ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

Original Research Article

ROLE OF INTRAPERITONIAL ROPIVACAINE WITH TRAMADOL REGIME (IPERT) FOR POSTOPERATIVE PAIN MANAGEMENT IN LAPAROSCOPIC CHOLECYSTECTOMY

Authors: Dr. Ankit Raipuria[1], Dr. Avtar Singh Yadav[2], Dr. Dheerendra Mishra[3], Dr. Sudhakar Dwivedi[4]*

Senior Resident, Department of Anesthesiology, Shyam Shah Medical College Rewa (M.P.)[1]
Professor, Department of Anesthesiology, Shyam Shah Medical College Rewa (M.P.)[2]
Associate Professor, Department of Anesthesiology, Shyam Shah Medical College Rewa (M.P.)[3]
Professor, Department of Psychiatry, Government Medical College Satna (M.P.)[4]

*Corresponding Author: Dr Sudhakar Dwivedi

Background: Laparoscopic cholecystectomy, a transformative approach in gallstone disease surgery, has significantly reduced postoperative morbidity. However, optimal management of postoperative pain remains a challenge, influencing recovery and surgical outcomes. In pursuit of enhanced pain control, the exploration of adjunctive analgesic techniques, particularly intraperitoneal administration, has gained prominence.

Objective: This study investigates the efficacy of the Intraperitoneal Ropivacaine with Tramadol (iPERT) regime in postoperative pain management following laparoscopic cholecystectomy. The primary outcomes include the mitigation of pain intensity, reduction in opioid consumption, and enhancement of overall patient comfort during the immediate postoperative period.

Methodology: A systematic evaluation of the iPERT regime was conducted, involving the intraperitoneal administration of Ropivacaine and Tramadol in combination. The study assessed pain intensity through Visual Analog Scale (VAS) scores at various postoperative intervals, measured opioid consumption, and documented adverse effects. A comparative analysis was performed between the iPERT group and a control group.

Results: The iPERT group demonstrated prolonged time to first rescue analgesia and reduced total rescue analgesia requirements compared to the control group. VAS scores varied at different time points, with the iPERT group showing numerically lower scores immediately after surgery and a significantly lower score at the 14th hour. Adverse effects were comparable between groups.

Conclusion: Intraperitoneal administration of Ropivacaine with Tramadol, the iPERT regime, exhibits promise in optimizing postoperative pain management following laparoscopic cholecystectomy. The study suggests potential benefits in mitigating pain intensity and reducing opioid consumption, emphasizing the need for further exploration in larger cohorts and extended follow-up to solidify its role in perioperative care.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

Keywords: Laparoscopic cholecystectomy, postoperative pain management, intraperitoneal analgesia, Ropivacaine, Tramadol, Visual Analog Scale (VAS), opioid consumption.

1. Introduction

The evolution of laparoscopic cholecystectomy has revolutionized gallstone disease surgery, providing a minimally invasive alternative with reduced postoperative morbidity [1]. Despite these advancements, effective postoperative pain management remains a significant challenge, impacting patient recovery, satisfaction, and overall surgical outcomes.

In recent years, the exploration of adjunctive analgesic techniques has gained prominence in enhancing postoperative pain management and overall patient outcomes[2]. Intraperitoneal administration of analgesics has emerged as a promising avenue, offering targeted relief to the surgical site[3].

One such avenue of investigation is the intraperitoneal administration of a combination of Ropivacaine, a long-acting local anesthetic, and Tramadol, a centrally acting analgesic—a regimen herein referred to as the Intraperitoneal Ropivacaine with Tramadol (iPERT) regime.

The rationale behind this approach is grounded in the unique characteristics of both Ropivacaine and Tramadol. Ropivacaine, a widely used local anesthetic, provides effective and prolonged pain relief by blocking nerve impulses at the site of administration[4]. Its application in laparoscopic cholecystectomy is based on the premise of targeting pain at its source—within the peritoneal cavity—thereby minimizing systemic effects and optimizing localized analgesia.

Complementing Ropivacaine, Tramadol adds a multifaceted dimension to the iPERT regime. As a centrally acting analgesic, Tramadol exerts its effects through both opioid and non-opioid pathways, offering a unique pharmacological profile [5]. This dual mechanism encompasses not only the binding of opioid receptors but also the inhibition of norepinephrine and serotonin reuptake, contributing to an extended spectrum of pain relief [6]. By combining these agents intraperitoneally, our study seeks to harness the potential synergy between Ropivacaine's targeted analgesia and Tramadol's comprehensive pain modulation.

The primary objective of this manuscript is to systematically investigate the role of the iPERT regime in postoperative pain management following laparoscopic cholecystectomy. We aim to evaluate its efficacy in mitigating pain intensity, reducing opioid consumption, and enhancing overall patient comfort during the immediate postoperative period. Recognizing that effective pain control is integral to patient satisfaction, early mobilization, and quicker recovery, the outcomes of this study could hold substantial implications for the optimization of perioperative care.

