

Study of Port-site and Intraperitoneal Infiltration of Local Anesthetics in Reduction of Postoperative Pain after Laparoscopic Cholecystectomy

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ABSTRACT

Objective: To evaluate the efficacy of bupivacaine administered by intraperitoneal versus port-site infiltration for postoperative pain management following laparoscopic cholecystectomy (LC).

Methods: A total of 80 patients who underwent elective LC between March 2022 and March 2023 were included. Patients were randomly assigned to one of the two study groups. After removal of the gall bladder from the patient in group A, a solution of bupivacaine with a concentration of 0.5% was injected into the right subdiaphragmatic area, along with 20 milliliters of bupivacaine solution was also injected into the port sites. While in Group C only standard analgesic management was performed and no wound infiltration was performed. Post-operative pain was the primary study outcomes.

Results: Mean age was 38.49 ± 14.78 years in group A and 40.18 ± 13.81 years in group B with p-value 0.53. There was majority 31 (77.5%) females in group A and 32 (80%) females in group B, p-value 0.78. Mean NRS score after 4 hours of LC was 4.51 ± 1.42 in group A and 5.11 ± 1.10 in group C (p-value 0.03). Mean NRS score after 6 hours was 3.7 ± 0.80 in group A versus 4.25 ± 1.05 in group C (p-value 0.03). Mean NRS score after 12 hours was 2.56 ± 0.75 in group A versus 3.23 ± 0.90 in group C (p-value <0.001). However, at 24 hours of surgery the mean NRS score became statistically insignificant with p-value 0.37. Mean requirement of tramadol as rescue analgesia was also significantly lower in study group.

Practical Implication: The study found that while demographic variables were similar across groups, there were significant differences in pain management outcomes. Group A showed lower NRS scores and lower tramadol requirements, suggesting it was more effective in managing postoperative pain. This suggests group A could be a preferable approach for early pain reduction.

Conclusion: Local port-site and intraperitoneal infiltration is a simple and effective method of post-operative pain control after LC and can be easily practiced after completion of surgery.

Keywords: Pain, Laparoscopic cholecystectomy, Port-sites, Intra-peritoneal.

INTRODUCTION

In cases of symptomatic cholelithiasis, laparoscopic cholecystectomy (LC) has established itself as the gold standard for gall bladder surgery. With the advent of laparoscopic method in general surgery, our expectations for patients' recoveries following cholecystectomy have shifted dramatically.¹ While laparoscopic surgery has greatly improved patient outcomes by reducing postoperative trauma and suffering, there is still work to be done.² The patient experience significant amounts of pain after LC, which is a key contributor to morbidity and frequently results in longer hospital stays for these patients. Pain experienced following LC often reaches its peak within six hours of the treatment, continues to rise for a couple of days, and then begins to subside; however, this time frame varies widely depending on the patient.^{3, 4} Controlling patients' postoperative pain in an efficient manner is a critical component of providing care for surgical patients. Inadequate management of the patient's pain may contribute to an increased risk of morbidity or fatality.⁵ When it comes to giving pain relief in the early postoperative period following laparoscopic surgeries, one of the most straightforward methods that is also highly effective is the instillation of local anesthetics into the intraperitoneal space. It was discovered that the reaction to local anesthetics administered intraperitoneally is mediated not by systemic absorption but rather by local peritoneal effects.⁶

Local anesthetics injected into the periportal space, the periportal parietal peritoneum, or sprayed intraperitoneally in the subdiaphragmatic and subhepatic spaces above the hepatoduodenal ligament have all been shown to have analgesic effects.⁷ For postoperative pain management, some surgeons favor intra-peritoneal infiltration with local bupivacaine, while others favor induction at the port site. The purpose of this research is to

evaluate the efficacy of bupivacaine administered by intraperitoneal versus port-site infiltration for postoperative pain management following laparoscopic cholecystectomy.

METHODS

At the General Surgery Unit of Jinnah Post-graduate Medical Centre Karachi, Pakistan, a prospective study was carried out in a timely manner over the course of a period of half a year. In order to participate in this experiment, patients needed to have an elective laparoscopic cholecystectomy scheduled between March 2022 and March 2023. There were a total of eighty patients that took part in this research, with each of the two study arms receiving 40 participants each. All of the patients took part in the research, provided their informed consent, and satisfied the following criteria: adult patient (> 16 age), ASA Class I or II, undergoing a planned elective LC procedure. Patients who had choledocholithiasis, those who had drains implanted intraoperatively, or those who had previously undergone surgery on the upper abdomen region were not allowed to participate in the study.

