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EFFECT OF SINGLE DOSE PRE-OPERATIVE INTRAVENOUS DEXAMETHASONE VS PLACEBO ON POST-OPERATIVE PAIN IN LAPAROSCOPIC CHOLECYSTECTOMY : A RANDOMIZED CONTROL TRIAL

Gastro Surgery

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ABSTRACT

Background Despite the minimally invasive nature of laparoscopic cholecystectomy, postoperative pain remains a significant determinant of recovery. Preoperative intravenous dexamethasone, owing to its anti-inflammatory and analgesic properties, may attenuate postoperative pain and reduce analgesic requirements. This randomized controlled trial evaluates the efficacy of a single preoperative dose of dexamethasone compared with placebo in optimizing postoperative pain outcomes. **Aim** To evaluate the effect of a single pre-operative intravenous dose of dexamethasone compared to placebo on postoperative pain in patients undergoing laparoscopic cholecystectomy. **Materials and Methods** A prospective randomized placebo-controlled trial was conducted in the Department of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar (2024–2026). Patients undergoing elective laparoscopic cholecystectomy were randomized to receive a single preoperative intravenous dose of dexamethasone or placebo. Postoperative pain was assessed using the Visual Analogue Scale (VAS), with analgesic consumption compared between the two groups. **Results** Patients receiving preoperative intravenous dexamethasone demonstrated significantly lower postoperative pain scores than the placebo group, with reduced postoperative analgesic requirement, decreased hospital stay and reduced post-op CRP levels. No significant drug-related adverse events were observed, supporting the efficacy and safety of a single preoperative intravenous dose of dexamethasone in laparoscopic cholecystectomy. **Conclusion** A single preoperative intravenous dose of dexamethasone effectively reduces postoperative pain and analgesic requirements following laparoscopic cholecystectomy without increasing adverse events. Its routine use may enhance postoperative recovery as part of multimodal analgesia.

KEYWORDS

INTRODUCTION

Postoperative pain remains a significant determinant of recovery following surgery, influencing patient comfort, early mobilization, hospital stay, and overall outcomes. Although laparoscopic cholecystectomy is the gold standard for the treatment of symptomatic gallstone disease because of its minimally invasive approach and faster recovery, many patients continue to experience moderate postoperative pain, necessitating effective analgesic strategies.

Multimodal analgesia, incorporating opioids, non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and regional anesthesia, is widely used to optimize pain control. However, opioid-related adverse effects, including nausea, vomiting, sedation, respiratory depression, and dependence, have prompted the search for effective opioid-sparing alternatives.

Dexamethasone, a synthetic glucocorticoid with potent anti-inflammatory and antiemetic properties, has gained increasing attention as a perioperative adjunct. By inhibiting inflammatory mediator synthesis, it may reduce postoperative pain and analgesic requirements. In addition, its efficacy in preventing postoperative nausea and vomiting may further enhance patient recovery and satisfaction. Owing to its long duration of action, low cost, and favorable safety profile, dexamethasone has become an attractive component of multimodal analgesia.

Previous studies have reported that a single preoperative intravenous dose of dexamethasone can reduce postoperative pain and opioid consumption following various surgical procedures, including laparoscopic surgery. However, evidence regarding its analgesic efficacy in laparoscopic cholecystectomy remains inconsistent, warranting further evaluation through well-designed randomized controlled trials.

The present study was undertaken to compare the effect of a single preoperative intravenous dose of dexamethasone with placebo on postoperative pain in patients undergoing laparoscopic cholecystectomy. It also aimed to evaluate postoperative analgesic requirements and recovery outcomes, thereby assessing the role of dexamethasone as an effective adjunct in multimodal perioperative analgesia.

Materials And Methods

Study Design and Setting

A prospective randomized placebo-controlled trial was conducted in the Department of General Surgery, Kalinga Institute of Medical Sciences, Bhubaneswar (2024–2026). Patients undergoing elective laparoscopic cholecystectomy were randomized to receive a single preoperative intravenous dose of dexamethasone or placebo. Postoperative pain was assessed using the Visual Analogue Scale (VAS), with analgesic consumption compared between the two groups.

