

Intraperitoneal Bupivacaine Does Not Attenuate Pain Following Laparoscopic Cholecystectomy

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ABSTRACT

Background: Laparoscopic cholecystectomy is characterized by a short hospital stay. Hence, pain control on the day of surgery is increasingly important. The aim of this study was to evaluate the effect of intraperitoneal bupivacaine on pain relief following laparoscopic cholecystectomy.

Methods: Sixty patients undergoing elective laparoscopic cholecystectomy were prospectively randomized into 2 groups. Following removal of the gallbladder, group A received 100 mg of bupivacaine in 50 cc of saline, installed into the gallbladder bed and right subphrenic space. Group B received saline without bupivacaine. Pain was assessed using a visual/analog scale at fixed-time intervals.

Results: No significant difference occurred in the average pain levels between the groups at 1, 2, 4, and 14 hours postsurgery. The average analgesic requirement was lower in the bupivacaine group, but this did not reach statistical significance.

Conclusion: Application of intraperitoneal bupivacaine did not attenuate pain following laparoscopic cholecystectomy, and no role exists for its routine use.

Key Words: Laparoscopy, Cholecystectomy, Postoperative pain, Bupivacaine

INTRODUCTION

The introduction of laparoscopic techniques into general surgery has dramatically changed our attitudes about the postoperative course of patients after cholecystectomy. Laparoscopic cholecystectomy is characterized by a short hospital stay and an early return to normal activity. Typically, patients are discharged home on the first postoperative day. As experience has expanded, a few recently reported series have shown that this operation is safe and feasible as an outpatient procedure in properly selected patients.¹⁻³ Thus, pain relief and patient comfort on the day of surgery have become increasingly important, as the need for analgesics may delay discharge on the same day.

Pain on the day of surgery is typically a diffuse abdominal pain, more so to the right upper quadrant, and radiates to the right shoulder.⁴ We assumed that this pain is mainly generated by irritation of the peritoneum, especially at the right upper abdomen, and hypothesized that the application of a local anesthetic agent into the peritoneal cavity would reduce this pain.

The aim of this study was to evaluate the use of intraperitoneal bupivacaine on pain relief following laparoscopic cholecystectomy.

MATERIALS AND METHODS

Sixty patients undergoing elective laparoscopic cholecystectomy were prospectively randomized into 2 groups. Group A received 100 mg of bupivacaine diluted in 50 mL of saline and installed into the peritoneal cavity. Group B received intraperitoneal saline. Following removal of the gallbladder and thorough irrigation, a feeding tube was inserted through the 5 mm trocar at the right upper quadrant, and its tip was guided using a grasping instrument inserted through the subxyphoid port. The solution was then released into the gallbladder bed and right subphrenic space, and the gas and instruments were removed.

Pain was assessed using a visual/analog scale of 1 to 10, at 1, 2, 4 and 14 hours after the end of the operation. All the patients were allowed to receive analgesic medications as needed, and the requirement of these medica-

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tions was recorded. Analgesic medications included 1 mg per Kg of intramuscular meperidine on the day of surgery, and 5 mg of oral oxycodone with 325 mg of acetaminophen on the following day, except in cases of allergy to these drugs.

The patients, the surgeons, and the nursing staff were blinded to the randomization. Anesthesia was administered according to a uniform study protocol to minimize the effect of different anesthesia drugs and techniques on the study results.

The study was approved by the local investigational review board for clinical studies, and all the patients gave their informed consent.

Patients in whom the procedure was converted to an open procedure and patients in whom a drain was left in the peritoneal cavity were excluded from the study.

Statistical analysis was performed using a two-tailed *t* test and chi-square analysis, and significance was determined as $p < 0.05$.

RESULTS

Nine patients were excluded from the study for the reasons mentioned above, leaving 51 patients for the data analysis. Twenty-six of them received bupivacaine, and 25 received saline. Mean age and sex distribution did not differ significantly between the two groups (**Table 1**). No significant difference occurred in the average pain levels between patients who received intraperitoneal bupivacaine and patients who received saline at all the time intervals (**Figure 1**). Furthermore, the difference between the average pain scores of the two groups was less than one at all time intervals, suggesting that this difference is not clinically significant.

The average analgesic requirement was lower in the bupivacaine group, but this did not reach statistical significance (**Figure 2**).

DISCUSSION

Although minimally invasive surgery is characterized by reduced pain, it is not painless.⁵ Patients undergoing laparoscopic cholecystectomy suffer considerable pain on the day of surgery, frequently requiring narcotic analgesics. The average pain scores of the entire group in our series was 5.5 in a scale of 1 to 10 in 1 hour, 4.25 in 2 hours, and 3.3 in 4 hours postsurgery.

