Original Research Article

Comparison of Outcomes of Methylprednisolone With Serratiopeptidase in Reducing Postoperative Complications After Extraction of the Mandibular Third Molar

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Abstract: *Surgical extraction of impacted mandibular third molars is one of the most common oral and maxillofacial procedures and is frequently associated with postoperative pain, swelling, and limitation of mouth opening. Pharmacological agents such as corticosteroids and proteolytic enzymes are widely prescribed to minimize these complications; however, comparative evidence on their efficacy remains limited.* **Objective:** *To compare the effectiveness of methylprednisolone and serratiopeptidase in reducing postoperative pain, swelling, and trismus following surgical extraction of impacted mandibular third molars.* **Methods:** *A randomized controlled trial was conducted at the Department of Oral and Maxillofacial Surgery, Sandeman Provincial Hospital, Quetta, Pakistan, from December 2021 to June 2022. Ninety-six eligible patients were randomly allocated into two equal groups. Group A received oral methylprednisolone 4 mg every 8 hours, and Group B received oral serratiopeptidase 10 mg every 12 hours for five days postoperatively. Pain was assessed using a visual analogue scale, swelling was measured using standardized anatomical landmarks, and mouth opening was recorded using interincisal distance. Data were analyzed using SPSS version 23, with $p \leq 0.05$ considered statistically significant.* **Results:** *Both groups were comparable in age, gender distribution, impaction side, and impaction classification. Methylprednisolone demonstrated significantly lower postoperative pain (1.3 ± 0.32 vs 7.3 ± 2.0, $p < 0.001$) and greater improvement in mouth opening (1.3 ± 2.5 vs 7.2 ± 4.1, $p < 0.001$) than serratiopeptidase. Serratiopeptidase showed relatively better reduction in postoperative swelling ($p = 0.04$). Similar outcome trends were observed among participants aged 23–30 years.* **Conclusion:** *Methylprednisolone was more effective in reducing postoperative pain and trismus, whereas serratiopeptidase provided superior reduction in swelling following third molar surgery. The predominant clinical requirement may guide the selection of either medication. Both agents appear safe and beneficial when used short-term in postoperative management.*

Keywords: Methylprednisolone; Serratiopeptidase; Impacted mandibular third molar; Postoperative pain; Swelling; Trismus

Introduction

The extraction of the mandibular third molar, commonly referred to as the wisdom tooth, is one of the most frequently performed surgical procedures in oral and maxillofacial surgery. This intervention is typically indicated for complications arising from impacted teeth, including postoperative pain, swelling, trismus, and dry socket (1, 2). Postoperative complications occur in approximately 10–30% of patients undergoing third molar extraction, with dry socket reported at 0.3-26% (1, 3). These complications not only cause significant discomfort but can also impose additional health risks, highlighting the need for effective postoperative management strategies (4, 5).

A range of pharmacological interventions has been used to promote better recovery after third molar surgery. Corticosteroids such as methylprednisolone and dexamethasone are widely recognized for their potent anti-inflammatory properties, which help reduce postoperative swelling and pain (5, 6). Evidence suggests that preoperative methylprednisolone significantly reduces edema by the seventh postoperative day compared with controls, demonstrating its efficacy in managing post-extraction morbidities (4). Serratiopeptidase, a proteolytic enzyme with anti-inflammatory potential, has also been investigated for the control of postoperative pain and inflammation. However, findings indicate that its effectiveness relative to corticosteroids remains less definitive and warrants further comparative research (5).

A critical evaluation of these pharmacological agents shows that methylprednisolone provides significant reductions in edema while improving patient comfort, whereas the therapeutic role of serratiopeptidase remains unclear. Recent literature underscores the need for additional high-quality studies to determine the comparative efficacy of these drugs across different patient populations and surgical settings (7). For example, a recent clinical trial reported that patients receiving methylprednisolone experienced notably lower levels of postoperative complications, particularly in terms of edema and pain intensity, compared with those treated with alternative agents (5).

In the Pakistani context, where access to oral healthcare is variable, optimizing postoperative care with effective pharmacological options is essential. Impacted third molars and their associated complications are frequently reported in Pakistan, making research on interventions such as methylprednisolone and serratiopeptidase crucial for improving clinical outcomes and enhancing the standard of oral surgical care in the region

Methodology

This randomized controlled clinical trial was conducted in the Department of Oral and Maxillofacial Surgery at Sandeman Provincial Hospital, Quetta, Pakistan, over six months from December 12, 2021, to June 13, 2022. The study aimed to compare the effectiveness of methylprednisolone and serratiopeptidase in controlling postoperative pain, swelling, and trismus following surgical extraction of impacted

mandibular third molars. Ethical approval was secured from the Institutional Ethical Review Committee before participant enrolment, and all patients provided written informed consent after receiving detailed information about the study's objectives, procedures, potential benefits, and associated risks, in accordance with the principles of the Declaration of Helsinki.

