant reduction in the need for intravenous morphine for further analgesia.

Conclusion

Local injection of Ropivacaine reduced acute pain after open cholecystectomy surgery in comparison to local injection of magnesium sulfate. In addition, the use of Ropivacaine is associated with a significant reduction in the need for intravenous morphine for analgesia.

Acknowledgment

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