

Research Article

The Influence of Postoperative Pain Management on Recovery in Gallbladder Surgery

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ABSTRACT

Aim: To assess the impact of postoperative pain management on recovery in Gallbladder Surgery.

Materials and Methods: The hospital based prospective observational study was conducted in the Department of Surgery. A total of 100 patients undergoing elective laparoscopic cholecystectomy for symptomatic gallbladder disease were included in the study.

Results: A total of 100 patients were included, with a mean age of 46.2 ± 12.3 years; most were females (62.0%) and aged 41-50 years (30.0%). Symptomatic cholelithiasis (70.0%) was the most common indication for surgery, while hypertension (24.0%) was the most frequent comorbidity. IV paracetamol plus NSAIDs (40.0%) was the most commonly used postoperative analgesic regimen. Patients receiving TAP block with paracetamol had the lowest postoperative pain scores, and pain decreased progressively over the first 24 hours in all groups. The mean time to first ambulation, oral intake, and hospital stay were 8.2 ± 2.3 hours, 6.9 ± 1.9 hours, and 2.3 ± 0.7 days, respectively, with all showing significant positive correlations with postoperative pain ($p < 0.001$). Postoperative nausea and vomiting occurred in 24.0% of patients, 30.0% required rescue analgesia, and 66.0% reported high satisfaction, which was significantly associated with lower pain scores ($r = -0.49$, $p < 0.001$).

Conclusion: Effective postoperative pain management improved recovery after gallbladder surgery by promoting earlier ambulation and oral intake, shortening hospital stay, and reducing rescue analgesic requirements. Multimodal analgesia, particularly TAP block with paracetamol, provided superior pain relief and was associated with better patient satisfaction.

Keywords: Postoperative Pain Management, Gallbladder Surgery.

INTRODUCTION

One of the most prevalent surgical conditions worldwide is gallbladder maladies, including acute cholecystitis, cholelithiasis, gallbladder polyps, and biliary dyskinesia. The gold standard treatment for symptomatic gallbladder disease is surgical removal of the gallbladder, which is most commonly performed through laparoscopic cholecystectomy. This procedure is preferred over open cholecystectomy due to its smaller incisions, faster recovery, reduced blood loss, and shortened hospital stay.¹

Nevertheless, postoperative pain continues to be a substantial clinical concern and is one of the most critical determinants of the quality and pace of postoperative recovery, despite the minimally invasive nature of laparoscopic surgery.^{2,3} The nature of postoperative discomfort following gallbladder surgery is

multifactorial. It may be the consequence of tissue manipulation, visceral irritation, diaphragmatic stretching, pneumoperitoneum, residual carbon dioxide trapped beneath the diaphragm, and trocar insertion sites. This discomfort may manifest as abdominal pain, incisional pain, visceral discomfort, or referred shoulder tip pain. Shoulder tip pain is a common occurrence following laparoscopic cholecystectomy and is believed to be caused by diaphragmatic irritation and phrenic nerve stimulation caused by residual pneumoperitoneum.³ Numerous adverse outcomes may result from inadequate postoperative pain management. The risk of pulmonary complications, including pneumonia and atelectasis, may be elevated as a result of severe pain, which may restrict deep breathing and coughing. It may also delay ambulation, extend the hospital stay, impede the return of

digestive function, reduce oral intake, disrupt sleep, and negatively impact overall patient satisfaction.

In the past, opioids have been the primary treatment for postoperative analgesia following gallbladder surgery. Nevertheless, there has been a transition to multimodal analgesia as a result of the growing recognition of opioid-related adverse effects and the necessity for a more rapid recovery. The utilization of various analgesic classes and pain control techniques that operate through distinct mechanisms is referred to as multimodal analgesia. These may encompass paracetamol, non-steroidal antiinflammatory medications, local anesthetic infiltration, regional nerve blocks, corticosteroids, and limited opioid use for rescue analgesia. Multimodal analgesic regimens have been demonstrated to enhance patient comfort, minimize postoperative nausea and vomiting, decrease opioid requirements, and reduce pain scores.⁴