Throughout the duration of this study, each patient underwent a preoperative screening with the assistance of an anesthetist. During this time, they were educated on the Numerical Rating Scale (NRS) for pain, which was a tool that was utilized throughout the course of the study. The patient assessed their current level of discomfort as a 1 on this scale, which ranged from 0 to 10, with 0 signifying no pain and 10 representing the most severe pain the patient had ever experienced.

Patients were randomly assigned to one of the two study groups utilizing a table that contained random numbers. In each and every one of the cases, the protocol was adhered to in terms of how the induction, maintenance, and removal of the anesthetic were performed.

After removal of the gall bladder from the patient in group A, a solution of bupivacaine with a concentration of 0.5% was injected into the right subdiaphragmatic area, along with 20 milliliters of

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bupivacaine solution was also injected into the port sites (6ml was infiltrated around each midline port site and 4ml at the lateral port sites). While in Group C only standard analgesic management was performed and no wound infiltration was performed.

Compressing the abdomen before closing the ports allowed any remaining carbon dioxide to be expelled at the very end of the surgery in each and every one of the cases.

The moment that the patient was first seen in the postoperative ward was considered the first postoperative hour. The level of pain was evaluated at predetermined time intervals of six hours, twelve hours, and twenty-four hours, respectively. During the same interval, an evaluation of the presence of shoulder pain was also carried out.

Patients were given rescue analgesic (Tramadol 50 mg) on an as-needed basis.

Using SPSS software, the statistical analysis of the data was carried out. The statistical analysis consisted of using the independent t-test as well as the chi-square test. When the probability threshold was lower than 0.05, the differences were determined to be significant.

RESULTS

Mean age of patients was 38.49±14.78 years in group A and 40.18±13.81 years in group B with p-value 0.53. Mean body mass index (BMI) in group A was 25.01±5.41 Kg/m² and in group B was 26.02±5.37 Kg/m² (p-value 0.40). There was no significant difference in the frequency of ASA status and frequency of co-morbidities between the groups (Table 1).

There was majority of females in our study with 31 (77.5%) females in group A and 32 (80%) females in group B, p-value 0.78 (Figure 1).

There was significant difference in mean NRS scores with mean scores significantly lower in group A patients. Mean score after 4 hours of LC was 4.51±1.42 in group A and 5.11±1.10 in group C (p-value 0.03). Mean NRS score after 6 hours was 3.7±0.80 in group A versus 4.25±1.05 in group C (p-value 0.03). Mean NRS score after 12 hours was 2.56±0.75 in group A versus 3.23±0.90 in group C (p-value <0.001). However, at 24 hours of surgery the mean NRS score became statistically insignificant with p-value 0.37. Mean requirement of tramadol as rescue analgesia was also significantly lower in study group (Table 2).

Table 1. Baseline Study Characteristics.

	Group A (N=40)	Group C (N=40)	P-value
Mean Age (Years)	38.49±14.78	40.18±13.81	0.53
BMI (Kg/m ²)	25.01±5.41	26.02±5.37	0.40
ASA I/II/III	8 (20%)/21 (52.5%)/11 (27.5%)	7 (17.5%)/23 (57.5%)/10 (25.0%)	0.9
Co-morbidities			
Diabetes	08 (20.0%)	06 (15.0%)	0.34
Hypertension	19 (47.5%)	18 (45.0%)	0.82
Dyslipidemia	03 (7.5%)	05 (12.5%)	0.46

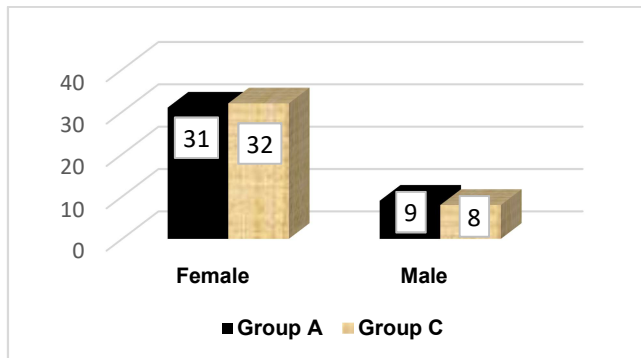


Figure 1. Frequency of Gender.