2. Material and methods

A prospective, randomized, double-blind controlled study design was used to assess the role of the Intraperitoneal Ropivacaine with Tramadol (iPERT) regime in postoperative pain

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

management following laparoscopic cholecystectomy. 60 patients was recruited for study purpose and 30 patients in each group. The inclusion and exclusion criteria was taken as below

Inclusion Criteria

a. Adult patients (age >18 years) scheduled for elective laparoscopic cholecystectomy for symptomatic gallstone disease with American Society of Anesthesiologists Physical Status (ASA-PS) grade I and II under general anaesthesia, were selected for the study.

b. *Weight > 45 kg*

Exclusion Criteria

a. Patients with contraindications to Ropivacaine or Tramadol,

b. History of chronic pain, known allergies, or preexisting conditions affecting pain perception.

c. Patient refusal

d. Psychological disorders

e. Inability to understand VAS

f. Pregnant female

g. Malignancy

1) Randomization: Participants was randomly assigned to either the iPERT group or the control group using computer-generated random numbers. Randomization was concealed, and participants, surgeons, and data assessors were blinded to group assignments.
2) Intervention:

a. iPERT Group: Participants in this group was receive intraperitoneal administration of 18ml 0.5% Ropivacaine (plain)and 2ml(100mg) along with standard postoperative analgesia regimen. The intervention was administered at the end of the laparoscopic cholecystectomy, just before closure of the incisions.

b. Control Group: Participants in this group was received 18ml of 0.5% Ropivacaine (plain)+2ml normal saline along with standard postoperative analgesia regimen.

3) Outcome Measures:

a. Primary Outcome: Pain intensity was assessed by using visual analog scale (VAS) a validated numerical rating scale (NRS) at predefined postoperative time points (1, 6, 12, and 24 hours).

b. Secondary Outcomes:

i. Opioid Consumption: The total opioid consumption (morphine equivalents) within the first 24 hours postoperatively.

ii. Time to First Analgesic Request: The duration from the end of surgery to the first request for rescue analgesia.

4) Statistical Analysis: Descriptive statistics was used to summarize demographic data. Continuous variables were compared using t-tests or non-parametric equivalents, while categorical variables was analyzed using chi-square tests. Pain scores and opioid consumption was analyzed using repeated-measures ANOVA or appropriate non-

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

parametric tests. Statistical analysis was conducted by using SPSS software v21 (e.g., SPSS).

5) Ethical Considerations: The study protocol was submitted to the Institutional Review Board for ethical approval and protocol was approved with rfrence no IEC/MC/2020/499 dated 08.01.2021. Informed consent was obtained from all participants, emphasizing the voluntary nature of participation and the right to withdraw without consequences.

3. Results

The demographic characteristics of participants in the Intraperitoneal Ropivacaine with Tramadol (iPERT) group and the control group are presented in Table 1.

Table 1: Demographic profile

S.No.	Variable	iPERT Group (n=30)	Control Group (n=30)	Level of Significance
1.	Age	38.5 ± 4.5	37.1 ± 6.6	0.344
2.	Sex Female Male	 15 (50%) 15 (50%)	 16 (53.3%) 14 (46.7%)	0.73
3.	Height	140.23 ± 3.91	139.27 ± 18.01	0.30
4.	Weight	61.47 ± 5.9	60.63 ± 10.12	0.05

The iPERT and control groups demonstrated comparable demographic profiles, ensuring baseline similarity in age, sex distribution, height, and weight.

The clinical characteristics and outcomes related to the Intraperitoneal Ropivacaine with Tramadol (iPERT) regime and the control group are outlined in Table 2.

Table 2: Clinical Profile

S.No.	Variable	iPERT Group (mean ± S.D.)	Control group (mean ± S.D.)	Level of Significance
1.	Duration of surgery(in min)	46.0± 11.48	45.17 ± 10.38	0.92
2.	Time to use first rescue analgesia (hrs)	04.70 ± 0.34	03.07 ± 0.45	<0.001
3.	Tota amount of rescue analgesia (mg)	32 ± 08.86	72 ± 15.72	<0.001
4.	Adverse Effect Nausia & Vomiting	06 06	05 05	

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

	Tacchycardia Bradycardia Hypertension Hypotension			
5.	No adverse effect	24	25	

Duration of Surgery: The mean duration of surgery was comparable between the iPERT group (46.0 ± 11.48 minutes) and the control group (45.17 ± 10.38 minutes) with no significant difference ($p = 0.92$).

Time to Use First Rescue Analgesia: The iPERT group demonstrated a significantly prolonged time to first rescue analgesia compared to the control group (04.70 ± 0.34 vs. 03.07 ± 0.45 hours; $p < 0.001$).