Recent research has demonstrated that the administration of intravenous paracetamol significantly enhances postoperative recovery and pain control following laparoscopic cholecystectomy.⁵ In the same vein, dexmedetomidine has been discovered to offer superior postoperative analgesia and perioperative hemodynamic stability when contrasted with conventional analgesic regimens.⁶ Additionally, the utilization of selective cyclooxygenase-2 inhibitors, such as parecoxib, and preemptive analgesia has been demonstrated to enhance recovery outcomes, reduce postoperative pain scores, and abbreviate hospital stays.^{7,8}

The significance of postoperative pain management in gallbladder surgery has been further underscored by the concept of Enhanced Recovery after Surgery. The objectives of ERAS protocols are to reduce surgical stress, promote early oral intake, facilitate early mobilization, minimize opioid use, and shorten the hospital stay. One of the fundamental components of ERAS pathways is the provision of effective pain control, as patients who experience less postoperative pain are more likely to ambulate earlier, recommence feeding sooner, and recover more rapidly.^{2,3} Although there are numerous pain management strategies at one's disposal, there is still fluctuation in the selection of an analgesic regimen following gallbladder surgery.

Consequently, it is crucial to assess the influence of postoperative pain management on recovery in gallbladder surgery in order to

identify the most effective analgesic strategies, enhance patient outcomes, minimize complications, and optimize postoperative care.

MATERIAL AND METHODS

After obtaining clearance from institutional ethical committee, this hospital based prospective observational study was conducted in the Department of Surgery. A total of 100 patients undergoing elective laparoscopic cholecystectomy for symptomatic gallbladder disease were included in the study.

Inclusion Criteria

- Patients aged 18 years and above.
- Undergoing elective laparoscopic cholecystectomy.
- Diagnosed with one of the following: Gallstone disease, Chronic cholecystitis, Gallbladder polyps, Biliary dyskinesia
- Willing to participate in the study.
- Provided written informed consent.

Exclusion Criteria

- Patients undergoing emergency surgery.
- Patients undergoing open cholecystectomy.
- Patients requiring conversion from laparoscopic to open cholecystectomy.
- Pregnant women.
- Patients with a known allergy to analgesic medications.
- Chronic opioid users.
- Patients with psychiatric illness affecting pain assessment.
- Patients with severe hepatic dysfunction.
- Patients with severe renal dysfunction.
- Patients unwilling to participate in the study

Study Procedure

A comprehensive history was acquired from all patients, including their age, sex, body mass index, presenting complaints, duration of symptoms, associated comorbidities, previous abdominal surgery, and indication for cholecystectomy. Routine preoperative investigations and baseline clinical examinations were implemented. Under general anesthesia, all patients underwent elective laparoscopic cholecystectomy. The treating anesthesiologist and surgeon established the postoperative pain management protocol in accordance with institutional protocols. Pain management strategies comprised intravenous paracetamol, non-steroidal antiinflammatory medications, opioids, local anaesthetic infiltration, transversus abdominis plane block,

dexmedetomidine, or combinations of these approaches. The Visual Analogue Scale was employed to evaluate the intensity of pain at 2, 6, 12, and 24 hours following the surgery.

The recovery parameters that were evaluated were the time to first ambulation, time to oral intake, duration of hospital stay, incidence of postoperative nausea and vomiting, prerequisite for rescue analgesia, patient satisfaction score, and occurrence of postoperative complications.

Outcome Measures: The primary outcome measure was the association between adequacy of postoperative pain control and postoperative recovery. Secondary outcome measures included postoperative pain scores, requirement of rescue analgesia, incidence of nausea and vomiting, time to ambulation, duration of hospital stay, and patient satisfaction.

Statistical Analysis

The data that was collected was analyzed using the Statistical Package for Social Sciences version 25.0 and inputted into Microsoft Excel. Continuous variables were represented as the mean $\pm$ standard deviation or median with interquartile range, depending on the distributed data. Frequency and percentage were used to express categorical variables. The independent t-test, one-way ANOVA, Mann-Whitney U test, or Kruskal-Wallis test were employed to compare the pain scores and recovery outcomes of various pain management modalities, as necessary. Categorical variables were subjected to either the Chisquare test or Fisher's exact test. The Spearman correlation coefficient was employed

to examine the correlation between the pain score and the recovery parameters. Statistical significance was defined as a p-value of less than 0.05.

