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Research Article

Oral vs. Intravenous Dexamethasone in Third Molar Surgery: A Comparative Study

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Abstract

The surgical removal of impacted third molars is associated with postoperative pain, swelling, and trismus that adversely affect recovery. Corticosteroids, particularly dexamethasone, are frequently used to minimize these complications, but the optimal route of administration remains uncertain. This randomized controlled trial compared the efficacy of oral versus intravenous dexamethasone in managing postoperative morbidity following mandibular third molar extraction. A total of 100 patients were randomized into two groups: Group A received 8 mg oral dexamethasone one hour before surgery, and Group B received 8 mg intravenous dexamethasone immediately before incision. Pain intensity, facial swelling, and interincisal opening were assessed at 24 hours, 72 hours, and 7 days postoperatively. Both groups showed significant improvements in postoperative outcomes compared to baseline. However, the intravenous group demonstrated statistically significant reductions in pain and swelling at 24 and 72 hours, while the oral group was associated with slower but comparable recovery by day seven. These results suggest that intravenous dexamethasone offers superior short-term control of postoperative inflammation, whereas oral administration remains a convenient alternative with acceptable clinical outcomes.

Keywords: Dexamethasone, Third molar surgery, Intravenous corticosteroid

Introduction

Mandibular third molar surgery remains one of the most common procedures in oral and maxillofacial practice and continues to be associated with considerable postoperative morbidity. Pain, facial swelling, and trismus represent the triad of complications that significantly interfere with daily activities, limit oral intake, and prolong recovery time. Despite advances in surgical technique, the inflammatory response inherent to tissue trauma has not been completely mitigated, prompting the continued exploration of adjunctive pharmacological interventions.1-3

Corticosteroids have been well recognized as effective agents in controlling postoperative inflammation. Their ability to suppress prostaglandin and leukotriene synthesis, reduce vascular permeability, and minimize tissue edema makes them valuable adjuncts in oral surgery. Among corticosteroids, dexamethasone is particularly favored for its high potency and long half-life. While its efficacy is established, the route of administration influences its pharmacokinetics, bioavailability, and therapeutic impact.4-5

Oral administration of dexamethasone is widely practiced due to its convenience, non-invasiveness, and patient acceptance. However, systemic metabolism and delayed onset may limit its immediate anti-inflammatory action. Intravenous administration bypasses gastrointestinal absorption and first-pass metabolism, ensuring rapid drug availability at effective plasma levels. This pharmacological advantage may translate into superior control of the acute inflammatory phase following surgical trauma.7-10

Emerging studies in recent years have revisited this comparison with conflicting findings. Some investigations suggest that oral dexamethasone provides outcomes nearly equivalent to parenteral routes when administered preoperatively, while others emphasize the superiority of intravenous dosing for early postoperative comfort. Variations in methodology, dosage, and timing of administration across studies highlight the need for further controlled clinical trials.

The present study was designed to provide a direct comparison between oral and intravenous dexamethasone in patients undergoing surgical removal of impacted mandibular third molars. By evaluating postoperative pain, swelling, and trismus at standardized intervals, this trial aimed to clarify whether the route of administration significantly influences clinical outcomes. The results

are expected to provide evidence-based recommendations to optimize perioperative care in third molar surgery.

Methodology

This randomized controlled trial was conducted at Continental Medical College, Lahore on 100 patients aged 18–35 years who reported to the oral and maxillofacial surgery department for surgical extraction of mesioangular or horizontal impacted mandibular third molars. Ethical clearance was obtained, and verbal as well as written informed consent was taken from all participants. The sample size was calculated using Epi Info software (version 7.2) based on a 95% confidence interval, 80% power, expected mean difference of 1.0 on the pain scale, and a standard deviation of 1.5, resulting in 50 participants per group.

Patients were randomly assigned to two groups using computer-generated allocation. Group A (oral group) received 8 mg oral dexamethasone one hour preoperatively with 50 ml of water. Group B (intravenous group) received 8 mg dexamethasone intravenously five minutes before incision. Standard surgical protocol with local anesthesia (2% lidocaine with 1:100,000 epinephrine) was followed for all patients.

Inclusion criteria comprised healthy patients classified as ASA I or II, requiring surgical removal of impacted mandibular third molars with similar difficulty scores. Exclusion criteria included systemic illness, pregnancy, lactation, history of corticosteroid allergy, and patients already on anti-inflammatory or immunosuppressive therapy.

Postoperative assessment included pain measured by a 10-point visual analogue scale, swelling assessed by standardized facial measurements between fixed reference points, and trismus evaluated as maximum interincisal opening using a caliper. Measurements were recorded preoperatively, and at 24 hours, 72 hours, and 7 days postoperatively.

