

Prophylactic and Postoperative Antimicrobial Effectiveness in Mandibular Impacted Third Molar Surgical Extraction

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Abstract

Postoperative problems like discomfort, swelling, trismus, and infection are frequently linked to the surgical extraction of mandibular impacted third molars. Because of worries about antibiotic resistance and overuse, the function and timing of antibiotic therapy in lowering these consequences are still debatable. In order to reduce postoperative morbidity, this study compared the efficacy of prophylactic and postoperative regimens in conjunction with anti-inflammatory medication. Twenty patients undergoing mandibular third molar extraction participated in a prospective trial. Two groups of patients (n = 10 each) were created: Prophylactic and postoperative antibiotics together with anti-inflammatory medication were given to Group A, while postoperative antibiotics and anti-inflammatory medication were given to Group B. Preoperative and postoperative days 1, 3, and 7 were used to assess pain (VAS), oedema, trismus, and symptoms of infection. One-way ANOVA was used to analyse the data. On the first postoperative day, both groups showed their highest levels of discomfort, oedema, and trismus before gradually improving. Pain, oedema, and trismus indicated highly significant differences between groups ($p < 0.001$), with Group A continuously displaying the lowest values, followed by Group B. Compared to postoperative antibiotics alone, prophylactic and postoperative antibiotic therapy is more successful at lowering surgical complications.

Keywords: Third molar, prophylactic antibiotics, postoperative complications, swelling, trismus.

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Introduction

The extraction of mandibular impacted third molars, commonly known as wisdom teeth, is among the most frequent procedures performed in oral and maxillofacial surgery.¹ Although it is often considered a routine intervention, it is not devoid of postoperative complications. Patients commonly experience discomfort, including pain, facial, swelling, trismus (difficulty opening the mouth), alveolar osteitis (dry socket) and most significantly, infections.^{2,3} These complications can significantly affect postoperative recovery and patient well-being and in some cases, lead to more serious systemic health concerns.

To address these complications many clinicians, prescribe prophylactic antimicrobial agents. Antibiotics are frequently recommended to reduce microbial contamination during and after surgery, with the aim of promoting faster, smoother healing.^{4,5} However, the effectiveness and necessity of routine antibiotic use remain subjects of ongoing debate. The long-term effects of antibiotic prophylaxis on healing and complication rates remain unclear. Considering these uncertainties and the growing importance of antibiotic stewardship, the present study critically examines the necessity, effectiveness and risks of antimicrobial therapy following surgical removal of mandibular impacted third molars. This study evaluates the effectiveness of prophylactic and postoperative regimens in reducing postoperative morbidity. It specifically assesses differences in pain, swelling, trismus and patient-reported outcomes among the two groups. The objective is to determine the most effective and safe approach, thereby supporting evidence-based clinical decision-making and

promoting rational antibiotic use.

Methodology

Twenty patients who were recommended for surgical extraction of mandibular impacted third molars were included in this prospective study. Two equal groups of participants ($n = 10$ each) were formed: Group B received postoperative antibiotics and anti-inflammatory drugs, while Group A received preventative and postoperative antibiotic therapy. Patients with ASA I or II status who were between the ages of 18 and 40 were included. Immunocompromised people, recent antibiotic usage, pregnancy or lactation, uncontrolled systemic disorders, poor dental hygiene, and known medication sensitivities were among the exclusion criteria. Every participant provided written informed permission.

All treatments were carried out under local anaesthesia utilising standard inferior alveolar, lingual, and buccal nerve block techniques with 2% lignocaine and 1:50,000 adrenaline. Operative time was used to record surgical difficulty. Celecoxib 200 mg was given to all groups combined with amoxicillin 500 mg (or clindamycin 300 mg for allergic patients) either preoperatively and postoperatively (Group A) or postoperatively exclusively (Group B). On days 1, 3, and 7, postoperative evaluations were carried out. A visual analogue scale (VAS) was used to measure pain, standardised facial measurements were used to measure oedema, and the greatest inter-incisal distance was used to determine trismus. One-way ANOVA was used to analyse the data for intergroup comparisons, with a significance level of $p < 0.05$.

Results

Pain scores showed statistically significant differences among the two groups at all postoperative time points as shown in Figure 1. A highly significant difference was observed on Day 1 and Day 3 ($p < 0.001$), while a significant difference was noted on Day 7 ($p < 0.01$). Across all time points, a consistent trend was evident: Group A exhibited the lowest pain scores, followed by Group B, ($A < B$). This pattern indicates that prophylactic and postoperative antibiotics, when combined with anti-inflammatory medication, were most effective at minimizing postoperative pain, whereas patients receiving only anti-inflammatory therapy experienced greater discomfort.

