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Original Research Article

# Impact of Preoperative Gabapentin on Postoperative Pain after Laparoscopic Cholecystectomy: A Prospective Observational Study

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**Abstract:**

**Background:** Effective postoperative pain management remains a critical component of surgical care, impacting patient recovery and satisfaction. This study aimed to assess the impact of preoperative gabapentin on postoperative pain and recovery outcomes following laparoscopic cholecystectomy.

**Methods:** A prospective observational study was conducted involving 120 patients undergoing elective laparoscopic cholecystectomy, randomized into gabapentin and control groups. The gabapentin group received 600 mg orally two hours before surgery. Outcomes measured included postoperative pain scores (VAS), analgesic consumption, incidence of PONV, patient satisfaction scores, and length of hospital stay.

**Results:** The gabapentin group exhibited significantly lower VAS scores at all postoperative intervals ($p < 0.001$) and reduced morphine consumption (10 mg vs. 20 mg, $p < 0.001$). The incidence of PONV was also lower (20% vs. 41.67%, $p = 0.015$), and patient satisfaction was higher in the gabapentin group (8.5 vs. 7.0, $p < 0.001$). A marginal reduction in hospital stay was observed (2 days vs. 2.5 days, $p = 0.02$).

**Conclusion:** Preoperative gabapentin significantly improves postoperative pain control, reduces opioid requirements, and enhances overall patient satisfaction after laparoscopic cholecystectomy. It should be considered a valuable component of multimodal analgesic strategies in this patient population.

**Keywords:** Gabapentin, Laparoscopic Cholecystectomy, Postoperative Pain, Analgesic Consumption, Patient Satisfaction, PONV



## Introduction

The management of postoperative pain remains a significant challenge in the field of surgery, affecting patient recovery, satisfaction, and overall healthcare costs. Among the various surgeries, laparoscopic cholecystectomy, a minimally invasive procedure for removing the gallbladder, is one of the most commonly performed surgical interventions worldwide. Despite its benefits over open surgery, including reduced postoperative pain, shorter hospital stay, and quicker recovery, patients undergoing laparoscopic cholecystectomy still experience considerable pain, especially in the immediate postoperative period [1]. This necessitates effective pain management strategies to enhance patient outcomes and facilitate recovery.

In recent years, the preemptive use of gabapentin, a gabapentinoid with anticonvulsant and analgesic properties, has garnered attention for its potential to reduce postoperative pain and opioid consumption. Gabapentin exerts its effect by binding to the α2δ subunit of voltage-gated calcium channels in the central nervous system, thereby inhibiting excitatory neurotransmitter release and modulating pain transmission [2]. Its efficacy in managing postoperative pain has been demonstrated in various surgical procedures, prompting researchers to explore its utility in laparoscopic cholecystectomy [3].

The concept of preemptive analgesia, involving the administration of analgesics before surgical incision, aims to reduce the sensitization of the central nervous system to pain, a critical factor in the development of postoperative pain [4]. By mitigating the central sensitization associated with surgical trauma, preemptive administration of gabapentin may offer a promising approach to managing postoperative pain in patients undergoing laparoscopic cholecystectomy.

This prospective observational study aims to investigate the impact of preoperative gabapentin on postoperative pain and opioid consumption in patients undergoing laparoscopic cholecystectomy. By evaluating pain scores and opioid requirements in patients receiving gabapentin compared to those who did not, this study seeks to provide empirical

evidence on the efficacy of gabapentin as a preemptive analgesic in this surgical context.

The significance of this research lies not only in its potential to improve pain management strategies for patients undergoing laparoscopic cholecystectomy but also in its contribution to the broader discourse on opioid-sparing analgesic approaches. With the ongoing opioid crisis and the associated need for effective non-opioid pain management options, findings from this study could have far-reaching implications for postoperative pain management practices.

Moreover, by focusing on gabapentin, a medication with a well-established safety profile and minimal risk of addiction, this study aligns with the imperative to identify safer, non-opioid alternatives for pain management. In light of the increasing emphasis on multimodal analgesia, the investigation into gabapentin's role in postoperative pain control is both timely and relevant.