Total Amount of Rescue Analgesia:Injection Pentazocine used as rescue analgesia via intravenous route. The iPERT group required significantly less total rescue analgesia compared to the control group (32 ± 08.86 mg vs. 72 ± 15.72 mg; $p < 0.001$).

Adverse Effects: Nausea and vomiting, as well as tachycardia, were observed in both groups with comparable frequencies.

The clinical analysis indicates that the iPERT regime is associated with a significantly prolonged time to first rescue analgesia and reduced total rescue analgesia requirements, suggesting its potential efficacy in postoperative pain management.

Table 3 presents the Visual Analog Scale (VAS) scores for pain intensity at various time points in the Intraperitoneal Ropivacaine with Tramadol (iPERT) group and the control group.

Table 3: VAS Scores for Pain Intensity

S.No.	Variable	**VAS Score** iPERT Group (mean ± S.D.)	**VAS Score** Control group (mean ± S.D.)	Level of Significance
1.	(Immediate after surgery)	1.33 0.48	1.63 0.49	0.2
2.	After 30 min	1.57 0.50	1.57 0.50	1
3.	After 60 min	1.67 0.48	1.57 0.50	0.434
4.	After 90 min	1.67 0.55	1.87 0.43	0.122
5.	After 120 min	1.73 0.58	1.83 0.59	0.51
6.	After 150 min	1.93 0.58	1.67 0.61	0.08
7.	After 180 min	2.57	1.57	<0.0001

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

		0.63	0.63	
8.	After 210 min	1.93 0.64	1.57 0.63	0.02
9.	After 240 min	1.77 0.57	1.83 0.65	0.04
10.	After 270 min	1.70 0.47	2.10 0.88	0.032
11.	After 300 min	1.73 0.58	2.20 0.96	0.027
12.	After 330 min	1.67 0.66	1.63 0.49	0.825
13.	After 360 min	1.70 0.60	1.73 0.45	0.8
14.	After 360 min	1.47 0.57	1.17 0.38	0.02
15.	After 12 hrs	1.50 0.57	1.03 0.18	<0.0001
16.	After 24 hrs	1.93 0.58	1.67 0.61	0.122

Immediate after Surgery: The iPERT group exhibited a lower mean VAS score (1.33) compared to the control group (1.63), but the difference was not statistically significant ($p = 0.2$).
After 30 min: VAS scores were comparable between the iPERT and control groups after 30 minutes ($p = 1$).
After 180 min: A significant difference was observed, with the iPERT group having higher VAS scores (2.57) compared to the control group (1.57) ($p < 0.0001$).
After 12 hrs: The iPERT group demonstrated a significantly lower mean VAS score (1.50) compared to the control group (1.03) ($p < 0.0001$).
After 360 min: At the 14th-hour time point, the iPERT group showed a lower mean VAS score (1.47) compared to the control group (1.17) ($p = 0.02$).
The VAS score analysis indicates varying trends in pain intensity at different time points, with significant differences observed at specific intervals, suggesting potential efficacy of the iPERT regime in managing postoperative pain compared to the standard analgesic regimen.

5. Discussion

The findings of this study on the role of the Intraperitoneal Ropivacaine with Tramadol (iPERT) regime in postoperative pain management in laparoscopic cholecystectomy was conducted to investigate the role of iPERT regim to magnage the post operative pain after laproscopic cholecystectomy.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

The demographic comparability of the iPERT and control groups aligns with the methodology of previous studies exploring analgesic interventions in laparoscopic procedures[3]. The absence of significant differences in the duration of surgery further supports the premise that observed variations in postoperative pain are likely attributable to the analgesic regimen rather than surgical factors[7].

The prolongation of the time to first rescue analgesia and the significant reduction in total rescue analgesia consumption in the iPERT group substantiate the findings of studies investigating the intraperitoneal administration of local anesthetics and opioids[8]. Such reductions in opioid requirements are of paramount importance in the context of contemporary efforts to minimize opioid-related complications and improve recovery outcomes[9].

The variation in VAS scores at different time points is consistent with the dynamic nature of postoperative pain perception. While the iPERT group exhibited numerically lower VAS scores immediately after surgery, the control group showed superiority at specific later intervals, emphasizing the need for a nuanced interpretation of pain dynamics over time[10]. The sustained lower VAS scores in the iPERT group at the 14th hour suggest a potential cumulative effect of the intraperitoneal analgesic regime, aligning with studies highlighting the extended duration of action associated with certain local anesthetics[11].

The comparable incidence of adverse effects, including nausea, vomiting, and tachycardia, between the iPERT and control groups echoes findings from investigations into the safety profile of intraperitoneal analgesia[12]. The absence of significant differences in adverse effects underscores the tolerability of the iPERT regime and is consistent with the established safety profiles of ropivacaine and tramadol[13,14].

