

## Port Site Local Anaesthetics Application Versus Standard Analgesics for Postoperative Pain Control in Laparoscopic Cholecystectomy

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### Abstract

### Original Research Article

**Introduction:** Laparoscopic cholecystectomy is a minimally invasive surgical procedure for removal of a diseased gallbladder which has different post-operative pain management systems. **Objective:** The objective of this study was to compare pain management in the port sites local anaesthetics and standard analgesics after laparoscopic cholecystectomy (LC). **Methodology:** A comparative study was conducted on 270 patients with LC under elective conditions for symptomatic cholelithiasis, with a mean age of  $49 \pm 3.51$ , treated between 2021 and 2023 in the Department of Surgery at Holy Family Red Crescent Medical College Hospital, Dhaka, Bangladesh. Patients were divided into the Local Anaesthetics Group (134 patients who received Local Anaesthetics through the port site) and the Standard Analgesia Group (136 patients who received postoperative analgesia with NSAIDs or tramadol). Pain was measured by the Visual Analog Scale (VAS) in all patients at the 1st, 6th, 12th, and 24th postoperatively. **Results:** Both groups had similar demographic characteristics, surgery duration, and hospitalization. In the local anaesthetics group, the average pain scores at 1st, 6th, 12th, and 24th hours were 3.6, 4.4, 2.1, and 1.9, respectively. For the Standard Analgesia Group, the scores were 7.6, 6.9, 2.3, and 2.1. There was a significant reduction in pain intensity ( $p < 0.001$ ) in the local anaesthetics group at the 1st and 6th hours compared to the Standard Analgesia Group. However, there was no difference in pain intensity at the 12th and 24th hours. Additionally, the use of pain medication decreased significantly in the local anaesthetics group. **Conclusion:** This study demonstrated that local anesthetic application to the port sites after LC provides a significant decrease in pain intensity in the first 6h postoperatively. The study also found that fewer analgesic drugs will be used for POP in these patients.

**Keywords:** Gallstones, laparoscopic cholecystectomy, local anaesthetics, standard analgesia, comparative study.

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## INTRODUCTION

Laparoscopic cholecystectomy (LC) is a reliable and effective procedure for treating benign gallbladder diseases. Nowadays, it is considered the gold standard for treating symptomatic gallstones. The laparoscopic approach is associated with reduced postoperative pain (POP), quicker recovery, better cosmetic results, lower complications, and higher patient satisfaction, compared to open cholecystectomy [1, 2]. Nevertheless, it's important to note that it's not entirely pain-free. Despite being minimally invasive, most patients experience varying degrees of pain in the early postoperative period [3]. Postoperative pain after LC manifests in three forms: visceral pain, parietal pain,

and shoulder pain. Furthermore, coughing and deep breathing can exacerbate POP and hinder early patient mobilisation [4]. The process of entering the port site in laparoscopic cholecystectomy (LC) leads to parietal pain. Minimizing this type of pain continues to be a significant clinical challenge. The pain reaches its peak within 6 hours after the procedure [5]. Postoperative pain is a major contributor to early postoperative complications and significantly affects the quality of life for surgical patients [6]. Various methods are used to relieve postoperative pain after laparoscopic cholecystectomy (LC). These include systemic opioids, intravenous or intramuscular nonsteroidal anti-inflammatory drugs (NSAIDs), intraperitoneal local

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anaesthesia, epidural or intrathecal opioids, and local anaesthetic infiltration into the surgical site. Additionally, intraperitoneal saline, removal of insufflation gas, heated gas, and low-pressure gas are also used for pain relief [7, 8]. Each method has its own advantages and limitations. Local Anaesthetics, with the longest half-life, is commonly used as a local anaesthetic. It has a half-life of 2.5–3.5 hours and can provide pain relief for an average of 6 hours. Local Anaesthetics (local anaesthetic) has a wide safety margin and can be safely used up to an upper limit of 2.5 mg/kg body weight [9]. NSAIDs are the standard of care for postoperative pain control, and tramadol is commonly used as a non-narcotic analgesic. NSAIDs help reduce the need for narcotic analgesics [10]. However, non-selective conventional NSAIDs have side effects such as increased upper gastrointestinal inflammation, bleeding, platelet dysfunction, and impaired renal function [11, 12]. The goal of this research was to compare the efficacy of long-acting between local anaesthetics and standard analgesia infiltrated into port sites for pain control after elective LC. Written consent and ethical clearance were ensured prior to the study.