	Bupivacaine (n=26)	Saline (n=25)
Male	9	7
Female	17	18
Mean Age	45	43.5

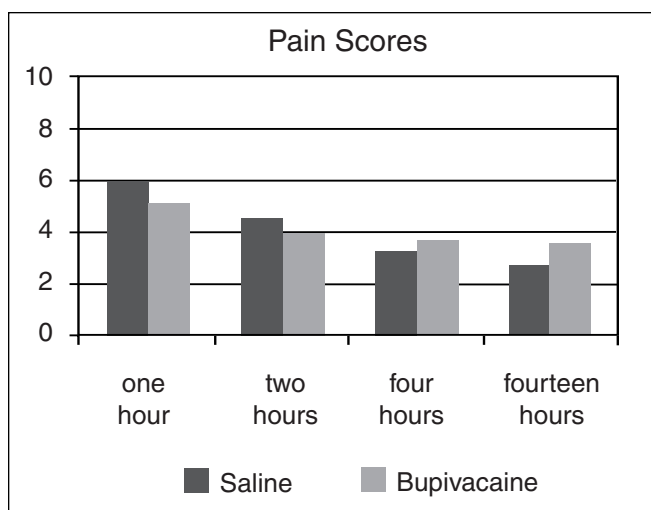


Figure 1. Average pain levels, on a visual/analog scale of 1 to 10, at fixed time intervals from completion of the surgical procedure.

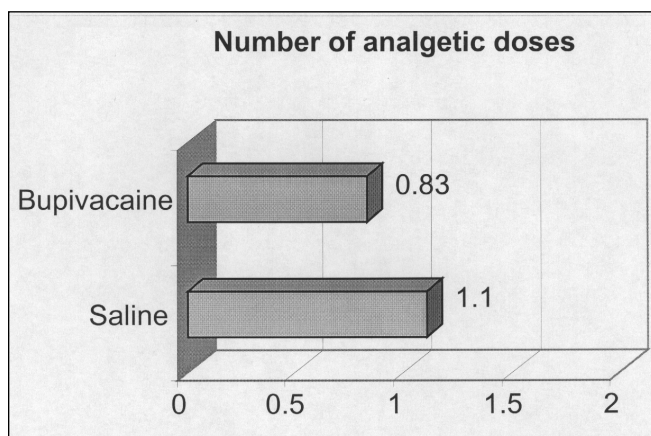


Figure 2. Average number of doses of analgesic medications per patient in each group. Each analgesic dose consisted of 1 mg/kg of meperidine (except in cases of meperidine allergy).

The pain characteristics suggest an intra-abdominal origin, and it seems unlikely that this pain is generated mainly by the small skin incisions. Studies of local anesthetics infiltrated into the skin wounds report reduced postoperative pain only to a minor degree.^{6,7} Pain may be generated by stretching of the abdominal wall during the pneumoperitoneum, by the local dissection, or by irritation of the peritoneum from blood, bile spillage, or by the CO₂ used for creation of the pneumoperitoneum.

We assumed that early postoperative pain was mainly generated by irritation of the peritoneum, and the application of a local anesthetic agent may attenuate this pain. Previous studies have suggested that the use of local anesthetics to block the afferent pain sensation may reduce the central hyper-excitability of the dorsal horn neurons in the spinal cord, in response to surgical trauma.⁸ Clinical studies of intraperitoneal bupivacaine have had inconsistent results. Whereas few authors have found a statistically significant difference with the use of local anesthetics,⁸⁻¹³ others, including those of this study, could not repeat these results.^{4,14-17} Furthermore, in a few of the studies that have found a statistically significant difference with the use of bupivacaine, the difference between the average pain scores was less than 1 in a scale of 1 to 10.^{9,12} Although this difference was found to be significant in statistical tests, it is doubtful whether such a difference is of clinical significance.

This study suggests that intraperitoneal bupivacaine installed at the end of the procedure did not attenuate pain following laparoscopic cholecystectomy. Pasqualucci et al¹⁸ and Mraovic et al¹⁰ have suggested that application of local anesthetics prior to the dissection of the gallbladder may enhance the effect and reduce pain. The sensory nerves conducting pain sensation to the posterior horn of the spinal cord transmit impulses during the dissection and may turn into a hyper-excitability state.¹⁸ Thus, application of the local anesthetic after the dissection is completed may not significantly attenuate the excitability of these nerves. Blocking these nerves prior to the dissection may result in more successful attenuation of pain following laparoscopic cholecystectomy.

The cause of the early postoperative pain in laparoscopic cholecystectomy is not clearly understood. The CO₂ used to create the pneumoperitoneum may induce local changes that irritate the peritoneum, such as local acidosis due to CO₂ dissolution in the peritoneal tissue.

Because the gas is equally distributed in the peritoneal cavity, application of a local anesthetic agent to the right upper quadrant may not be sufficient to attenuate this pain. Use of a higher volume of local anesthetic solution, sufficient to irrigate most of the peritoneal cavity, may also improve the effect on pain after laparoscopy. However, because absorption of the drug from the peritoneum occurs, care should be taken not to administer overdoses of these agents.

CONCLUSION

Intraperitoneal bupivacaine did not attenuate pain following laparoscopic cholecystectomy in this study. These results suggest that no role exists for the use of intraperitoneal bupivacaine, in the fashion described here, in laparoscopic cholecystectomy. Further studies are needed to establish the role of intraperitoneal bupivacaine for pain relief in laparoscopic surgery.

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