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Research Article

Comparison of Intravenous Paracetamol and Tramadol for Postoperative Analgesia in Patients Undergoing Open Appendectomy: A Prospective Comparative Study

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ABSTRACT

Background & Objectives: Effective postoperative pain management after open appendectomy is crucial to minimize complications and support recovery. Intravenous (IV) paracetamol offers safe, well-tolerated pain control, and tramadol offers effective analgesia but accompanied with opioids related side effects. So, effectiveness and safety of IV paracetamol and tramadol for postoperative analgesia after open appendectomy were compared in this study.

Materials and Methods: A comparative cohort study was conducted at Lumbini medical college & teaching hospital, Nepal, involving 110 patients (aged 18–60 years, ASA I or II) who were scheduled for open appendectomy. Appendectomy was done under spinal anaesthesia for all cases. Upon completion of the surgery, patients were immediately shifted to the post-anaesthesia care unit (PACU). Patients were divided into two cohorts: Group P (n=55) received intravenous paracetamol and Group T (n=55) received intravenous tramadol every 6 hours for 24 hours. Pain intensity was assessed using the Visual Analogue Scale (VAS) at baseline 0, 30 minutes, 2, 6, 12, 18, and 24 hours after giving first dose of analgesia. Ketorolac was given as rescue analgesia if VAS ≥ 4. Adverse effects (nausea, vomiting, dizziness) and additional analgesic requirements were recorded. Data was analyzed using Student's t-test and chi-square test, with $p < 0.05$ considered significant.

Results: Demographic and clinical characteristics were comparable between groups ($p > 0.05$). At 30 minutes post-PACU, Group P had significantly higher VAS scores (1.29 ± 1.44) compared to Group T (0.73 ± 1.06; $p = 0.021$). No significant differences in VAS scores were observed at other time points over 24 hours ($p > 0.05$). The 24-hour cumulative rescue ketorolac dose was similar between groups ($p = 0.411$). Nausea ($p = 0.017$) and vomiting ($p = 0.031$) were significantly higher in Group T, while dizziness incidence was comparable ($p = 0.112$).

Conclusion: Both paracetamol and tramadol provided adequate post operative analgesia after open appendectomy with low incidence of side effects with paracetamol analgesia.

Keywords: Analgesia, Appendectomy, Paracetamol, Post-operative, Tramadol

INTRODUCTION

Postoperative pain management is a critical component of surgical care. Inability to manage pain adequately may lead to cardiovascular, respiratory, psychological complications and increase risk of chronic pain. Adequate analgesia after surgery prevents atelectasis, deep vein thrombosis, promotes wound healing, early mobilization and early recovery leading to early discharge, eventually reducing the economic burden on health sector [1,2].

Open appendectomy is a commonly performed procedure for the removal of an inflamed appendix. It involves considerable postoperative pain, necessitating effective analgesia for perioperative pain management [3]. Appendectomy in adult population is conducted under either spinal anaesthesia or general anaesthesia. Commonly preferred under spinal anaesthesia due to its good analgesic effect on intraoperative and post operative period [4,5]. But, during post operative period analgesia is required for long duration and may need other additional analgesic agents. Commonly used drugs for analgesia after appendectomy are paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and opioids analgesia [6].

An efficient centrally acting analgesic, IV paracetamol lowers temperature by inhibition of cyclooxygenase-3 (COX-3) and pain by serotonergic pathways in the central nervous system, which lowers prostaglandin synthesis with little adverse effects [7]. The synthetic opioid IV tramadol, on the other hand, relieves pain by inhibiting serotonin and norepinephrine reuptake and weakly stimulating μ-opioid receptors. Tramadol is more frequently linked to adverse effects like nausea, despite its effectiveness for moderate to severe pain [8,9].

The purpose of this study was to compare the efficacy of intravenous (IV) tramadol and paracetamol for postoperative pain management in patients undergoing appendectomy. Using the Visual Analogue Scale (VAS), the assessment was concentrated on the extent of pain, the need for additional analgesics, and the frequency of adverse effects such as drowsiness, nausea, and vomiting. The result of this study may direct postoperative pain treatment, particularly in environments with limited resources.

MATERIALS AND METHODS

This was a prospective, comparative study conducted at the post-anesthesia Care Unit of Lumbini Medical College & Teaching Hospital, a tertiary care facility in Tansen, Palpa, Nepal from January 2025 to March 2025. A sample size of 110 patients (55 per group) was calculated to detect a 1.5-point difference in VAS scores with 90% power, a 5% significance level, an SD of 2.0, and a 5%

dropout rate using the formula: $n = (Z\alpha/2 + Z\beta)^2 * 2 * \sigma^2 / d^2$.

Patients aged between 18 to 60 years, classified as ASA physical status I or II, were enrolled in this study. Those who had history of allergy to paracetamol or tramadol, pregnant patients, lactating women, who were under antipsychotic medication and patients with failed spinal anaesthesia or those patients with complain of pain intraoperatively and needed other intervention were excluded from the study. Informed written consent was obtained during preanaesthesia consultation by a trainee anaesthesiologist from all participants after explaining the nature and purpose of the study.

