e-ISSN: 0975-1556, p-ISSN:2820-2643
Available online on www.ijpcr.com
International Journal of Pharmaceutical and Clinical Research 2024; 16(5); 1354-1357

Original Research Article

Postoperative Analgesic Efficacy of the Pulmonary Recruitment Manoeuvre Compared to Intraperitoneal Hydrocortisone in Laparoscopic Surgical Procedure

Apurva Dayal[1], Anirudh Prasad Mandal[2], Jitesh Kumar[3], Sudama Prasad[4]

[1]Anesthetist, Department of Anaesthesia & Critical Care, Patna Medical College & Hospital, Patna, Bihar, India
[2]Anesthetist, Department of Anaesthesia & Critical Care, Patna Medical College & Hospital, Patna, Bihar, India
[3]Assistant Professor, Department of Anaesthesia & Critical Care, Patna Medical College & Hospital, Patna, Bihar, India
[4]Professor & HOD, Department of Anaesthesia & Critical Care, Patna Medical College & Hospital, Patna, Bihar, India

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 20-04-2024
Corresponding Author: Dr. Anirudh Prasad Mandal
Conflict of interest: Nil

Abstract:

Laparoscopic surgical patients need good postoperative pain treatment to recover and be satisfied. Despite limited studies, the pulmonary recruitment manoeuvre (PRM) and intraperitoneal hydrocortisone (IPH) relieve severe pain. This 11-month prospective, randomized controlled trial recruited 92 patient elective laparoscopic surgical Surgery patients at Patna Medical College & Hospital. Participants were randomly assigned to PRM or IPH groups, which received intraperitoneal hydrocortisone or a pulmonary manoeuvre after surgery. VAS was used to assess postoperative pain up to 48 hours following surgery.

The PRM group showed faster analgesic effects than the IPH group, with substantially lower VAS scores at 1-, 6-, and 12 hours post-operation ($p<0.05$). After 24 and 48 hours, both groups had similar pain scores. In the first 24 hours, PRM patients needed less analgesics.

Conclusion: In laparoscopic surgical Surgery, pulmonary recruitment reduces postoperative pain more than intraperitoneal hydrocortisone. Its postoperative use may increase patient comfort and recovery without drugs.

Keywords: Pulmonary Recruitment Maneuver, Intraperitoneal Hydrocortisone, Postoperative Pain, Laparoscopic surgical Surgery.

Introduction

Laparoscopic surgical Surgeries are widely recognized for their benefits, which include reduced postoperative pain, shorter hospital stays, and quicker recoveries compared to open surgeries [1]. However, managing postoperative pain remains a critical aspect of patient care to enhance recovery, reduce the risk of complications, and improve overall patient satisfaction. Among the various strategies employed to manage this pain, the use of pulmonary recruitment maneuvers (PRM) and intraperitoneal hydrocortisone injection has garnered attention [2,3].

The pulmonary recruitment maneuver is a technique used to re-expand collapsed alveoli through transient increases in transpulmonary pressure. It has been hypothesized that beyond its primary use for improving pulmonary function, PRM may also reduce postoperative pain in laparoscopic surgery [4]. This reduction in pain is thought to be mediated through the alleviation of diaphragmatic irritation caused by residual pneumoperitoneum, which is a common consequence of laparoscopic procedures [5].

On the other hand, the administration of intraperitoneal hydrocortisone during laparoscopic surgeries is considered an effective method to control local inflammatory responses. Hydrocortisone, a glucocorticoid, helps reduce the release of inflammatory mediators in the peritoneal cavity, thus potentially reducing postoperative pain [6]. Recent research has examined various pain management methods, although their efficacy is still debated. In laparoscopic surgical operations, the pulmonary recruitment manoeuvre is compared to intraperitoneal hydrocortisone for postoperative analgesia. This research analyses the causes, clinical results, and patient-centered pain and recovery metrics to help laparoscopic surgical optimize postoperative pain treatment.

Methodology

Study Design: The study participants were 92 patients scheduled for elective laparoscopic surgical Surgery procedures. Patients aged 18–65 undergoing laparoscopic cholecystectomy or herniorrhapy were included. Patients with hydrocortisone allergy, chronic pulmonary illnesses, long-term corticosteroid medication, and laparoscopic contraindications were excluded.

Study Setting: The research was conducted at Patna Medical College & Hospital, a tertiary care center known for its comprehensive surgical treatment services. The study spanned 11 months.

Participants: The study participants were 92 patients scheduled for elective laparoscopic surgical procedures. Patients aged 18–65 undergoing laparoscopic cholecystectomy or herniorrhapy were included. Patients with hydrocortisone allergy, chronic pulmonary illnesses, long-term corticosteroid medication, and laparoscopic contraindications were excluded.

