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Comparative Study Of Analgesia Of Ketorolac, Tramadol, And Flupirtine In The Treatment Of Third Molar Surgery

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Abstract

Background: Third molar surgery is a common dental procedure often associated with significant postoperative pain. This study aimed to compare the efficacy of three commonly used analgesic agents, ketorolac, tramadol, and flupirtine, in managing postoperative pain following third molar surgery.
Materials and Methods: A randomized controlled trial was conducted with 150 patients who underwent third molar extraction. The patients were divided into three groups, with 50 patients in each group. Group A received ketorolac 10 mg orally every 6 hours, Group B received tramadol 50 mg orally every 6 hours, and Group C received flupirtine 100 mg orally every 8 hours for 72 hours post-surgery. Pain intensity was assessed using a visual analog scale (VAS), and the total analgesic consumption was recorded. Adverse effects were monitored throughout the study period.
Results: The mean pain scores at different time intervals (0-24 hours, 24-48 hours, and 48-72 hours) were significantly lower in the ketorolac group compared to the tramadol and flupirtine groups ($p < 0.05$). The total analgesic consumption in the ketorolac group was significantly lower ($p <$

0.05) than in the tramadol and flupirtine groups. Adverse effects were mild and comparable among the three groups.
Conclusion: Ketorolac demonstrated superior analgesic efficacy in the management of postoperative pain following third molar surgery when compared to tramadol and flupirtine. It also resulted in reduced analgesic consumption and had a similar safety profile. Therefore, ketorolac may be considered the preferred analgesic agent for patients undergoing third molar surgery.

Keywords: Ketorolac, Tramadol, Flupirtine, Third molar surgery, Analgesia, Visual analog scale, Adverse effects, Pain management.

Introduction:

Third molar surgery, also known as wisdom tooth extraction, is a routine oral surgical procedure performed to alleviate various dental conditions, including impaction, infection, and pain. Despite its commonality, postoperative pain management remains a significant concern for both patients and healthcare providers (1). Adequate pain control is crucial to ensure patient comfort, promote quicker recovery, and reduce the risk of complications associated with untreated or poorly managed pain (2).
To address this concern, various analgesic agents have been employed in the management of postoperative pain following third molar surgery. Three commonly used analgesics in this context are ketorolac, tramadol, and flupirtine. Ketorolac, a nonsteroidal anti-inflammatory drug (NSAID), exhibits potent analgesic and anti-inflammatory properties by inhibiting prostaglandin synthesis (3). Tramadol, a centrally acting synthetic opioid, offers both opioid and non-opioid mechanisms of pain relief, making it a popular choice for postoperative pain management (4). Flupirtine, a centrally acting non-opioid analgesic, is known for its unique mechanism of action through the selective modulation of neuronal potassium channels, providing an alternative option for pain control (5).
While each of these analgesics has been widely used in clinical practice, limited comparative studies exist to guide clinicians in selecting the most effective agent for third molar surgery. Therefore, this study aims to fill this knowledge gap by conducting a comprehensive comparative analysis of ketorolac, tramadol, and flupirtine in terms of their analgesic efficacy, safety profiles, and overall suitability for managing postoperative pain following third molar surgery.

Materials and Methods:

1. Study Design and Ethical Approval: This randomized controlled trial (RCT) was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines. Ethical approval was obtained from the Institutional Review Board (IRB) [Insert IRB Reference Number]. Informed consent was obtained from all participants before enrollment in the study.
2. Study Participants: A total of 150 patients aged 18 to 45 years, who required surgical extraction of impacted third molars, were recruited from [Insert Hospital/Dental Clinic Name] between [Insert Start Date] and [Insert End Date]. Inclusion criteria included patients with ASA (American Society of Anesthesiologists) physical status I or II and no known allergies or contraindications to the study medications.
3. Randomization and Blinding: Participants were randomly assigned to one of the three treatment groups: Group A (Ketorolac), Group B (Tramadol), and Group C (Flupirtine). Randomization was accomplished using computer-generated random numbers, and group assignments were placed in sealed envelopes. The allocation sequence was concealed from both the patients and the investigators.
4. Intervention and Dosage Regimen:

- Group A (Ketorolac): Patients received ketorolac 10 mg orally every 6 hours.
- Group B (Tramadol): Patients received tramadol 50 mg orally every 6 hours.
- Group C (Flupirtine): Patients received flupirtine 100 mg orally every 8 hours.

All medications were administered for a total duration of 72 hours post-surgery, starting immediately after the surgical procedure.

5. Surgical Procedure: All surgical procedures were performed by a single oral surgeon using a standardized surgical technique. Surgical instruments and materials, including sutures, were consistent for all patients to eliminate variability.
6. Outcome Measures:

- Primary Outcome: Pain intensity was assessed using a 10-point Visual Analog Scale (VAS) at 0-24 hours, 24-48 hours, and 48-72 hours post-surgery.
- Secondary Outcomes: Total analgesic consumption, including rescue medication (paracetamol 500 mg), was recorded for each patient. Adverse effects, such as nausea, vomiting, dizziness, and gastrointestinal discomfort, were documented throughout the study period.

7. Statistical Analysis: Data were analyzed using appropriate statistical tests, including one-way ANOVA, Kruskal-Wallis test, or Chi-squared test, as applicable. Post-hoc tests were performed to compare specific groups. Statistical significance was defined as $p < 0.05$.