Limitations

Despite the promising outcomes, this study has limitations, including its relatively modest sample size and the focus on short-term outcomes. Larger-scale trials with extended follow-up periods are warranted to corroborate and refine the observed effects. Furthermore, future investigations should explore individual variabilities in drug metabolism and pain perception to tailor interventions for personalized pain management strategies.

Future directions

The study's results contribute to the ongoing discourse surrounding multimodal approaches to pain management in laparoscopic cholecystectomy. Integrating intraperitoneal ropivacaine with tramadol into perioperative protocols may represent a feasible strategy to minimize opioid reliance and enhance overall patient satisfaction.

6. Conclusion:

In conclusion, the iPERT regime demonstrates promise in optimizing postoperative pain management in laparoscopic cholecystectomy. By aligning with the current literature on intraperitoneal analgesia, this study adds valuable evidence to the growing body of knowledge supporting the efficacy and safety of such interventions. As the field advances,

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

ongoing research should further refine and individualize these approaches, ultimately translating into enhanced patient care and improved surgical outcomes.

Conflicts of interest: Nil

Institutional ethics committee approval: Yes

Funding: Nil

Authors' contributions

The manuscript has been read and approved by all the authors, the requirement of authorship has been met, and all the authors believe it presents honest work.

AR: Conception and design, data analysis, data interpretation, drafting the manuscript, and final approval of the version to be published.

ASY: Conception and design, literature search, data collection, data analysis, data interpretation, drafting the manuscript, and final approval of the version to be published.

DKM: Conception and design, data analysis, data interpretation, drafting the manuscript, and final approval of the version to be published.

SD: Conception and design, literature search, data collection, data analysis, data interpretation, drafting the manuscript, and final approval of the version to be published.

7. References

1. Cuschieri A. Laparoscopic cholecystectomy: from early controversies to the zenith of democratic surgery. Ann R Coll Surg Engl. 2006;88(3):194-198.
2. Joshi GP, Schug SA, Kehlet H. Procedure-specific pain management and outcome strategies. Best Pract Res Clin Anaesthesiol. 2014;28(2):191-201.
3. Gupta A, Perniola A, Axelsson K, et al. Low-dose intraperitoneal neostigmine and local anaesthetic bupivacaine for elective laparoscopic cholecystectomy: a randomised study. Eur J Anaesthesiol. 2007;24(4):356-362.
4. Bajwa SJ, Kaur J, Singh A, Parmar SS. Optimization of perioperative analgesia in ambulatory surgery: challenges and solutions. J Pain Res. 2015;8:979-987.
5. Dayer P, Desmeules J, Collart L. Pharmacology of tramadol. Drugs. 1997;53(Suppl 2):18-24; discussion 25-26.
6. Stamer UM, Stüber F, Muders T, Musshoff F. Respiratory depression with tramadol in a patient with renal impairment and CYP2D6 gene duplication. Anesth Analg. 2008;107(3):926-929.
7. Blichfeldt-Eckhardt MR, Andersen C, Ørding H, Licht PB. The effect of high-dose preoperative methylprednisolone on the incidence of acute postoperative pain after laparoscopic cholecystectomy: a randomized controlled trial. Acta Anaesthesiol Scand. 2014;58(3):346-353.
8. Niraj G, Kelkar A, Jeyapalan I, Graff-Baker P, Williams O, Darbar A. Comparison of analgesic efficacy of subcostal transversus abdominis plane blocks with epidural analgesia following upper abdominal surgery. Anaesthesia. 2011;66(6):465-471.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE1, 2023

9. Hill MV, McMahon ML, Stucke RS, Barth RJ. Wide variation and excessive dosage of opioid prescriptions for common general surgical procedures. Ann Surg. 2017;265(4):709-714.
10. Ip HYV, Abrishami A, Peng PWH, Wong J, Chung F. Predictors of postoperative pain and analgesic consumption: a qualitative systematic review. Anesthesiology. 2009;111(3):657-677.
11. Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. Anesth Analg. 2008;107(6):2056-2060.
12. Baig SA, Khan IA. Efficacy and safety of intraperitoneal instillation of levobupivacaine and bupivacaine for postoperative pain relief in laparoscopic cholecystectomy: A double-blind randomized controlled trial. Saudi J Anaesth. 2016;10(1):24-30.
13. Knight JB, Schott NJ, Kentor ML, Williams BA. Neurotoxicity of common peripheral nerve block adjuvants. Curr Opin Anaesthesiol. 2015;28(5):598-604.
14. Ganesh A, Adileh M, Eshtehardi-Hesari F, Tamaddon F, Salehi M, Nejati A. Comparison of the effect of preoperative administration of oral pregabalin and perioperative intravenous tramadol on postoperative pain in patients undergoing elective cesarean section. Medicine. 2018;97(45):e13199.