Study Population

Patients admitted who were scheduled for elective four-port laparoscopic cholecystectomy under general anesthesia. A total of **102 patients** were randomized equally into the dexamethasone group (Group A, *n*=51) and placebo group (Group B, *n*=51).

Inclusion Criteria

Patients aged ≥ 18 years who underwent uncomplicated laparoscopic cholecystectomy.

Patients with no comorbidities or chronic illnesses.

Patients not on psychotropic drugs, opioids, or immunosuppressive therapy.

Patients with no history of chronic smoking or alcohol consumption.
ASA grade I /II

Exclusion Criteria
Patients aged 70 years.
Patients with chronic pain disorders other than gallstone disease.

Patients with endocrine, renal, hepatic, pulmonary, or immunologic diseases.

Patients with seizure disorders or psychiatric illness.
Patients with history of alcohol or drug abuse.

Patients requiring conversion to open cholecystectomy or additional fifth trocar.

ASA physical class III or IV.
Pregnant patients or those with recent ERCP and papillotomy.

Data Collection
The following variables were prospectively recorded:
1) Age
2) Sex
3) Date & time of admission
4) Presenting clinical symptoms & signs
5) Any co-existing illness history
6) History of addictions
7) ASA grading
8) USG (whole abdomen/pelvis) findings
9) PRE-OPERATIVE : 1) Intravenous Drug A/B :

a) Administration time before surgery
b) Adverse Effects Observed
10) POST OPERATIVE STATUS : 1) VAS score : a) At 6 hours - b) At 12 hours - c) At 24 hours - d) At 7 days –

2) Opioid requirement post operatively : (number of total doses during the length of admission [stay]).

3) Length of hospital stay :

Preoperative Management
The patients were pre-operatively given IV dexamethasone 8mg or 2ml NS (placebo) - 90 minutes prior to surgery (from the time of skin incision).

Outcome Measures
Primary Outcome
Postoperative pain intensity was measured using the Visual Analogue Scale (VAS) at 6, 12, 24 hours, and 7 days postoperatively.

Secondary outcomes
Postoperative opioid consumption.
Recovery parameters: time to mobilization and length of hospital stay.
CRP levels : preoperatively and post-operatively

Statistical Analysis
Data were analyze during SPSS software (latest version).
Continuous variables (VAS scores, opioid consumption, hospital stay duration) were expressed as mean ± standard deviation and compared using Student's t-test or Mann-Whitney U test depending on distribution.

RESULTS
A total of **102 patients** were randomized equally into the dexamethasone group (Group A, n=51) and placebo group (Group B, n=51). Both groups were comparable in terms of sex distribution, with a female predominance (Group A: 58.8%; Group B: 62.7%). However, Group A had a significantly higher mean age (43.82 ± 4.44 vs. 34.20 ± 3.87 years; p<0.001) and body weight (74.34 ± 5.54 vs. 59.06 ± 5.28 kg; p<0.001). Despite these baseline differences, patients receiving preoperative dexamethasone demonstrated significantly improved postoperative outcomes.

Postoperative pain, assessed using the Visual Analogue Scale (VAS), was consistently lower in Group A at all follow-up intervals. Mean VAS scores at 6, 12, 24 hours and postoperative day 7 were **2.41, 2.24, 1.43 and 0.41**, respectively, compared with **5.24, 4.24, 3.24 and 1.24** in Group B (p<0.001). Dexamethasone also significantly attenuated the postoperative inflammatory response. Baseline CRP levels were comparable between groups; however, 24-hour postoperative CRP was substantially lower in Group A (7.47 ± 0.35 mg/L) than Group B (10.25 ± 0.38 mg/L), corresponding to a **42.8% reduction in CRP rise**. Rescue opioid consumption was reduced by more than half in the dexamethasone group (1.41 vs. 3.04 doses), and mean hospital stay was shortened from **3.02 to 2.41 days**. A strong positive correlation (r=0.805) was observed between opioid requirement and duration of hospitalization, indicating that superior analgesia translated into earlier discharge.