Randomization and Blinding: Participants were randomly assigned to one of two groups using computer-generated random numbers:

1. Pulmonary Recruitment Maneuver Group (n=46)

2. Intraperitoneal Hydrocortisone Group (n=46)

Blinding was maintained for patients and the postoperative assessment team to minimize bias. The surgeons performing the interventions were not blinded due to the nature of the procedures.

Intervention

Pulmonary Recruitment Maneuver Group: Immediately after the laparoscopic procedure and before extubation, a pulmonary recruitment maneuver was performed. This involved applying a continuous positive pressure ventilation bag for 10 seconds, repeated five times.

Outcome Measures: The primary outcome measured was the intensity of postoperative pain, assessed using the Visual Analog Scale (VAS) at 1, 6-, 12-, 24-, and 48-hours post-operation. Secondary outcomes included the need for additional analgesics, incidence of postoperative nausea and vomiting, length of hospital stay, and any adverse events.

Data Collection: Data were collected on standardized forms which included demographic details, surgical details, VAS scores at specified time intervals, analgesic requirement during the first 48 hours post-operation, and any complications or side effects.

Statistical Analysis: Data were analyzed using SPSS software (version 25.0). Continuous variables were presented as mean ± standard deviation and categorical variables as frequencies and percentages. Comparison between the two groups was performed using the student's t-test for continuous variables and the Chi-squared test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

Participant Characteristics: The study included 92 patients, 46 per group. Both groups had identical demographics and baseline characteristics. Intraperitoneal hydrocortisone (IPH) group participants averaged 41.8 years and the pulmonary recruitment maneuver (PRM) group 42.3 years. Most procedures were cholecystectomy or herniorrhapy.

Primary Outcome: Pain Scores: The Visual Analog Scale (VAS) scores for pain at various time points post-operation showed significant differences between the two groups:

At 1-hour post-op: The PRM group reported a mean VAS score of 4.2 ± 1.1, significantly lower than the IPH group, which reported a mean VAS score of 5.6 ± 1.3 ($p<0.01$).

At 6 hours post-op: The PRM group had a mean VAS of 3.5 ± 0.9 compared to 4.4 ± 1.2 in the IPH group ($p<0.05$).

At 12 hours post-op: The difference remained statistically significant with PRM at 2.9 ± 0.8 and IPH at 3.8 ± 1.0 ($p<0.05$).

At 24- and 48-hours post-op: The pain scores converged, with no significant differences observed between the groups (PRM 2.1 ± 0.6 vs. IPH 2.3 ± 0.7 at 24 hours, $p=0.34$; PRM 1.5 ± 0.5 vs. IPH 1.7 ± 0.6 at 48 hours, $p=0.28$).

Secondary Outcomes

Analgesic Requirements: Patients in the PRM group required fewer additional analgesics in the first 24 hours post-operation ($p<0.05$).

Postoperative Nausea and Vomiting (PONV): There was no significant difference in the incidence of PONV between the groups (PRM 15% vs. IPH 17%, $p=0.74$).

Length of Hospital Stay: Both groups had a similar length of hospital stay, averaging 2.3 days ($p=0.88$).

Adverse Events: No serious adverse events related to the interventions were reported. Minor complications were evenly distributed between the groups.

Discussion

The pulmonary recruitment maneuver (PRM) outperformed intraperitoneal hydrocortisone (IPH) in immediate postoperative analgesia during

laparoscopic surgical operations. The PRM group had significantly lower pain scores at 1-, 6-, and 12 hours post-operation, suggesting that PRM reduces early intense pain after laparoscopic surgeries. Because PRM removes residual pneumoperitoneum better than IPH, it may reduce diaphragmatic discomfort [7].
PRM loses its analgesic advantage to IPH between 24- and 48 hours post-op, however, the early postoperative period is critical for patient recovery. Effective pain management during this phase can speed up ambulation and lower the risk of surgical complications like venous thromboembolism and lung problems [8].

The findings are in line with previous studies that highlight the role of PRM in improving respiratory mechanics and reducing postoperative pain after laparoscopic surgeries. However, the comparison with intraperitoneal hydrocortisone is relatively novel in this context. Previous research has typically focused on IPH's role in reducing local inflammatory responses, which is effective but may not be as immediate in pain relief as mechanical interventions like PRM [9,10].

Given the results of this study, implementing PRM could be considered a standard practice for pain management in laparoscopic surgical surgeries. The maneuver is relatively simple to perform and does not require additional pharmacological interventions, which could also reduce the potential for drug-related side effects and interactions. Additionally, the reduced need for postoperative analgesics in the PRM group could have significant implications for reducing opioid use and the associated risks of addiction and side effects [11,12].

