COMPARATIVE STUDY ON LOW PRIMITIVE ORAL CELECOXIB AND NABUMETONE FOR PAIN MANAGEMENT AFTER THIRD MOLAR EXTRACTIONS

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Abstract

Background: Surgical extraction of impacted mandibular third molars is frequently associated with postoperative pain, swelling, and trismus. Effective pre-emptive analgesia can minimize these complications by suppressing central sensitization before tissue injury occurs. Selective COX-2 inhibitors like celecoxib and nonselective NSAIDs such as Nabumetone are commonly used, yet their comparative efficacy in third molar surgery remains underexplored. **Aim:** To evaluate and compare the analgesic effectiveness of pre-emptive oral administration of celecoxib (200 mg) and Nabumetone (500 mg) in patients undergoing mandibular third molar Disimpaction. **Materials and Methodology:** This prospective study included 40 healthy individuals (ASA I or II), aged 20–50 years, with Mesioangular Class I Position A impactions. Participants were randomly allocated into two groups: Group A received celecoxib 200 mg, and Group B received Nabumetone 500 mg, administered one hour prior to surgery. All extractions were performed under standardized local anesthesia and surgical technique by the same operator. Postoperative pain intensity was assessed using an 11-point Visual Analog Scale (VAS) at 2, 4, 6, 8, 12, and 24 hours. Ibuprofen 300 mg was prescribed as rescue analgesia, and consumption within 24 hours was recorded. **Results:** Celecoxib demonstrated significantly lower mean VAS scores compared to Nabumetone at 2, 4, 6, 8, and 12 hours postoperatively ($p < 0.05$), with the highest difference observed at 6 hours ($p = 0.004$). At 24 hours, no significant difference was observed. Patients in the celecoxib group required fewer rescue analgesic doses and reported greater comfort during the first 12 hours post-surgery. **Conclusion:** Pre-emptive administration of celecoxib 200 mg provided superior and more sustained pain relief compared to Nabumetone 500 mg following third molar extraction. Celecoxib's favourable efficacy and safety profile support its use as a reliable option for managing acute postoperative pain in minor oral surgical procedures.

Keywords: Pre-emptive analgesia, celecoxib, Nabumetone, third molar surgery, postoperative pain, COX-2 inhibitor

Introduction

Extraction of impacted mandibular third molars under local anesthesia is frequently accompanied by postoperative complications such as pain, swelling, and trismus. Inadequate control of acute pain after oral surgery not only prolongs recovery but also adversely affects the patient's quality of life.[1] Surgical trauma triggers the release of mediators including prostaglandins, leukotrienes, and platelet-activating factor, which promote vasodilatation, increase vascular permeability, and lead to edema, thereby intensifying the local inflammatory response.[2] To counter these mechanisms, the use of pre-emptive (prophylactic) analgesia has been recommended in third molar surgery.[3] The principle of pre-emptive analgesia is to suppress the cascade of central sensitization that amplifies nociceptive signalling after tissue damage, thereby preventing hyperalgesia and minimizing postoperative pain.[4] Key aspects of this strategy include: (1) differentiating between analgesics that target normal nociception and those effective against abnormal hypersensitivity, (2) identifying pharmacological interventions that interrupt central sensitization, and (3) instituting treatment before surgery to reduce the likelihood of severe postoperative pain.[5] Celecoxib, a selective COX-2 inhibitor, is particularly attractive for pre-emptive use since it provides analgesic and anti-inflammatory benefits while sparing platelet function and reducing gastrointestinal irritation compared to conventional NSAIDs.[6] Clinical studies in third molar surgery have shown that a 200 mg pre-operative dose is effective in pain prevention,[7],[8] while higher doses (≥400 mg) have been linked to an increased risk of adverse cardiovascular effects. Nonetheless, data suggest that doses ≤200 mg remain safe without significantly elevating cardiovascular risk.[9] Nabumetone, another NSAID frequently prescribed for dental pain, acts through COX inhibition to reduce prostaglandin-mediated inflammation.[10] It is typically administered in daily doses of 500–1000 mg, either once or twice daily, and has proven effective in controlling postoperative pain following third molar surgery.[11],[12] Owing to its long half-life and convenient dosing schedule, Nabumetone is a practical option for managing moderate to severe post-surgical pain.[12]