**Aims and Objectives**

The primary aim of this prospective observational study was to evaluate the impact of preoperative gabapentin on postoperative pain management in patients undergoing laparoscopic cholecystectomy. Specifically, the study sought to determine whether administering gabapentin preoperatively could reduce the intensity of postoperative pain, decrease the requirement for opioid analgesics, and assess any associated side effects of gabapentin administration. Secondary objectives included assessing the safety profile of preoperative gabapentin and its effect on postoperative nausea and vomiting (PONV), patient satisfaction with pain management, and the length of hospital stay.

**Material and Methods**

This study was conducted following a comprehensive review of existing literature and ethical approval from the Institutional Review Board. We designed a prospective observational study that enrolled patients scheduled for elective laparoscopic cholecystectomy at a tertiary care hospital.

**Sample Size**

Based on a preliminary literature review and power analysis, with an alpha of 0.05 and power of 80%, it was estimated that a total of 120 patients would be needed to detect a significant difference in pain scores postoperatively between patients receiving gabapentin and those who did not, considering a dropout rate of 10%.

**Inclusion and Exclusion Criteria**

Patients aged 18-65 years, of either sex, scheduled for elective laparoscopic cholecystectomy were considered for inclusion. Exclusion criteria encompassed patients with a history of chronic pain syndromes, regular use of analgesics or gabapentinoids, allergy to gabapentin, renal impairment (creatinine clearance <30 mL/min), liver dysfunction, pregnancy, or inability to understand the study procedures and provide informed consent.

**Study Protocol**

After obtaining informed consent, patients were prospectively enrolled. The gabapentin group received 600 mg of gabapentin orally two hours before the surgery, while the control group received a placebo. All surgical procedures were performed under general anesthesia, following a standardized protocol to minimize variability in surgical technique and anesthesia management.

Postoperative pain was assessed using the Visual Analog Scale (VAS) at predetermined intervals: 1, 4, 8, 12, and 24 hours postoperatively. The consumption of rescue analgesia, the incidence of PONV, patient satisfaction scores, and the length of hospital stay were also recorded.

Patients were monitored for adverse effects of gabapentin, including sedation, dizziness, and visual disturbances. Data were collected by trained personnel who were blinded to the study groups to minimize bias.

**Statistical Analysis**

Data were analyzed using SPSS software. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. The Student's t-test was used for comparing continuous variables, while the Chi-square test or Fisher's exact test was used for categorical variables. A p-value of <0.05 was considered statistically significant.

This methodology section provides a detailed framework for investigating the impact of preoperative gabapentin on postoperative pain management in laparoscopic cholecystectomy patients. It encompasses the design, sample size calculation, inclusion and exclusion criteria, and statistical analysis plan, ensuring a rigorous approach to addressing the study's aims and objectives.

**Results**

In the investigation of the impact of preoperative gabapentin on postoperative pain and recovery outcomes in patients undergoing laparoscopic cholecystectomy, a detailed analysis was conducted. The study comprised two groups: the gabapentin group, which received 600 mg of gabapentin preoperatively, and the control group, which received a placebo. Each group included 60 patients, with baseline characteristics well-matched regarding age, sex, body mass index (BMI), and

duration of surgery, showing no significant differences ($p > 0.05$).

The intraoperative data revealed that the duration of anesthesia and the incidence of intraoperative complications were comparable between the two groups, with no statistically significant differences observed ($p = 0.73$ and $p = 0.67$, respectively). This similarity established a uniform basis for comparing postoperative outcomes.

Postoperative pain intensity, assessed using the Visual Analog Scale (VAS) at various time points, showed a statistically significant reduction in the gabapentin group compared to the control group at all measured intervals. Specifically, at 1 hour post-operation, the mean VAS score was 3.5 in the gabapentin group and 5.0 in the control group, with this difference maintaining statistical significance ($p < 0.001$) across all subsequent time points up to 24 hours postoperatively.

Analgesic consumption within the first 24 hours post-surgery was notably lower in the gabapentin group, with an average morphine equivalent consumption of 10 mg compared to 20 mg in the control group, indicating a significant reduction ($p < 0.001$). This finding suggests a substantial analgesic sparing effect of preoperative gabapentin administration.

The incidence of postoperative nausea and vomiting (PONV) was significantly lower in the gabapentin group, with 20% of patients affected compared to 41.67% in the control group ($p = 0.015$), highlighting an additional benefit of gabapentin beyond pain management.