The study has limitations. While sufficient to prove statistical significance, the sample size is tiny, and a larger cohort might reinforce the conclusions [13]. The single-center study may also limit generalizability. Future research could examine the long-term effects of pain management measures to determine if early pain control affects recovery or quality of life. More research is needed to understand how PRM affects pain pathways and compare it to other non-pharmacological therapies. Multicenter studies would confirm the findings and analyze PRM's efficacy across settings and groups [14,15].

Conclusion

This study proves that the pulmonary recruitment manoeuvre (PRM) is better than intraperitoneal hydrocortisone (IPH) at treating early postoperative pain after laparoscopic surgical operations. PRM is a promising non-pharmacological alternative for patient comfort and earlier recovery by considerably lowering pain scores and the requirement for extra analgesics in the first 12 hours post-operation. Laparoscopic surgical postoperative care procedures should include PRM as a simple and effective way to improve patient outcomes. To make PRM universally recommended, future research should validate these outcomes across bigger and more diverse groups.

References

1. Smith AB, Jones SM, Newell ET. "Effectiveness of Pulmonary Recruitment Maneuver in Reducing Postoperative Pain After Laparoscopy." Journal of Pain Research 2021; 14: 1123-1132.
2. Lee JH, Park DA, Kim MH. "Intraperitoneal Hydrocortisone for Pain Management in Laparoscopic surgical Surgery: A Systematic Review." Surgical and Obstetric Investigation 2020; 89(3): 245-254.
3. Martinez GP, Green CR, Barbara JA. "Pulmonary Recruitment Maneuvers in Abdominal Surgery: A Meta-Analysis of Randomized Trials." Pain Management Nursing 2022; 23(1): 56-64.
4. Thompson JD, Cohen SM. "Hydrocortisone as an Analgesic in Laparoscopic Surgery: Review of Clinical Outcomes." Journal of Clinical Anesthesia. 2019; 53: 65-70.
5. Patel VK, Schwartz JN, Lee HH. "Comparative Study of Postoperative Recovery Outcomes between Pulmonary Recruitment Maneuver and Intraperitoneal Drug Administration." Surgical Endoscopy 2021; 35(6): 3021-3027.
6. Morgan DJ, Black CK, Anderson GF. "Residual Pneumoperitoneum Management for Pain Reduction after Laparoscopic Surgery." American Journal of Surgery 2019; 218(5): 875-881.
7. Garcia ML, Faulkner H, Rosenthal VD. "Pain Control Methods in Laparoscopic Surgical Surgery: A Systematic Review." Pain Practice 2020; 20(8): 899-908.
8. Reynolds LW, Smith AA, Zhang QQ. "The Role of Glucocorticoids in Decreasing Inflammatory Response during Surgery." Journal of Surgical Research 2020; 246: 217-223.
9. O'Neill TM, Rawlings JM, Burkhart HM. "Effects of Pulmonary Recruitment on Shoulder Pain after Laparoscopic cholecystectomy " Obstetrics & surgical 2018; 132(2): 437-445.
10. Kim KH, Lee D, Marshall JD, et al. "Postoperative Pain Management Techniques in Laparoscopic Surgery: A Systematic Review and Meta-Analysis." Hernia 2021; 25(2): 305-319.
11. Harada T, Momoeda M, Taketani Y, Hoshiai H, Terakawa N. "Minimal Interventional Techniques for Pain after Laparoscopic Surgery: A Comparative Study." Journal of Minimally Invasive Sergical 2019; 26(5): 871-879.
12. Grant MC, Yang D, Wu CL. "Intraperitoneal Use of Local Anesthetics and Steroids for

Postoperative Pain Control: US Guidelines." Anesthesia & Analgesia 2020; 130(4): 914-922.
13. Choi GJ, Kang H, Baek CW, Jung YH, Woo YC. "Pulmonary Recruitment Maneuver for the Reduction of Shoulder Pain in Laparoscopic surgical Surgery." International Journal of Medical Sciences 2022; 19(3): 300-307.
14. Stevens RJ, Terrell JD, Lee SJ. "The Use of Hydrocortisone in Reducing Inflammatory Responses in Abdominal Surgery." Journal of Clinical Pharmacology 2021; 61(7): 865-874.
15. Wagner OJ, Sabatini L, Stricker K, Tarr PE, Mantokoudis G. "Comparison of Two Different Techniques for an Effective Pain Control in Endoscopic Surgeries." BMC Anesthesiology 2019; 19(205): 1-9.