Materials and Methodology

This prospective investigation was carried out in the Department of Oral and Maxillofacial Surgery at SIBAR Institute of Dental Sciences following ethical approval from the Institutional Ethics Committee (Pr. 563/IEC/SIBAR/2025). Written informed consent was obtained from all participants after explaining the study objectives and procedures over a three-month duration, from April to June 2025. Participants were carefully selected based on defined inclusion and exclusion parameters to maintain uniformity and reliability of results. Individuals classified as ASA I or II, presenting with Mesioangular Class I, Position A impacted mandibular third molars, and aged between 20 and 50 years, were included in the study. Patients were excluded if they had any known hypersensitivity to steroidal medications, had taken analgesic or anti-inflammatory drugs within the week preceding surgery, or were pregnant at the time of enrolment. Patients were randomly assigned into two groups using random number tables. Group A received 200 mg oral Celecoxib, and Group B received 500 mg oral Nabumetone, both administered one hour preoperatively. All Disimpactions were

performed by the same surgeon using standardized local anesthesia: 2% lidocaine for nerve blocks (inferior alveolar, lingual, long buccal) and 4% articaine with 1:100,000 epinephrine for infiltration. A standardized surgical technique was employed, including a buccal mucoperiosteal flap, tooth is surgical extracted, socket debridement with sterile saline, and wound closure with 4-0 silk sutures. Sutures were removed one week postoperatively. Pain was assessed using an 11-point Visual Analog Scale (VAS) at 2, 4, 6-, 8-, 12-, and 24-hours post-surgery. Ibuprofen 300 mg was prescribed as rescue analgesia, and patients recorded the number of tablets consumed and time of first dose within 24 hours.

Results

The data in Table 1 and Table 2 demonstrates the postoperative pain assessment revealed a consistent reduction in pain intensity in patients who received celecoxib compared to those who were administered Nabumetone. At two hours following surgery, the mean VAS score for the celecoxib group was 3.2 ± 0.8, which was significantly lower than the Nabumetone group mean of 4.1 ± 0.9 ($p = 0.032$). This trend continued at four hours, where celecoxib showed a mean score of 2.8 ± 0.7 compared to 3.9 ± 0.8 in the Nabumetone group ($p = 0.014$). The most notable difference was observed at six hours, with celecoxib demonstrating a highly significant reduction in pain (2.5 ± 0.6) compared to Nabumetone (3.7 ± 0.7; $p = 0.004$). At eight and twelve hours postoperatively, celecoxib maintained superior analgesic efficacy with mean VAS scores of 2.2 ± 0.5 and 1.8 ± 0.4, respectively, both showing statistically significant differences when compared with Nabumetone ($p = 0.021$ and $p = 0.038$). By twenty-four hours, although pain levels had declined in both groups, the difference between celecoxib (1.0 ± 0.3) and Nabumetone (1.5 ± 0.4) was not statistically significant ($p = 0.095$). With respect to rescue medication use, patients in the celecoxib group required fewer additional doses of ibuprofen (mean = 0.6 ± 0.2) compared to those in the Nabumetone group (mean = 1.2 ± 0.4). Moreover, the mean time to the first rescue dose was longer for patients who received celecoxib (8.5 ± 1.4 hours) than for those given Nabumetone (5.2 ± 1.1 hours), indicating that celecoxib provided a more prolonged duration of pain control. Overall, celecoxib offered more effective and sustained postoperative analgesia within the first twelve hours following mandibular third molar surgery.

Time Interval (hours)	Celecoxib (Mean ± SD)	Nabumetone (Mean ± SD)	p-value	Statistical Significance
2	3.2 ± 0.8	4.1± 0.9	0.032	Significant ($p < 0.05$)
4	2.8 ± 0.7	3.9 ± 0.8	0.014	Significant ($p < 0.05$)
6	2.5 ± 0.6	3.7 ± 0.7	0.004	Highly significant ($p < 0.01$)
8	2.2 ± 0.5	3.3 ± 0.6	0.021	Significant ($p < 0.05$)
12	1.8 ± 0.4	2.9 ± 0.5	0.038	Significant ($p < 0.05$)
24	1.0 ± 0.3	1.5 ± 0.4	0.095	Not significant

Table 1: Comparison of Mean Postoperative Pain Scores (VAS) Between Celecoxib and Nabumetone Groups

Parameter	Celecoxib Group	Nabumetone Group	Interpretation
Mean number of rescue doses	0.6 ± 0.2	1.2 ± 0.4	Fewer doses required in Celecoxib group
Mean time to first rescue dose (hours)	8.5 ± 1.4	5.2 ± 1.1	Longer analgesic duration for Celecoxib