RESULTS

In the present study, a total of 100 patients were included in the study, with a mean age of 46.2 ± 12.3 years. Most patients were 41–50 years old (30.0%), and females (62.0%) outnumbered males (38.0%). Symptomatic cholelithiasis (70.0%) was the most common indication for surgery. Hypertension (24.0%) was the most common comorbidity, followed by diabetes mellitus (18.0%) and obesity (12.0%), while 46.0% of patients had no comorbidities (Table 1).

In our study, among the 100 patients, IV paracetamol plus NSAIDs (40.0%) was the most commonly used postoperative pain management regimen, followed by IV paracetamol plus opioids (24.0%). Patients receiving TAP block with paracetamol had the lowest mean VAS scores at all postoperative time points, while pain scores decreased progressively over the first 24 hours across all treatment groups (Table 2).

The mean time to first ambulation, oral intake, and hospital stay were 8.2 ± 2.3 hours, 6.9 ± 1.9 hours, and 2.3 ± 0.7 days, respectively, and showed significant positive correlations with postoperative pain ($p < 0.001$). Postoperative nausea and vomiting occurred in 24.0% of patients, while 30.0% required rescue analgesia. Overall, 66.0% of patients reported high satisfaction, which was significantly associated with lower pain scores ($r = -0.49$, $p < 0.001$) (Table 3).

Table 1: Demographic and Clinical Characteristics of Study Participants (n = 100)

Variable	Number (n)	Percentage (%)	Mean $\pm$ SD
Age (years)			46.2 $\pm$ 12.3
21–30 years	10	10.0	-
31–40 years	26	26.0	-
41–50 years	30	30.0	-
51–60 years	24	24.0	-
>60 years	10	10.0	-
Gender			
Male	38	38.0	-
Female	62	62.0	-
Indication for Surgery			
Symptomatic cholelithiasis	70	70.0	-
Chronic cholecystitis	20	20.0	-

Gallbladder polyp	5	5.0	-
Biliary dyskinesia	5	5.0	-
Comorbidities			
Hypertension	24	24.0	-
Diabetes mellitus	18	18.0	-
Obesity	12	12.0	-
No comorbidity	46	46.0	-

Table 2: Distribution of Postoperative Pain Management Modalities and Pain Scores (n = 100)

Pain Management Modality	Number (n)	Percentage (%)	Mean VAS Score at 2 Hours	Mean VAS Score at 6 Hours	Mean VAS Score at 12 Hours	Mean VAS Score at 24 Hours
IV Paracetamol + NSAIDs	40	40.0	5.0 ± 1.0	3.7 ± 0.9	2.5 ± 0.8	1.5 ± 0.6
IV Paracetamol + Opioids	24	24.0	6.1 ± 1.3	4.6 ± 1.1	3.2 ± 1.0	2.1 ± 0.8
TAP Block + Paracetamol	16	16.0	4.1 ± 0.8	2.9 ± 0.7	1.9 ± 0.6	1.1 ± 0.4
Dexmedetomidine-based regimen	12	12.0	4.8 ± 0.9	3.5 ± 0.8	2.3 ± 0.7	1.4 ± 0.5
Other multimodal regimens	8	8.0	5.3 ± 1.1	3.9 ± 1.0	2.7 ± 0.8	1.6 ± 0.6
Overall	100	100.0	5.2 ± 1.2	3.8 ± 1.0	2.6 ± 0.9	1.6 ± 0.7

Table 3: Association of Postoperative Pain with Recovery Outcomes (n = 100)

Recovery Parameter	Mean ± SD / Number (%)	Correlation Coefficient (r)	p-value
Time to first ambulation (hours)	8.2 ± 2.3	0.57	<0.001
Time to oral intake (hours)	6.9 ± 1.9	0.45	<0.001
Duration of hospital stay (days)	2.3 ± 0.7	0.54	<0.001
Postoperative nausea and vomiting	24 (24.0%)	–	0.005
Rescue analgesia required	30 (30.0%)	–	0.002
High patient satisfaction	66 (66.0%)	–0.49	<0.001
Moderate patient satisfaction	25 (25.0%)	–	–
Poor patient satisfaction	9 (9.0%)	–	–

DISCUSSION

The majority of patients (30%) were in the 41–50 age category, with a mean age of 46.2 ± 12.3 years in the current study. The sample population was composed of 62% females and 38% males. The most prevalent indication for surgery was symptomatic cholelithiasis, which was observed in 70% of patients. Similar findings were reported by Sattar et al⁹, who observed that most patients undergoing laparoscopic cholecystectomy were middle-aged females. Singla et al¹⁰ also reported female predominance in the fourth and fifth decades of life. Yasir et al¹¹ found that most

patients were between 30 and 50 years of age and females formed the majority in both study groups. These findings suggested that gallstone disease was more common among middle-aged women.