The sample size was determined using the OpenEpi calculator based on previously published mean mouth-opening values on postoperative day one, which reported 17.7 ± 5.5 mm in the methylprednisolone group and 22.1 ± 4.2 mm in the serratiopeptidase group. With a 95% confidence level and 80% study power, the required sample size was calculated to be 96 participants, with 48 individuals per treatment arm. Eligible patients were recruited through a non-probability consecutive sampling approach. Patients aged 23 to 40 years of either gender who required surgical extraction of impacted mandibular third molars and demonstrated a preoperative interincisal opening of at least 35 mm were included. Only medically fit individuals with no known allergies to local anesthetic agents were considered. Patients younger than 21 years, those with systemic comorbidities such as diabetes mellitus, hypertension, or bleeding disorders, pregnant women in their first or third trimester, individuals with localized infections at the surgical site, and those with hypersensitivity to any study medication or anesthetic agents were excluded.

Participants who met eligibility criteria were randomly allocated to two groups using a lottery method. Group A received oral methylprednisolone 4 mg every eight hours for five days, while Group B received oral serratiopeptidase 10 mg every twelve hours for the same duration. All surgical extractions were performed under local anesthesia using 2% lignocaine with 1:100,000 epinephrine. A standardized surgical technique was employed for all patients to reduce operator-related variability. A crestal mucoperiosteal flap extending from the second to the third molar region was raised, followed by buccal bone removal using a rotary bur under copious saline irrigation. Tooth sectioning was performed when necessary, and extractions were completed using elevators and forceps. The socket was thoroughly irrigated with sterile saline, and closure was achieved with 3-0 Vicryl sutures.

All patients received uniform postoperative instructions and analgesics. Clinical evaluations were conducted on postoperative days 1, 3, and 5. Pain intensity was measured using a Visual Analogue Scale; facial swelling was recorded using a flexible measuring tape between predetermined anatomical landmarks (tragus to mouth commissure on the operated side); and mouth opening was assessed by measuring interincisal distance using a millimeter scale. The primary outcome measures included mean pain scores, mean swelling measurements, and mean mouth opening values. Secondary analyses examined the influence of age, gender, impaction side, and mandibular third-molar classification on treatment outcomes.

Data analysis was performed using SPSS version 22. Continuous variables were presented as mean and standard deviation, while categorical variables were summarized as frequencies and percentages. Intergroup comparisons were conducted using independent sample t-tests. Stratification based on key demographic and clinical variables was undertaken to control potential confounding effects, followed by post-stratification t-testing. A p-value of ≤ 0.05 was considered statistically significant for all analyses.

Results

The demographic characteristics of the study population showed that the mean age of participants was comparable between the two groups, with Group A at 27.0 ± 10.82 years and Group B at 26.2 ± 13.08 years, indicating no meaningful age difference between the treatment arms (Table 1). Gender distribution was also balanced, with males comprising 54.3% of Group A and 52.0% of Group B. In comparison, females accounted for 45.7% and 48.0% respectively, reflecting an almost equal representation of both genders across groups (Table 2). The side of impaction showed a similar pattern across groups, with the right side more frequently involved in both cohorts (70.5% in Group A and 72.9% in Group B), followed by the left (Table 3). The classification of mandibular third molars also showed comparable distribution, with the majority of impactions falling under Class II in both groups, followed by Class I, while Class III cases were least frequent (Table 4).

Postoperative outcomes revealed significant differences between the treatment groups. Patients receiving methylprednisolone showed markedly lower pain scores than those receiving serratiopeptidase, and a similar superiority was observed in mouth opening, with Group A demonstrating better postoperative improvement. Swelling was also lower in the methylprednisolone group, with the difference reaching statistical significance. These findings collectively indicate that methylprednisolone was more effective in reducing postoperative morbidity after third molar surgery (Table 5). When analyzing outcomes specifically among patients aged 23–30 years, similar trends were observed. Group A consistently exhibited lower pain scores and greater improvement in mouth opening compared to Group B, with statistically significant differences. Swelling reduction showed a borderline trend favoring methylprednisolone, although it did not reach statistical significance within this age bracket (Table 6).

Table 1: Mean Age (Years) of Patients

Group	Mean ± SD
Group A (Methylprednisolone)	27.0 ± 10.82
Group B (Serratiopeptidase)	26.2 ± 13.08

Table 2: Gender Distribution

Gender	Group A n (%)	Group B n (%)
Male	26 (54.3%)	25 (52.0%)
Female	22 (45.7%)	23 (48.0%)

Table 3: Side of Impacted Mandibular Third Molar

Side	Group A n (%)	Group B n (%)
Right	34 (70.5%)	35 (72.9%)
Left	14 (29.5%)	13 (27.1%)

Table 4: Classification of Mandibular Third Molar

Classification	Group A n (%)	Group B n (%)
Class I	19 (39.5%)	18 (37.5%)
Class II	25 (52.0%)	27 (56.2%)

| Class III | 4 (8.3%) | 3 (6.3%) |

Table 5: Comparison of Postoperative Outcomes between Groups

Outcome	Group A Mean ± SD	Group B Mean ± SD	p-value
Pain Score	1.3 ± 0.32	7.3 ± 2.0	<0.001
Swelling Score	10.1 ± 9.9	1.4 ± 7.9	0.04
Mouth Opening	1.3 ± 2.5	7.2 ± 4.1	<0.001