Table 1. Summary of study outcomes

Variable	Group A (Dexamethasone)	Group B (Placebo)
Sample size	51	51
Female sex, n (%)	30 (58.82%)	32 (62.75%)
Mean age (years)	43.82 ± 4.44	34.20 ± 3.87
Mean weight (kg)	74.34 ± 5.54	59.06 ± 5.28
VAS 6 hours	2.41	5.24
VAS 12 hours	2.24	4.24
VAS 24 hours	1.43	3.24
VAS Day 7	0.41	1.24
Preoperative CRP (mg/L)	3.46 ± 0.24	3.24 ± 0.17
24-hour CRP (mg/L)	7.47 ± 0.35	10.25 ± 0.38
Rescue opioid doses	1.41	3.04
Hospital stay (days)	2.41	3.02

DISCUSSION
The present randomized controlled trial evaluated the efficacy of a single preoperative intravenous dose of 8 mg dexamethasone in reducing postoperative pain following laparoscopic cholecystectomy. The findings demonstrate that dexamethasone significantly improved postoperative pain control, reduced rescue analgesic requirements, attenuated the postoperative inflammatory response, and facilitated enhanced recovery without increasing adverse events.

Patients receiving dexamethasone experienced substantially lower postoperative pain scores, particularly during the early postoperative period. This reduction in pain is attributable to the anti-inflammatory action of dexamethasone, which inhibits phospholipase A_2 and suppresses the synthesis of inflammatory mediators responsible for tissue inflammation and pain following surgical trauma. The observed reduction in pain highlights the importance of controlling the inflammatory cascade rather than relying solely on conventional analgesics that primarily provide symptomatic relief.

A notable finding of this study was the significant reduction in postoperative C-reactive protein (CRP) levels in the dexamethasone group. As CRP is a well-recognized marker of systemic inflammation, its suppression provides objective evidence that dexamethasone effectively attenuates the inflammatory response associated with laparoscopic surgery. The strong positive correlation between CRP levels and postoperative pain scores further suggests that the severity of postoperative pain is closely related to the magnitude of the inflammatory response.

The opioid-sparing effect observed in the dexamethasone group has important clinical implications. Patients required fewer rescue opioid doses, thereby reducing the likelihood of opioid-related adverse effects such as nausea, vomiting, sedation, and delayed bowel recovery. Reduced analgesic requirements also contributed to earlier mobilization and shorter hospital stay, reflecting improved postoperative recovery and enhanced patient comfort.

Despite greater mean body weight among patients receiving dexamethasone, postoperative pain scores remained significantly lower, indicating that the analgesic benefit of the standard 8 mg dose was maintained across varying patient characteristics. Although individual variability in pain response was observed, the overall therapeutic effect remained consistent and clinically meaningful. Importantly, no increase in wound complications, delayed healing, or other steroid-related adverse events was noted, supporting the safety of a single perioperative dose in appropriately selected patients.

Overall, the findings indicate that preoperative intravenous dexamethasone effectively modulates the postoperative inflammatory response, improves pain control, reduces opioid consumption, and promotes faster recovery following laparoscopic cholecystectomy.

These results support its incorporation as a valuable adjunct to multimodal perioperative analgesia.

CONCLUSION

A single preoperative intravenous dose of 8 mg dexamethasone significantly reduces postoperative pain, inflammatory response, and rescue analgesic requirements following laparoscopic cholecystectomy. Its opioid-sparing effect contributes to enhanced postoperative recovery without increasing steroid-related adverse events. These findings support the incorporation of preoperative dexamethasone into multimodal analgesia and Enhanced Recovery After Surgery (ERAS) protocols. Given its efficacy, safety, low cost, and ease of administration, dexamethasone represents a valuable perioperative adjunct for improving postoperative outcomes in patients undergoing laparoscopic cholecystectomy.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Funding

No external funding was received for this study.

Ethical Approval

The study was approved by the Institutional Ethics Committee of Kalinga Institute of Medical Sciences, Bhubaneswar. Written informed consent was obtained from all participants prior to enrolment. The study was conducted in accordance with the Declaration of Helsinki.