Table 2. Comparison of NRS Pain Scores.

	Group A (N=40)	Group C (N=40)	P-value
NRS Pain Scores			
4 hours	4.51±1.42	5.11±1.10	0.03
6 hours	3.7±0.80	4.25±1.05	0.01
12 hours	2.56±0.75	3.23±0.90	<0.001
24 hours	1.48±0.56	1.61±0.73	0.37
Total analgesia Requirement in 24 hours	107.34±40.82	181.58±58.38	<0.001

DISCUSSION

Gallbladder removal with laparoscopic cholecystectomy is now the norm. There is less discomfort after surgery, a shorter hospital stay, an earlier return to work, a better cosmetic outcome, and less tissue dissection compared to the conventional cholecystectomy.^{8,9} However, postoperative pain is a common complaint, especially in the first operative day.

On the main factor causing pain after a laparoscopic procedure, there is some debate. The principal source, according to some medical professionals, is the insertion of trocars into the abdominal wall. Others, on the other hand, contend that the bulk of discomfort is caused by intraperitoneal dissection and CO₂ insufflations, which cause the abdominal wall to swell and the diaphragm to remain elevated for an extended period of time.¹⁰ In order to minimize pain related to the incision, the intraabdominal area, and the shoulder during laparoscopic cholecystectomy, a number of researchers have advised combining somatovisceral and local anesthetic treatment. Different methods can be used to provide local anesthetic medications; some researchers have shown that local parietal anesthesia is effective in treating postoperative pain, while others have shown that it is not.^{11, 12} Numerous studies have examined the use of local anesthetics intraperitoneally during laparoscopic cholecystectomies, and all of them have concluded that doing so lowers postoperative pain and the need for narcotic analgesics. These studies' findings have been positive.^{13,14}

Therefore, in present study, we evaluated postoperative pain by comparing the effect of combined intraperitoneal and port site infiltration of bupivacaine for pain relief following laparoscopic cholecystectomy.

We kept in mind that combined use of local anaesthetics on incisions and intraperitoneum should provide the best pain control. My study shows differences in mean pain scores between the bupivacaine groups and control group. In our study the mean NRS score during the first 12 hours of surgery was significantly lower in study group in comparison to controls.

The findings are in line with those of El-labban and colleagues, who compared intra-incisional and intraperitoneal infiltration of local anesthetic for the purpose of controlling early post-laparoscopic cholecystectomy pain. They discovered that intra-incisional infiltration of levobupivacaine resulted in significantly less postoperative abdominal pain. The authors determined pain from 30 minutes postoperatively to 24 hours after LC.¹⁵

The results are consistent with those found by Chari NB, who performed the study with 50 patients and split them into two groups, giving one group 20 milliliters of normal saline intraperitoneally and the other group 20 milliliters of 0.5% bupivacaine. Both groups were placed in the Trendelenburg position at the end of the procedure. The authors proven that administering bupivacaine by intraperitoneal instillation results in a decreased VAS score up to eight hours after surgery. However, there was no significant difference in the amount of shoulder pain experienced by any of the two groups, but the postoperative analgesic requirements are lower in bupivacaine group.¹⁶

A study by Muazzam et al. from Pakistan also reported that port-site and intra-peritoneal infiltration of bupivacaine after LC is a safe and convenient method of pain control after LC.¹⁷ Gupta et al. also recommended the same in a study of 60 patients.

The levels of pain experienced by participants in our study who were assigned to the control group reached their highest point immediately after the completion of the surgical procedure, but then gradually decreased to a level that was comparable to that experienced by participants in the bupivacaine groups by the time of the fifth assessment, which took place 24 hours after surgery. Therefore, the primary effect of bupivacaine in this trial appears to have been on postoperative pain in the first twelve hours after the surgical procedure. The early postoperative discomfort that patients experience needs to be taken into consideration if laparoscopic cholecystectomy is going to become a standard surgical technique that can be performed as a day case. According to the findings of this study, administering bupivacaine through intraperitoneal instillation or by injecting it into the port site might greatly lessen the amount of narcotic analgesics that are required to treat pain in the immediate postoperative period.

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