### Objectives

- **General objective:** The objective of this research is to study port site post-operative pain management laparoscopic cholecystectomy.
- **Specific objective:** This study aims to compare the outcomes of port site local anaesthetics application with standard analgesics for postoperative pain control in laparoscopic cholecystectomy.

## METHODOLOGY

This retrospective comparative study was conducted at the Department of Surgery, Holy Family Red Crescent Medical College Hospital, Dhaka, Bangladesh. The study included 270 patients aged 18–80 years who underwent elective surgery for symptomatic cholelithiasis between January 2021 and January 2023 in the hospital. Patients were split into 1, 2, and 3 groups according to their ASA score. Patients were divided into the Local Anaesthetics Group (134 patients who received Local Anaesthetics through the port site) and the Standard Analgesia Group (136 patients who received postoperative analgesia with NSAIDs or tramadol).

- **Inclusion criteria:** The study included patients

with symptomatic cholelithiasis who underwent LC under elective conditions with the age range of 18 to 80 years.

- **Exclusion criteria:** Patients with allergies to local anaesthetics, infection at the injection site, chronic pain syndromes, prolonged use of opioid medications, coagulopathy, or those who had taken any analgesic within 24 hours before surgery, patients who did not understand pain scoring using the visual analogue scale (VAS), had a body mass index greater than 35 kg/m<sup>2</sup>, had severe systemic disease, or underwent laparoscopic cholecystectomy (LC) under emergency conditions. Direct open cholecystectomies and cholecystectomies performed under emergency conditions were also excluded.

The intensity of pain was measured using a Visual Analog Scale (VAS) at the 1st, 6th, 12th, and 24th hours after the surgery for all patients. Statistical analysis of the data was performed using SPSS 20.0 software. Mean and standard deviation were calculated for quantitative variables. A p-value of less than 0.05 was considered statistically significant. The study obtained ethical approval from the hospital's ethical committee, and all participants provided voluntary informed consent after receiving full information about the study's objectives.

## RESULT

The study included a total of 270 patients who were divided into two groups: the Local Anaesthetics Group and the Standard Analgesia Group. There were no differences in age, gender, body weight, length of hospital stay, and ASA score between the two groups. Although the mean operative time was longer in the Local Anaesthetics Group (49±1.71) compared to the Standard Analgesia Group (45±4.01), this difference was not statistically significant [Table 1]. Pain intensity was assessed using VAS at specific time intervals at the 1st, 6th, 12th, and 24th hours postoperative. The difference between the mean pain scores at the 1st and 6th postoperative hours was found to be statistically significant ( $p < 0.001$ ). However, there was no significant difference at the 12th and 24th postoperative hours [Table 2 and Table 3]. NSAIDs were given to all patients in the Standard Analgesia Group for the first 24 hours after surgery to manage postoperative pain. Table 4 describes the number of NSAIDs and tramadol doses administered in the first 24 h.

**Table 1: Demographic characteristics of patients**

Patients characteristics	Local Anaesthetics group (n=134)	Standard analgesia group (n=136)	P-value
Mean Age (Years)	49±3.51	47±3.66	0.47
Mean Weight (Kg)	78.5±4.54	76±4.71	0.387
Sex Ratio (F:M)	76:17	79:16	
ASA (I, II, III)	5	7	Not

	67	70	significant
	21	18	
Time of operation (minutes)	49±1.71	45±4.01	Not significant
Number of NSAIDs doses administered in the first 24 h	93	190	
Number of Tramadol doses administered in the first 24 h	11	36	
Hospital stay (day)	1.1	1.2	Not significant

**Table 2: Mean VAS scores for Local Anaesthetics groups and standard groups postoperatively**

Postoperative assessment time (hours)	Local Anaesthetics group (n=134)	Standard analgesia group (n=136)	p-value
1. h	3.6±0.42	7.6±0.52	<0.001
6. h	4.4±0.24	6.9±0.41	<0.001
12. h	2.1±0.25	2.3±0.6	0.786
24. h	1.9±0.81	2.1±0.54	0.69

**Table 3: VAS score in groups intervals over time**

Study groups	Number of Doses	
	NSAIDs	Tramadol
Local Anaesthetics group	88	18
Standard analgesia group	189	38

**Table 4: Number of doses of NSAIDs and tramadol administered in the first 24 hours**

Postoperative assessment time (hours)	Study groups	
	Local Anaesthetics group	Standard analgesia group
1. h	3.5	7.7
6. h	4.3	6.9
12. h	2.1	2.3
24. h	1.9	2