All patients were kept nil per OS (NPO) overnight, received alprazolam 0.25 mg and pantoprazole 40 mg orally the night before surgery, and were given ondansetron 4 mg IV 15 minutes before the operation. Standard monitoring (ECG, NIBP, SpO_2) were applied intraoperatively, and baseline vitals were recorded. All surgeries were carried out under spinal anaesthesia. Spinal anaesthesia was performed in sitting position at level of L3-L4 interspace with 25G Quincke spinal needle and 15mg of bupivacaine 0.5% was given intrathecally. After surgery patients were shifted to PACU and kept for 24 hours for observation.

Among 110 patients, 55 of them received intravenous paracetamol 1gram- (Group P), and next 55 patient received 50mg tramadol (Group T) after receiving in PACU and repeated every 6 hours. If additional analgesia was required in between (if VAS score ≥ 4) then ketorolac 30 mg was given as rescue analgesia. Pain intensity was measured using the VAS at baseline (T0)-after receiving in PACU but before giving first dose of analgesia, and then at 30 minutes, 2, 6, 12,18 and 24 hours after surgery. A structured proforma was used by trainee anaesthesiologist to document patient demographics, pain scores, total rescue analgesia, and any adverse effects such as nausea, vomiting, and drowsiness.

Data were analysed using IBM SPSS Statistics (version 25). Quantitative variables like: age, time of surgery VAS score, additional analgesia requirement was expressed as mean ± SD. Gender, ASA and complications were expressed in percentage and frequency. Student's paired t-test was applied to compare means and chi-square test was used to compare frequencies between two groups. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Research Committee of Lumbini Medical College & Teaching Hospital (Ref: IRC-LMC-23/N-24).

RESULTS

Demographic and clinical characteristics were similar between the two groups, with no statistically significant differences of Group P (n=55) and Group T (n=55). The age distributions, gender compositions, and ASA classifications of the two groups were comparable with p value less than 0.05. Furthermore, there were not any significant differences in the length of the procedure between the two groups.

Table 1: Demographics and characteristics of patients

		Group P (n=55)	Group T (n=55)	p value	t value
Age (years)		31.27 ± 9.02	33.92 ± 10.07	0.148	-1.456
Gender	Male	31(28.2%)	33 (30%)	0.699	
	Female	24 (21.8%)	22 (20%)		
ASA	I	43 (39.1%)	37 (33.6%)	0.199	
	II	12 (10.9%)	18 (16.4%)		
Surgery time (minutes)		56.18 ± 9.96	60.10 ± 13.97	0.093	-1.697

Table 1: Table showing VAS score at different time period over 24 hours

Time after reaching to PACU	Group P (n=55) (mean ± SD)	Group T (n=55) (mean ± SD)	p value	t value
0 hour	0.47 ± 0.72	0.38 ± 0.76	0.519	0.647
30 minutes	1.29 ± 1.44	0.73 ± 1.06	0.021*	2.340
2 hours	2.42 ± 1.70	2.65 ± 1.70	0.469	-0.727
6 hours	4.32 ± 1.40	4.25 ± 1.40	0.786	0.272
12 hours	3.58 ± 0.83	3.83 ± 1.08	0.170	-1.381
18 hours	2.30 ± 0.97	2.49 ± 1.03	0.346	-0.947
24 hours	1.00 ± 0.69	1.05 ± 0.97	0.735	-0.339
Rescue analgesia over 24 hours (mg)	42.86 ± 16.04	36.67 ± 13.22	0.411	0.847