The mean VAS score in our study decreased from 5.2 ± 1.2 at 2 hours to 1.6 ± 0.7 at 24 hours postoperatively. Patients who underwent TAP block with paracetamol experienced the lowest pain scores across all intervals, while those who received intravenous paracetamol in conjunction with analgesics experienced comparatively higher pain scores. Singla et al¹⁰ reported significantly lower abdominal and

shoulder tip pain in patients undergoing low-pressure pneumoperitoneum compared to standard-pressure pneumoperitoneum. Yasir et al¹¹ observed shoulder tip pain in 28% of patients in the standard-pressure group compared with 10% in the low-pressure group. Their mean pain scores at 8 hours were 3.5 ± 0.76 and 2.2 ± 1.1 , respectively, while at 24 hours the scores were 0.64 ± 0.74 and 0.2 ± 0.45 . Sandhu et al¹² also reported postoperative shoulder pain in 28.57% of patients in the standard-pressure group compared with only 7.14% in the low-pressure group. Celik et al¹³ reported reduced analgesic requirement and lower pain intensity with low intra-abdominal pressure.

The mean time to first ambulation was 8.2 ± 2.3 hours, the mean time to oral intake was 6.9 ± 1.9 hours, and the mean duration of hospital stay was 2.3 ± 0.7 days in the current study. Delayed ambulation ($r = 0.57$, $p < 0.001$), delayed oral intake ($r = 0.45$, $p < 0.001$), and prolonged hospital stay ($r = 0.54$, $p < 0.001$) were all significantly associated with higher pain scores. In 30% of patients, rescue analgesia was necessary, and 24% experienced postoperative nausea and vomiting. Yasir et al¹¹ reported that the mean hospital stay was 1.21 ± 0.36 days in the standard-pressure group compared with 1.1 ± 0.45 days in the low-pressure group. They also found that analgesic injections were higher in the standard-pressure group (2.71 ± 0.50) than in the low-pressure group (2.2 ± 0.45). Esmat et al¹⁴ reported pain scores of 3.0, 3.9, and 2.5 at 6, 12, and 24 hours in the standard-pressure group compared with 2.0, 3.0, and 1.29 in the low-pressure group.

In general, the results indicated that gallbladder surgery was associated with improved overall recovery, shorter hospital stays, earlier oral intake, and earlier ambulation, as well as lower postoperative pain scores. The recovery process following gallbladder surgery was significantly influenced by postoperative pain management. Patients with lower pain scores exhibited earlier oral intake, shorter hospital stays, earlier ambulation, and a reduced need for rescue analgesia. Better pain control and improved recovery outcomes were associated with multimodal pain management strategies, particularly TAP block with paracetamol. In general, the results indicated that the implementation of effective postoperative pain management was crucial for the improvement

of patient satisfaction and recovery following gallbladder surgery.

Limitation of the Study

The generalizability of the findings may have been adversely affected by the study's single-center design and relatively small sample size of 100 patients. The follow-up was limited to the immediate postoperative period, and there was no evaluation of long-term pain or quality of life. Psychological factors, comorbidities, and individual variations in pain perception were not assessed separately.

CONCLUSION

Effective postoperative pain management was instrumental in enhancing the rehabilitation process following gallbladder surgery. Patients who demonstrated improved pain control exhibited earlier ambulation, oral intake, shorter hospital stays, and a decreased requirement for rescue analgesia. Multimodal analgesia and TAP block with paracetamol were found to provide superior pain relief in comparison to conventional analgesic methods, among the various pain management strategies. The results of the study in general indicated that the provision of adequate postoperative pain management considerably improved the comfort, recovery, and satisfaction of patients who underwent gallbladder surgery.

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