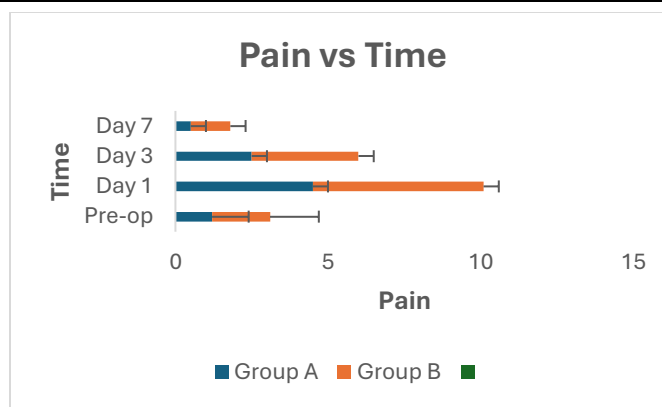


Figure 1: The figure shows pain scoring level at different time point.

Swelling (mm):

Postoperative swelling showed highly significant differences among the two groups at all evaluated time points, including Day 1, Day 3, and Day 7 ($p < 0.001$). A consistent pattern was observed, with Group A demonstrating the least amount of facial swelling throughout the postoperative period, followed by Group B. These findings suggest that the addition of prophylactic and postoperative antibiotics to anti-inflammatory therapy plays a crucial role in minimizing postoperative inflammatory edema compared to the other treatment protocols.

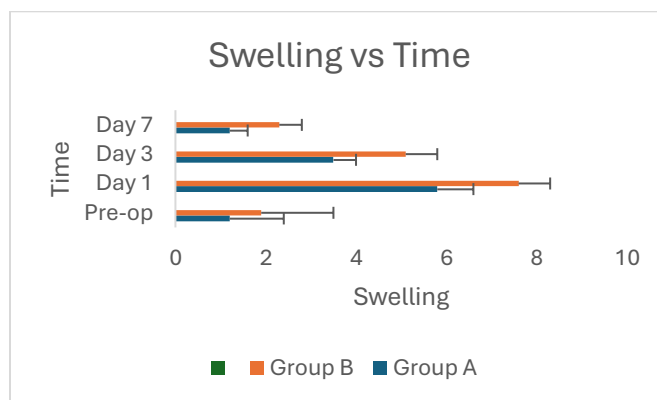


Figure 2: The figure shows pain scoring level at different time point.

Trismus demonstrated a highly significant difference among the two groups at all postoperative time points ($p < 0.001$). Patients in Group A exhibited the least reduction in mouth opening and recovered faster than those in Groups B. A consistent trend was observed: Group A recovered more rapidly, followed by Group B, experienced the greatest trismus and slower improvement over time. These

findings indicate that the combined use of prophylactic and postoperative antibiotics with anti-inflammatory medication contributes to better preservation and quicker restoration of mouth opening following surgery.

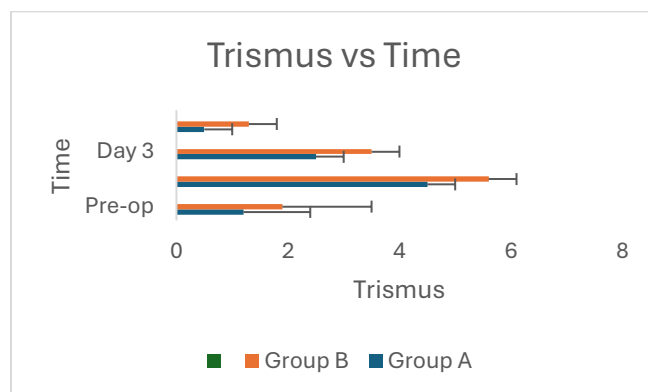


Figure 3: The figure shows pain scoring level at different time point.

Overall pain, swelling and trismus peaked on Day 1 in all groups, then gradually decreased on Day 3 and reached near-complete resolution by Day 7. Group A (prophylactic and postoperative antibiotic regimen) consistently recorded the lowest mean pain scores at all postoperative intervals (Day 1: 4.5 ± 0.5 ; Day 3: 2.5 ± 0.5 ; Day 7: 0.5 ± 0.5), with Group B. Similar trends were observed for swelling and trismus as Group A demonstrated significantly reduced postoperative facial swelling and improved mouth opening compared with the other groups. One-way ANOVA revealed highly significant differences in pain, swelling, and trismus between the groups at Days 1, 3 and 7 ($p < 0.001$). Post hoc comparisons indicated significant improvement between Group A and Group B, a highly significant difference between Group A, and a moderate difference in Group B. This prospective study aimed to comparatively evaluate the effectiveness of prophylactic and postoperative, in combination with anti-inflammatory therapy, in minimizing postoperative morbidity following surgical extraction of mandibular impacted third molars. The findings demonstrated a clear and consistent trend across all postoperative parameters, with the prophylactic plus postoperative antibiotic regimen (Group A) showing superior outcomes, followed by the postoperative-only regimen (Group B).