Table 2: Summary of Rescue Analgesic Use Within 24 Hours

Discussion

The present study supports the evidence that administering analgesics before surgical trauma—known as pre-emptive analgesia—can help reduce postoperative pain intensity and the need for additional medication after oral surgical procedures such as third molar extractions. The rationale is that blocking peripheral and central sensitization prior to tissue injury prevents escalation of pain pathways. COX-2 inhibitors and other agents have been widely investigated within this concept.[12] Among these, celecoxib has consistently shown favourable results. Clinical trials in third molar surgery have demonstrated that pre-operative celecoxib reduces pain scores and prolongs the time before rescue analgesics are needed, compared with acetaminophen or placebo.[1,4] Xie et al. specifically reported that even a relatively low dose of celecoxib was more effective than acetaminophen for early postoperative pain control.[4] Similarly, Al-Sukhun et al. observed that low-dose celecoxib offered stronger pre-emptive analgesia than traditional NSAIDs, which is likely related to selective inhibition of prostaglandin synthesis without excessive gastrointestinal irritation.[9] Reviews on dental pain also suggest COX-2 inhibitors are useful when bleeding risks or GI concerns make nonselective NSAIDs less suitable.[10,12] Acetaminophen is commonly prescribed due to its safety and tolerability, yet its pre-emptive efficacy in isolation is less convincing. Studies suggest it is inferior to celecoxib in controlling immediate postoperative pain.[1,4] While acetaminophen can complement NSAIDs after surgery, its role as a stand-alone pre-emptive agent remains limited in impaction surgery models.[1,4,10]

Alternative agents have also been tested. Dextromethorphan, which acts on NMDA receptors, was found to provide pain relief comparable to ibuprofen in one trial after third molar extraction, pointing to central sensitization as another therapeutic target.[3] However, variability in study designs and dosages makes it difficult to draw firm conclusions. Systematic reviews reinforce the potential of pre-emptive strategies. A meta-analysis on dental implant surgery demonstrated reduced postoperative pain at different time points with pre-emptive regimens.[2] A review focused on third molar extraction also concluded that pre-emptive use of analgesics decreases postoperative discomfort and analgesic intake, although methodological limitations across studies reduce the certainty of evidence.[7] Additional clinical and observational studies have supported these findings, showing benefits of NSAID administration before extraction.[6,8]

Safety profiles remain critical when choosing pre-emptive drugs. COX-2 inhibitors, unlike traditional NSAIDs, do not impair platelet function, making them preferable in surgeries with higher bleeding risks.[10,12] Their short-term use at the lowest effective dose is generally safe, but cardiovascular risks must still be considered.[10],[12] Nonselective NSAIDs are effective alternatives but are associated with gastrointestinal irritation and antiplatelet effects.[10,12] Acetaminophen can be reserved for patients who cannot tolerate NSAIDs, though caution with hepatotoxicity is essential.[10] Nabumetone, for example, has been shown in Cochrane reviews to provide acute pain relief, but comparative data against COX-2 inhibitors in oral surgery are sparse.[11] Timing and dosage significantly influence outcomes. Administering celecoxib (e.g., 200 mg) 30–60 minutes prior to surgery has yielded good results in third molar trials.[4,9] Delaying administration until after tissue injury appears to diminish its effect. Reviews emphasize that pre-incision dosing is key to maximizing preventive analgesia.[12] Still, heterogeneity in drug selection, timing, and outcome measures across studies complicates pooling of results and underscores the need for standardized protocols.[2,7] Overall, the evidence suggests that well-timed pre-emptive therapy can improve early postoperative outcomes in third molar surgery. In patients without contraindications, COX-2 inhibitors such as celecoxib may be considered the preferred choice. Acetaminophen alone has limited benefit but can serve as an adjunct or alternative where NSAIDs are contraindicated. Other drug classes, such as NMDA antagonists, warrant more exploration.[1,3,4,9,10,12] Future trials should directly compare standardized regimens, assess patient satisfaction and recovery, and closely monitor cardiovascular and bleeding complications.[2,7]

Conclusion:

Preemptive administration of celecoxib (200 mg) provided more consistent and superior pain control compared to Nabumetone (500 mg) in patients undergoing mandibular third molar surgery. Celecoxib demonstrated significantly lower pain scores between 2 and 12 hours postoperatively, reduced the need for rescue analgesia, and showed a more favourable safety profile. These findings support the use of low-dose celecoxib as an effective and reliable option for managing acute postoperative pain in minor oral surgical procedures.

Conflict of interest: There are no conflicts of interest

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