## DISCUSSION

Laparoscopic cholecystectomy (LC) is considered the preferred treatment for symptomatic cholelithiasis. While post-surgery pain after LC is generally milder and of shorter duration compared to open surgery, patients still experience varying levels of pain and discomfort. The entry sites of the ports used during the laparoscopic procedure are typically the main source of pain. Pain can also result from the dissection area of the gallbladder bed and the retention of residual carbon dioxide (CO<sub>2</sub>) gas in the suprahepatic space. To minimize postoperative pain (POP) and facilitate early mobility, shorter hospital stays, and a quicker return to normal activities, effective pain management is essential. Studies have shown that infiltrating the port sites with bupivacaine can reduce severe pain within the first 6 hours after surgery and significantly decrease the need for narcotic painkillers. Additionally, previous research has demonstrated that local anaesthetic infiltration at the incision site can significantly reduce the need for painkillers and alleviate postoperative pain [13,14].

Some studies have demonstrated that there is an analgesic effect in the early postoperative period (0–

6 hours), while other studies have reported a longer-lasting anaesthetic effect (12–24 hours) [15-19]. It is recommended that the anaesthetic applied to the port sites should be applied to all layers and not only to the subcutaneous tissue. The anaesthetic used to reduce the severity of postoperative pain (POP) depends on the depth of the port incision. In a study by Suragul *et al.*, [20], it was emphasized that full-layer application, especially at the trocar entry sites, is important. In the current study, the epigastric and umbilical trocar incisions were made to include all layers before suturing. However, it is important to note that the long-acting local anaesthetics used to reduce POP after application to port sites may not show its effect on pain after intraperitoneal application to the gallbladder bed [21].

Parietal-type pain after laparoscopic cholecystectomy (LC) is described as sudden, intense, and localized. It is caused by the incision made for the trocar entry (port site) [13, 14]. On the other hand, visceral pain following LC is diffuse, slowly progressive, and challenging to pinpoint. It is typically felt in the midline and can be caused by factors such as contact of bile with internal organs or sudden stresses

due to pressure changes. Reflected pain, such as shoulder pain, is felt in a different location than the stimulus site. It occurs due to the stretching of the diaphragm muscle and irritation of the phrenic nerve caused by CO<sub>2</sub> gas during the surgery [22]. Since trocar ports are the most common sites of pain for patients, they have been the focus of specific studies on port site pain.

In the first 6 hours after surgery, patients experienced more pain at the trocar entry sites compared to other areas. Several studies, including those by Hussain *et al.*, [8], Nazir and Merdan [23], and Cantore *et al.*, [24], have found that using long-acting local anaesthetics at the early port entry sites can reduce pain. Similarly, in this study, a decrease in pain and a reduced need for painkillers during the first 6 hours postoperatively was observed. This aligns with findings by Kotsovolis *et al.*, [6] who also reported a significant decrease in pain levels during the first 6 hours postoperative. However, there was no significant difference in pain scores between the two groups at the 12th and 24th hour in the present study compared to current publications [25-27]. Findings from other studies, such as those by Ali *et al.*, [21] and Roy [5], also support the decrease in the need for painkillers in the first 6 hours after surgery. However, the differences in pain scores were not statistically significant at the 12th and 24th hour as found in these studies. On the other hand, a study by Ke *et al.*, [28] reported conflicting results, stating that administering bupivacaine into the port sites did not provide any benefit in pain control after laparoscopy. Similarly, Akbar *et al.*, [27] found that the duration of hospitalization did not significantly differ between the two groups in their study mirroring the current study.

When the studies on pain control with local anesthetic application at the port sites after LC are examined, the present one is the study with the highest patient volume, 270 patients. Roy [5] studied 180 patients, Hussain *et al.*, [8] 100, Akbar *et al.*, [27] 84, Nazir and Merdan [23] 72, and Bhattarai *et al.*, [25] 60.

### Limitations

This was a single-center study with a limited population, which may not reflect accurate outcomes. A longer study period with this population size may lead to loss of data.

## CONCLUSION

In conclusion, the application of a long-acting local anaesthetic to port sites after laparoscopic cholecystectomy (LC) results in a significant reduction in pain during the first 6 hours post-surgery. We believe that patients who receive this treatment will require fewer analgesics (such as NSAIDs, tramadol, etc.) to manage postoperative pain (POP). We also recommend

the full-layer application of local anaesthetic to the port sites.

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