Discussion

A notable observation in this study was that a proportion of patients presented with preoperative pain, swelling and trismus, indicating the presence of pre-existing inflammatory conditions such as pericoronitis. This is consistent with

clinical reality, as impacted mandibular third molars are frequently associated with varying degrees of local inflammation prior to surgical intervention. The inclusion of such patients enhances the external validity of the study, as it reflects routine clinical scenarios rather than idealized asymptomatic cases. Postoperatively, both groups exhibited a similar temporal pattern, with peak pain, swelling and trismus observed on the first postoperative day, followed by a progressive reduction on days 3 and 7. This pattern aligns with the expected physiological inflammatory response to surgical trauma, where an initial acute phase is followed by gradual resolution and tissue repair. However, despite this common trajectory, the magnitude and rate of recovery differed significantly between the two groups, underscoring the influence of the pharmacological regimens used.

Pain assessment revealed statistically significant differences between Group A and Group B at all postoperative intervals, with highly significant differences on days 1 and 3 ($p < 0.001$) and a significant difference on day 7 ($p < 0.01$). The consistent trend of Group A < Group B indicates that the combined use of prophylactic and postoperative antibiotics with anti-inflammatory therapy was more effective in controlling postoperative pain than postoperative antibiotics with anti-inflammatory therapy alone. The lower pain scores observed in Group A may be attributed to a reduction in bacterial load prior to surgical intervention, which likely attenuated the release of inflammatory mediators that activate nociceptors. In contrast, patients in Group B, who received antibiotics only after surgery, experienced higher pain levels, suggesting that postoperative antibiotics alone may not sufficiently prevent the initial inflammatory cascade triggered during surgical manipulation.

A similar pattern was observed in the evaluation of postoperative swelling. Highly significant differences were observed between the two groups at all time points ($p < 0.001$), with Group A demonstrating less facial swelling than Group B. Swelling is a hallmark of the inflammatory response and is influenced by both surgical trauma and bacterial contamination. The reduced swelling observed in Group A suggests that prophylactic antibiotic administration may help limit the extent of tissue inflammation by controlling microbial proliferation at an early stage. This finding supports the concept that antibiotics, when administered prior to surgery, can indirectly modulate the inflammatory response by reducing the stimulus for cytokine release. Trismus, measured as the reduction in mouth opening, also demonstrated highly significant differences between the two groups ($p < 0.001$). Patients in Group A exhibited less trismus and showed more rapid recovery

compared with Group B. This may be attributed to reduced inflammation and edema in the muscles of mastication, particularly the medial pterygoid muscle, resulting from effective microbial control. Group B showed greater restriction in mouth opening throughout the postoperative period.

The statistical analysis of the data supports these clinical observations. One-way ANOVA revealed highly significant differences in pain, swelling, and trismus between Group A and Group B at all postoperative time points ($p < 0.001$). These findings emphasize that while postoperative antibiotics provide clinical benefit, the addition of a prophylactic component significantly enhances postoperative outcomes. A key implication of this study is the importance of timing in antibiotic administration. Prophylactic antibiotics, when administered prior to surgery, ensure adequate tissue concentrations of the drug at the time of incision, thereby preventing bacterial colonization and reducing the inflammatory response. In contrast, postoperative antibiotics primarily serve a therapeutic role and may not be as effective in preventing the initiation of infection and inflammation. This distinction explains the superior performance of Group A compared with Group B. Despite the clear advantages observed with prophylactic antibiotic use, it is essential to consider the broader context of antibiotic stewardship. The increasing prevalence of antibiotic resistance necessitates a cautious and judicious approach to antibiotic prescribing. While this study's findings support the use of prophylactic antibiotics to reduce postoperative morbidity, their routine use in all patients may not be justified. Instead, antibiotic use should be individualized based on patient-specific factors such as pre-existing infection, systemic health status and surgical complexity.

Conclusion

In conclusion, this study demonstrates that a combined prophylactic and postoperative antibiotic regimen is more effective than postoperative antibiotics alone or anti-inflammatory therapy without antibiotics for minimizing postoperative pain, swelling, trismus and infection. These findings underscore the importance of preoperative antibiotic administration in improving clinical outcomes following mandibular third molar surgery. Nevertheless, antibiotic use should be guided by evidence-based principles and tailored to individual patient needs to optimize outcomes and minimize the risk of antibiotic resistance.

Ethical Approval: The study was conducted in accordance with the ethical approval obtained by ethical committee

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