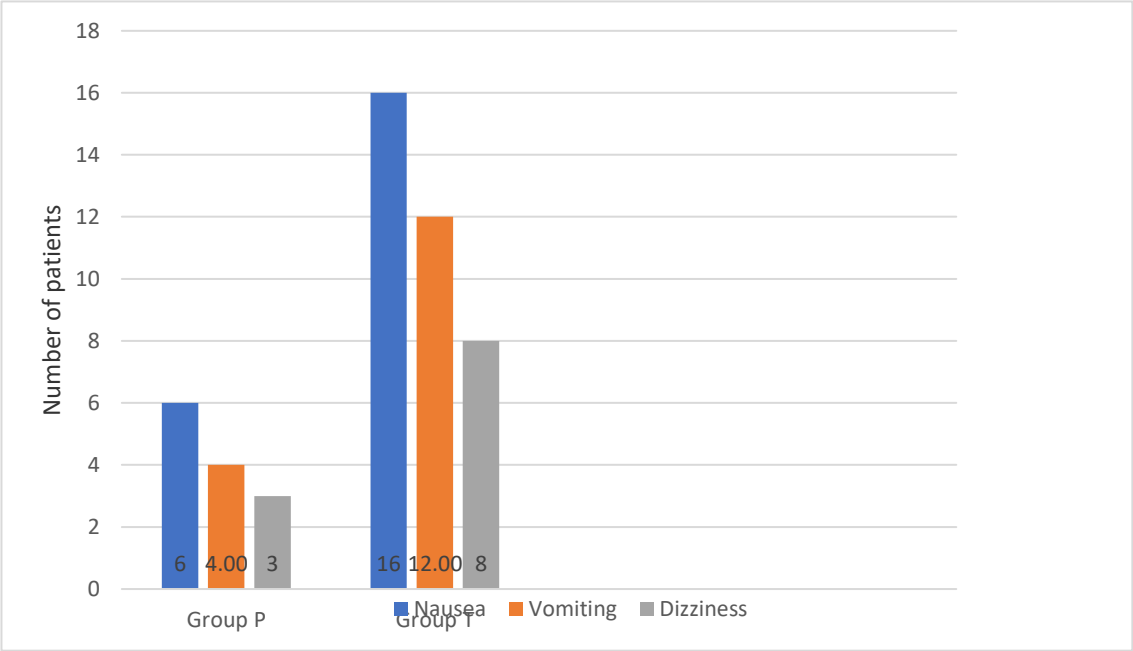

Figure 1: Bar diagram showing number of patients who developed complications.

Table showing demographics and characteristics of patients along with duration of surgery, age and surgery time is expressed as mean ± standard deviation and student's t test was applied. Gender and ASA status were expressed in frequency and percentage; chi-square test was used.

A significant difference in pain scores was detected at 30 minutes post-PACU, with Group P exhibiting higher scores (1.29 ± 1.44) compared to Group T (0.73 ± 1.06; p = 0.021, t = 2.340). No significant differences were observed at other time points over 24 hours duration. Need of rescue analgesia over 24 hours was also comparable among both groups with p value, 0.411. Table showing VAS score at different time period over 24 hours in PACU after surgery and cumulative rescue dose of tramadol required over 24 hours. Values are expressed in mean and standard deviation along with p value. Statistical significance is marked with *. p value ≤ 0.05 was considered significant. Table 2.

Adverse effects such as nausea, vomiting, and dizziness were evaluated and compared among two groups. Nausea and vomiting were noted to be significantly higher in the group who received tramadol as analgesic agent with p value 0.017 and 0.031 respectively. Whereas incidence of dizziness was similar in both group, p value 0.112 (Fig. 1).

DISCUSSION

According to the study's findings, there were no significant variations (p > 0.05) between Group P and Group T in terms of demographic and clinical parameters, such as age, gender, ASA classifications, and procedure duration. This indicates that the output results are attributable to the intervention, strengthening the validity. Paracetamol and tramadol are commonly used drugs for management of post operative pain after appendectomy [6,10]. Combination of both paracetamol and tramadol had better pain control compared to only tramadol as shown in some studies [10]. In our study, we compared intravenous paracetamol and tramadol for pain management after open appendectomy as opioid based analgesia provides good analgesia but holds more side effects.

A significant difference in pain scores at 30 minutes after receiving in PACU was one of the main findings. Group P had greater pain scores (1.29 ± 1.44) than Group T (0.73 ± 1.06), (p = 0.021, t = 2.340). Incidence of nausea and vomiting was also significantly higher in the group who received tramadol than those who received paracetamol, (16, 29% vs 6,10.90%) and (12, 21.81% vs 4, 7.27%). Cumulative dose of rescue analgesia administered over 24 hours was also similar in both of the groups, paracetamol (25.45 ± 39.52) and tramadol (30.00 ± 46.74), p value 0.583. This suggests that tramadol may provide better postoperative analgesia in the early postoperative phase but holds more complications. Paracetamol is a cyclooxygenase (COX-3) inhibitor, good for analgesia and holds less complications than opioids analgesia. It doesn't hinder platelet's function and can be safely administered in peptic ulcer disease [11]. Tramadol, an opioid analgesic, is commonly associated with side effects such as nausea, vomiting, dizziness, and constipation [12].

Similar study found comparable pain score between tramadol and paracetamol till 120 minutes when used for management of pain

during labour. There was a higher incidence of nausea (3.3%) and vomiting (3.3%) among patients who received tramadol. Patients who received paracetamol had no incidence of nausea and vomiting [13]. Another study found Paracetamol and tramadol had comparable analgesic efficacy (VAS: 1.86 ± 2.40 vs. 3.03 ± 2.42) and side effect profiles. However, group with paracetamol required fewer rescue analgesics (1.6 vs. 3.7; Z = 4.00, $p < 0.0001$), suggesting better sustained pain control [14].

Our findings indicate that both paracetamol and tramadol are similarly effective in management of pain after open appendectomy. However, tramadol analgesia is better to avoid due to its high incidence of complications like nausea and vomiting. This study is a single centre-based study and had a smaller number of patients so; Further multicentre randomized studies with larger sample sizes are needed to validate these findings and formulate the protocol for post operative analgesia after open appendectomy.

CONCLUSION

Intravenous paracetamol and tramadol are both effective options for managing postoperative pain after open appendectomy. Considering the potential undesirable side effects associated with tramadol, paracetamol could be a safer and more favorable choice for routine postoperative analgesia.

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