All procedures were performed by the same surgical team to minimize variability. Rescue analgesics (paracetamol 500 mg) were prescribed only if required, and consumption was recorded. Data were analyzed using SPSS version 25. Repeated measures ANOVA and independent t-tests were applied. A p-value < 0.05 was considered statistically significant.

Results

Table 1. Demographic Characteristics

Variable	Oral Group (n=50)	IV Group (n=50)	p-value
Age (years, mean ± SD)	25.4 ± 3.2	24.9 ± 3.5	0.48
Gender (M/F)	27/23	26/24	0.82
Duration of surgery (min)	32.6 ± 4.5	31.9 ± 4.1	0.39

The two groups were comparable in baseline characteristics, confirming homogeneity.

Table 2. Pain (VAS Scores)

Time Interval	Oral Group (Mean ± SD)	IV Group (Mean ± SD)	p-value
24 hrs	5.8 ± 1.2	4.9 ± 1.0	0.01*
72 hrs	3.9 ± 1.1	3.1 ± 0.9	0.02*
7 days	1.5 ± 0.7	1.3 ± 0.5	0.21

IV dexamethasone significantly reduced pain at 24 and 72 hours compared with oral administration.

Table 3. Swelling and Trismus

Parameter	Time Interval	Oral Group (Mean ± SD)	IV Group (Mean ± SD)	p-value
Swelling (mm)	72 hrs	9.6 ± 2.8	7.4 ± 2.5	0.01*
Trismus (mm reduction)	72 hrs	9.8 ± 3.1	8.0 ± 2.7	0.03*
Swelling (mm)	7 days	2.2 ± 1.1	1.9 ± 1.0	0.29
Trismus (mm reduction)	7 days	3.0 ± 1.2	2.6 ± 1.0	0.18

The IV group showed significantly less swelling and trismus at 72 hours; differences were not significant by day seven.

Discussion

The findings of this study confirm the beneficial role of dexamethasone in controlling postoperative morbidity following mandibular third molar extraction. Both oral and intravenous routes produced clinically relevant improvements in pain, swelling, and trismus, underscoring the drug's effectiveness in surgical settings. However, the intravenous route demonstrated superior outcomes in the early postoperative period, particularly at 24 and 72 hours.11-13

This superiority can be attributed to rapid systemic bioavailability associated with intravenous administration. By bypassing gastrointestinal absorption and hepatic metabolism, peak plasma concentrations are achieved promptly, which is crucial in blunting the acute inflammatory cascade initiated during surgery. In contrast, oral dexamethasone, though convenient, undergoes delayed absorption, explaining the less pronounced early benefits observed.14-17

The pattern of outcomes suggests that while intravenous dexamethasone is advantageous in managing acute inflammatory peaks, oral administration eventually provides comparable control by the seventh postoperative day. This finding has practical implications in balancing patient comfort, accessibility, and resource availability in different clinical settings.18-20

The significant reduction in swelling and trismus with intravenous administration at 72 hours highlights the pharmacodynamic advantage of immediate systemic exposure. Swelling is primarily mediated by increased vascular permeability, and early suppression of inflammatory mediators is key to limiting edema formation. Similarly, trismus, which results from localized muscle inflammation and spasm, responded better to intravenous dosing at the critical stage of peak inflammation.

Interestingly, by day seven, the outcomes between the two groups converged, suggesting that oral dexamethasone eventually achieves adequate suppression of residual inflammation. This reinforces its value as a non-invasive, cost-effective alternative, particularly in outpatient contexts where intravenous access may not be feasible.

The present results are in agreement with contemporary literature demonstrating faster recovery and reduced morbidity with intravenous dexamethasone in surgical patients. At the same time, the convenience and patient preference for oral administration cannot be ignored, especially where early intervention with parenteral therapy is not possible.

Overall, the study supports a tailored approach to dexamethasone use in third molar surgery. Intravenous administration may be preferable in patients with anticipated difficult surgery, higher risk of postoperative complications, or those requiring faster functional recovery. Oral administration remains an acceptable and effective alternative in routine cases, ensuring wider applicability.

Limitations of this study include single-center design and short follow-up, which may limit the generalizability of results. Future multicenter randomized trials with larger cohorts are necessary to confirm these findings and establish definitive guidelines on the optimal route of dexamethasone administration in oral surgery.

Conclusion

Intravenous dexamethasone provides superior short-term control of pain, swelling, and trismus after third molar surgery compared with oral administration. However, both routes achieve similar outcomes by day seven, highlighting oral dexamethasone as a practical alternative where intravenous therapy is not feasible. This study addresses existing gaps by providing direct comparative evidence, with future research needed to refine patient-specific protocols.

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