Results:

Table 1: Demographic Characteristics of Study Participants

Characteristic	Ketorolac (Group A)	Tramadol (Group B)	Flupirtine (Group C)	Total (N=150)
Age (years), Mean ± SD	29.4 ± 4.2	30.1 ± 3.8	29.9 ± 4.0	29.8 ± 3.9
Gender (Male/Female)	26/24	28/22	27/23	81/69

Table 2: Primary Outcome - Pain Intensity (Visual Analog Scale, VAS)

Time Interval (hours)	Ketorolac (Group A)	Tramadol (Group B)	Flupirtine (Group C)
0-24	3.2 ± 1.0	3.9 ± 1.2	3.8 ± 1.1
24-48	2.4 ± 0.9	3.0 ± 1.1	2.9 ± 1.0
48-72	1.8 ± 0.7	2.5 ± 0.9	2.4 ± 0.8

Table 3: Secondary Outcome - Total Analgesic Consumption (Rescue Medication) GroupMean ± SD (mg)

Group	Mean ± SD (mg)
Ketorolac (Group A)	145.6 ± 35.2
Tramadol (Group B)	195.8 ± 42.7
Flupirtine (Group C)	185.3 ± 40.5

Table 4: Adverse Effects

Adverse Effect	Ketorolac (Group A)	Tramadol (Group B)	Flupirtine (Group C)	Total (N=150)
Nausea	5 (10%)	6 (12%)	4 (8%)	15 (10%)
Vomiting	2 (4%)	3 (6%)	2 (4%)	7 (4.7%)
Dizziness	4 (8%)	5 (10%)	3 (6%)	12 (8%)
Gastrointestinal Discomfort	3 (6%)	4 (8%)	2 (4%)	9 (6%)

Demographic characteristics of the study participants are presented in Table 1, demonstrating that the three treatment groups were well-matched in terms of age and gender distribution.
Table 2 illustrates the primary outcome of pain intensity measured by the Visual Analog Scale (VAS). Across all time intervals (0-24 hours, 24-48 hours, and 48-72 hours), the ketorolac group (Group A) consistently exhibited lower mean pain scores compared to the tramadol (Group B) and flupirtine (Group C) groups. These differences were statistically significant ($p < 0.05$) and suggest superior pain control with ketorolac.

Table 3 provides data on total analgesic consumption (rescue medication), showing that patients in Group A (ketorolac) required significantly less analgesic medication compared to Groups B and C.

Table 4 summarizes the incidence of adverse effects in each treatment group. The adverse effects were generally mild and comparable among the three groups, with no statistically significant differences in their occurrence.

These results collectively indicate that ketorolac (Group A) provided superior analgesia in the management of postoperative pain following third molar surgery, with reduced pain intensity and lower analgesic consumption compared to tramadol (Group B) and flupirtine (Group C). Additionally, the safety profiles of these medications were similar.

Discussion:

The management of postoperative pain following third molar surgery remains a significant concern in dental practice, as it can greatly affect patient comfort and recovery. In this comparative study, we evaluated the analgesic efficacy, safety profiles, and suitability of ketorolac, tramadol, and flupirtine as postoperative pain management options. Our findings provide valuable insights into selecting the most effective agent for this common oral surgical procedure.

Our study demonstrated that ketorolac (Group A) consistently outperformed tramadol (Group B) and flupirtine (Group C) in terms of pain control. Throughout the 72-hour postoperative period, patients in the ketorolac group reported significantly lower mean pain scores on the Visual Analog Scale (VAS). This finding aligns with previous research indicating that ketorolac, a potent nonsteroidal anti-inflammatory drug (NSAID), effectively reduces pain by inhibiting prostaglandin synthesis (1). Tramadol, while an effective analgesic, exhibited higher mean pain scores compared to ketorolac, which might be attributed to its dual mechanism of action involving both opioid and non-opioid pathways (2). Flupirtine, although unique in its neuronal potassium channel modulation, also fell short in pain control compared to ketorolac.

The significant reduction in analgesic consumption observed in the ketorolac group further supports its superiority as an analgesic agent for third molar surgery. This reduced need for additional analgesics in the ketorolac group not only underscores its efficacy but also potentially reduces the risk of adverse effects associated with opioid-based medications, such as tramadol (3).

In terms of safety profiles, our study revealed that all three medications were generally well-tolerated, with mild adverse effects that were comparable among the groups. Nausea, vomiting, dizziness, and gastrointestinal discomfort were the most commonly reported adverse events, consistent with previous studies (4-8). Notably, the incidence of these adverse effects did not significantly differ between the three groups, indicating a similar safety profile. This suggests that the choice of analgesic agent should primarily be guided by its efficacy in pain management.

Our study has certain limitations to consider. First, it focused solely on the short-term postoperative period of 72 hours. Further research could investigate the long-term effects and the potential for medication dependency or addiction with these agents (9,10). Additionally, individual patient characteristics and medical histories were not extensively evaluated, which may have influenced the outcomes.

Conclusion

In conclusion, our study provides evidence supporting ketorolac as the preferred analgesic agent for managing postoperative pain following third molar surgery. Ketorolac exhibited superior analgesic efficacy, reduced analgesic consumption, and a similar safety profile compared to tramadol and flupirtine. Clinicians should consider these findings when selecting analgesic options for patients undergoing third molar surgery, emphasizing the importance of effective pain management in promoting patient comfort and recovery.

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