Table 6: Comparison of Outcomes in Patients Aged 23–30 Years

Outcome	Group A Mean ± SD	Group B Mean ± SD	p-value
Pain Score	1.3 ± 0.30	7.2 ± 1.9	<0.001
Swelling Score	10.0 ± 7.5	1.4 ± 7.7	0.06
Mouth Opening	1.3 ± 2.7	7.1 ± 4.3	<0.001

Discussion

The current study evaluates the outcomes of methylprednisolone versus serratiopeptidase in reducing postoperative complications following mandibular third molar extraction. Our findings demonstrate significant advantages of methylprednisolone across several parameters, particularly postoperative pain scores, mouth opening, and swelling. The demographic data presented in Tables 1 and 2 indicate that the mean ages of participants in both groups were comparable (27.0 ± 10.82 years in Group A vs 26.2 ± 13.08 years in Group B). The gender distribution was also statistically balanced, with males constituting approximately 54% and females 45% in Group A. Previous studies, such as those by Nehme et al. and Isola et al., report similar demographic characteristics in their cohorts, reinforcing the robustness of our demographic sampling method (8, 9). Age and gender may influence postoperative outcomes; however, our findings show that neither factor skewed the results, validating the comparability of the two groups (10).

As shown in Table 3, there is a higher prevalence of right-sided impaction in both groups, consistent with literature indicating that the right lower third molar is more frequently impacted (11). The classification of impacted mandibular third molars revealed that Class II impactions were predominant, consistent with Xu et al., who reported that most impacted molars fall into this category (12). This classification helps understand the complexity of surgical intervention and anticipate postoperative complications.

Postoperative outcomes showed significant findings, particularly in pain scores. Patients receiving methylprednisolone experienced lower mean pain scores (1.3 ± 0.32) than those receiving serratiopeptidase (8.3 ± 2.0), with a p-value < 0.001. This result is consistent with findings by Altaweel et al., who reported that methylprednisolone effectively reduces postoperative pain intensity, enhancing patient comfort after surgical procedures (13). Our swelling results also favored methylprednisolone, with Group A showing a mean swelling score of 10.1 ± 9.9 compared to 1.4 ± 7.9 in Group B (p = 0.04). This aligns with Shuborna et al., who emphasized that corticosteroids significantly decrease swelling due to their potent anti-inflammatory properties (14). Similarly, mouth opening was markedly better in Group A (1.3 ± 2.5) than in Group B (8.2 ± 4.1), corroborating the results of Dulina et al., who observed substantial improvement in oral function following corticosteroid administration (15).

Among patients aged 23–30 years, the outcomes in Table 6 similarly favored the methylprednisolone group. Both pain scores and mouth opening showed statistically significant improvements, reaffirming corticosteroid effectiveness in this age group, which is notable given the high frequency of third molar extractions in young adults (16). The borderline significance of the swelling effect (p = 0.06) suggests that further studies may be needed to fully establish the benefit of methylprednisolone in reducing edema in younger patients.

The findings of this study echo growing evidence on the efficacy of pharmacological interventions after third molar surgery, particularly for dexamethasone and other corticosteroids, which have demonstrated promising outcomes (8, 17, 18). The superiority of methylprednisolone in reducing postoperative morbidity strengthens the rationale for integrating it into standard postoperative care protocols. Considering the well-documented complications following third molar extractions, the use of methylprednisolone could substantially reduce morbidity and promote faster recovery.

Within the Pakistani context, where patients often experience heightened postoperative discomfort and complication rates, implementing effective drug protocols such as methylprednisolone carries substantial clinical value (19). Our findings emphasize the need for incorporating evidence-based pharmacological strategies to enhance surgical outcomes and improve patient satisfaction in routine dental practice.

Overall, our study highlights the comparative advantages of methylprednisolone over serratiopeptidase in reducing pain, minimizing swelling, and improving mouth opening after third molar extraction. These findings suggest that methylprednisolone may serve as a superior postoperative management option in dental surgeries, particularly within the Pakistani healthcare setting.

Conclusion

The present randomized controlled trial demonstrates that methylprednisolone provides superior control of postoperative pain and trismus compared with serratiopeptidase following surgical removal of impacted mandibular third molars. In contrast, serratiopeptidase offers comparatively greater reduction in postoperative swelling. Both agents were well tolerated and safe for short-term postoperative use. These findings suggest that individualized postoperative pharmacologic strategies—prioritizing corticosteroids for pain and functional limitation, and serratiopeptidase for inflammatory edema—may optimize recovery outcomes. Future multicenter trials with larger sample sizes and longer follow-up are warranted to validate these results and to guide evidence-based perioperative protocols in oral and maxillofacial surgery.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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