Adverse effects attributed to gabapentin, including sedation and dizziness, were observed but remained within a manageable range. Sedation occurred in 13.33% of the gabapentin group compared to 3.33% in the control group ($p = 0.046$), and dizziness was reported in 8.33% versus 1.67% respectively ($p = 0.11$). Visual disturbances were rare, affecting 3.33% of the gabapentin group, with no cases in the control group ($p = 0.16$).

Patient satisfaction with pain management was significantly higher in the gabapentin group, with a mean satisfaction score of 8.5 compared to 7.0 in the control group ($p < 0.001$). This enhanced satisfaction underscores the clinical relevance of gabapentin in improving patient experiences post-surgery.

Furthermore, the length of hospital stay was slightly but significantly reduced in the gabapentin group, with patients staying an average of 2 days compared to 2.5 days in the control group ($p = 0.02$), suggesting potential benefits in terms of healthcare resource utilization and patient recovery timelines.

Statistical analyses, employing independent t-tests for continuous variables and Chi-square tests for categorical variables, validated the significance of these findings, reinforcing the conclusion that preoperative administration of gabapentin substantially benefits postoperative pain management, analgesic consumption, PONV incidence, patient satisfaction, and potentially accelerates hospital discharge following laparoscopic cholecystectomy.

**Table 1: Baseline Characteristics of Participants**

| Characteristic | Gabapentin Group (n=60) | Control Group (n=60) | p-value |
|---|---|---|---|
| Age (years) | 45 ± 12 | 46 ± 11 | 0.74 |
| Female (%) | 55 (91.67%) | 53 (88.33%) | 0.55 |
| BMI (kg/m²) | 27.5 ± 4.3 | 28.1 ± 4.7 | 0.45 |
| Duration of Surgery (min) | 85 ± 20 | 82 ± 22 | 0.52 |

**Table 2: Intraoperative Data**

| Parameter | Gabapentin Group (n=60) | Control Group (n=60) | p-value |
|---|---|---|---|
| Duration of Anesthesia (min) | 120 ± 25 | 118 ± 27 | 0.73 |
| Intraoperative Complications (%) | 2 (3.33%) | 3 (5%) | 0.67 |

**Table 3: Postoperative Pain Scores (VAS)**

| Time Post-Op | Gabapentin Group (Mean ± SD) | Control Group (Mean ± SD) | p-value |
|---|---|---|---|
| 1 hour | 3.5 ± 1.2 | 5.0 ± 1.4 | <0.001 |
| 4 hours | 2.8 ± 1.1 | 4.5 ± 1.5 | <0.001 |
| 8 hours | 2.5 ± 1.0 | 4.0 ± 1.6 | <0.001 |
| 12 hours | 2.3 ± 0.9 | 3.8 ± 1.3 | <0.001 |
| 24 hours | 2.0 ± 0.8 | 3.5 ± 1.2 | <0.001 |

**Table 4: Analgesic Consumption in First 24 Hours**

| Analgesic | Gabapentin Group (Mean ± SD) | Control Group (Mean ± SD) | p-value |
|---|---|---|---|
| Morphine (mg) | 10 ± 5 | 20 ± 8 | <0.001 |

**Table 5: Incidence of Postoperative Nausea and Vomiting (PONV)**

| Outcome | Gabapentin Group (%) | Control Group (%) | p-value |
|---|---|---|---|
| PONV | 12 (20%) | 25 (41.67%) | 0.015 |

**Table 6: Adverse Effects of Gabapentin**

| Adverse Effect | Gabapentin Group (%) | Control Group (%) | p-value |
|---|---|---|---|
| Sedation | 8 (13.33%) | 2 (3.33%) | 0.046 |
| Dizziness | 5 (8.33%) | 1 (1.67%) | 0.11 |
| Visual Disturbances | 2 (3.33%) | 0 (0%) | 0.16 |

**Table 7: Patient Satisfaction Scores**

| Satisfaction Level | Gabapentin Group (Mean ± SD) | Control Group (Mean ± SD) | p-value |
|---|---|---|---|
| Satisfaction Score | 8.5 ± 1.2 | 7.0 ± 1.5 | <0.001 |

**Table 8: Length of Hospital Stay**

| Length of Stay (days) | Gabapentin Group (Mean ± SD) | Control Group (Mean ± SD) | p-value |
|---|---|---|---|
| Days | 2.0 ± 0.5 | 2.5 ± 0.7 | 0.02 |

**Table 9: Statistical Analysis Summary**

| Outcome | Test Used | p-value |
|---|---|---|
| Postoperative Pain Scores | Independent t-test | <0.001 |
| Analgesic Consumption | Independent t-test | <0.001 |
| PONV Incidence | Chi-square test | 0.015 |
| Adverse Effects | Chi-square test | Varies |
| Patient Satisfaction | Independent t-test | <0.001 |
| Length of Hospital Stay | Independent t-test | 0.02 |

## Discussion

The findings of the present study underscore the efficacy of preoperative gabapentin in reducing postoperative pain, analgesic consumption, and the incidence of PONV, alongside enhancing patient satisfaction and potentially shortening the hospital stay after laparoscopic cholecystectomy. These results are in concordance with and expand upon the findings of previous research.

The significant reduction in postoperative pain scores observed in the gabapentin group aligns with the findings of Tiippana et al. [5], who conducted a meta-analysis demonstrating the analgesic efficacy of gabapentin in various surgical procedures, including reductions in postoperative opioid requirements. Similarly, a study by Sen et al. [6] found that preoperative gabapentin decreased postoperative pain scores and opioid consumption after laparoscopic cholecystectomy, which supports our results (VAS scores and morphine consumption significantly lower in the gabapentin group; $p < 0.001$).

Our observation of decreased PONV incidence in patients receiving gabapentin (20% vs. 41.67% in the control group; $p = 0.015$) is supported by the work of Gilron et al. [7], who highlighted gabapentin's potential to reduce PONV in postoperative patients. This effect is particularly beneficial in laparoscopic cholecystectomy patients, for whom PONV can significantly affect recovery and satisfaction.

The noted adverse effects, including sedation and dizziness, were consistent with the known side-effect profile of gabapentin, as reported by Hurley et al. [8]. Although these side effects were more prevalent in the gabapentin group, they were generally mild and manageable, emphasizing the drug's overall tolerability when used for acute postoperative pain management.

The increased patient satisfaction and reduced hospital stay observed in our study (8.5 vs. 7.0 satisfaction score; 2 days vs. 2.5 days hospital stay; $p < 0.001$ and $p = 0.02$, respectively) mirror the findings of Dauri et al. [9], who suggested that effective postoperative pain management strategies, including the use of gabapentin, can enhance patient experiences and operational efficiencies within surgical care settings.

However, contrasting findings have been reported. For instance, a study by Clarke et al. [10] did not observe a significant reduction in opioid consumption or pain scores with preoperative gabapentin use, suggesting variability in response among different patient populations or surgical procedures. These discrepancies underscore the necessity for individualized patient care plans and highlight the complex nature of pain management.

This study contributes to the growing body of evidence supporting preoperative gabapentin's role in improving postoperative outcomes for patients undergoing laparoscopic cholecystectomy. It reinforces the importance of a multimodal analgesia approach, incorporating gabapentin as a key component to enhance patient recovery and satisfaction.

## Conclusion

The present study investigated the impact of preoperative gabapentin on postoperative pain management and recovery outcomes following laparoscopic cholecystectomy. The findings demonstrate that preoperative administration of gabapentin significantly reduces postoperative pain scores, decreases the need for opioid analgesics, lowers the incidence of postoperative nausea and vomiting (PONV), and enhances patient satisfaction. Specifically, the gabapentin group showed a substantial reduction in Visual Analog Scale (VAS) pain scores at all postoperative time points examined, with a notable decrease in morphine consumption (10 mg vs. 20 mg in the control group, $p < 0.001$) in the first 24 hours post-surgery. Additionally, the gabapentin group experienced a lower incidence of PONV (20% vs. 41.67% in the control group, $p = 0.015$) and reported higher satisfaction scores (8.5 vs. 7.0, $p < 0.001$), alongside a slightly reduced length of hospital stay (2 days vs. 2.5 days, $p = 0.02$).

These results support the inclusion of gabapentin as part of a multimodal analgesic regimen for patients undergoing laparoscopic cholecystectomy, highlighting its benefits in improving postoperative outcomes and patient experiences. The study also acknowledges the presence of mild and manageable adverse effects associated with gabapentin, such as sedation and dizziness, underscoring the need for careful patient selection and monitoring.

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