Vol: 8 Issue: 2

EDJ

Effect of Local Dexamethasone on Pain, Swelling, and Trismus After Extraction of Impacted Lower Third Molar

Zain Mohsin Hamzah[(1)] , Twana Hoshyar Saleem[(1)]

ABSTRACT

Background and Objectives: This study concluded that postoperative extraction of impacted lower third molars is often followed by complications such as pain, swelling, or limited jaw opening.

Aim of Study: This study aimed to assess whether intramuscular dexamethasone administration in or through the masseter muscle is an effective measure in alleviating postoperative pain, swelling, or limited jaw opening that occurs after lower third molar extraction.

Patient and Method: In total, 20 patients underwent a split mouth randomized surgical removal of impacted lower third molar teeth., distributed on two groups, each group presented with 10 patients, as follows: Group A: (study group) patients received local dexamethasone Group B: (control group) patients did not receive any drug intraoperatively.

Results: 20 individuals had a total of 40 affected lower third molars extracted, split mouth design, for 4 males and 16 females, A statistically significant difference was detected between groups in pain scoring during third day assessment according to sex distribution, but for swelling and maximum mouth opening, in seventh day assessment there were no differences (P = 0.034, by independent t-test

Conclusion: This study found that local dexamethasone injection after impacted lower third molar removal, leads to significant reduction in postoperative pain, swelling, and limited mouth opening.

Keywords: Impaction, trimus, swelling, lower third molar, dexamethasone.

Article Information

Submission Date: 25/6/2025
Revision date: 10/8/2025
Acceptance date: 18/8/2025
Publishing date: Dec 2025

Affiliation Info

[(1)]College of Dentistry, Hawler Medical University, Kurdistan Region, Iraq.
Corresponding Author: Zain Mohsin Hamzah.
Email: zaindizayee@gmail.com

DOI: doi.org/10.15218/edj.2025.31

INTRODUCTION

Impaction refers to a condition in which a tooth fails to erupt through the gingiva within the expected developmental age due to failure of the neighboring structures to allow it to come through, or because there isn't adequate space in the dental arch.[1] The classification of impacted lower third molars has been defined by different anatomical and positional parameters that help in the diagnosis and treatment of the impacted teeth.[2,3]

In fact, the extraction of impacted lower third molars is commonly followed by postoperative morbidity such as pain, swelling of the face, and the formation of trismus, all of which often have a negative effect on postoperative comfort of the patient.[3] These adverse outcomes primarily arise from the inflammatory response triggered by surgical trauma, a process mediated by the local release of biochemical agents including prostaglandins and cytokines at the operative site. These symptoms must always be handled correctly to avoid any kind of discomfort for the patient.[3,4]

Corticosteroids, such as dexamethasone, have recently attracted significant attention for its powerful anti-inflammatory and anti-nociceptive effects. It is suggested that the corticosteroid act on the arachidonic acid cascade phospholipase A2 leading to decreased synthesis of prostaglandins and leukotrienes.[5]

Locally Administrated Dexamethasone minimizes postoperative swelling and aids in restoration of mouth opening. They are more effective than systemic corticosteroids to get rid of trismus and other complications.[6,7]

This study aimed to determine the efficacy of intramasseteric dexamethasone in relieving postoperative complications such as pain, swelling of the face, and trismus (loss of mouth opening) that occur after impacted lower third molar extractions.

METHODS

This randomized clinical trial was conducted in Hawler Medical University, college if dentistry in Erbil, Iraq, between October 2024 and May 2025. The duration of this study involved data collection, data entry, analysis of results, and final assessment of those results. Participants in this research study included those above 18 years of age, they gave their fully informed consent and met criteria that involved bilateral surgical extraction of impacted lower third molars in a mesioangular relationship according to Pederson's Index.[7] Patients meeting any of the following exclusion criteria were omitted from the study: individuals with a risk of bacterial endocarditis, those diagnosed with diabetes mellitus (controlled or uncontrolled), patients who had received radiotherapy to the head and neck region, individuals presenting with acute or chronic infections near the surgical site, those already undergoing antibiotic therapy for unrelated conditions, pregnant or lactating women, patients on prolonged nonsteroidal anti-inflammatory drug (NSAID) or systemic corticosteroid treatment, and individuals with coagulation disorders.

A total of 20 patients were recruited and treated using a split-mouth design, allowing each individual to serve as their own control. Participants were randomly divided into two groups. In Group A (Study Group), an 8 mg/ 2 ml dose of dexamethasone was injected intra-operatively in the masseter muscle, in three divided dose using insulin syringe that 60 international units (IU) per each injection, figure 1, This was done after identifying the region by telling the participant to clench his teeth, after which an equal amount of anesthetic was given at three points: superior (at a 45° angle to the occlusal plane of the lower molar) and middle points (parallel to the occlusal plane) and at an inferior point (again at a 45° angle to the occlusal plane of the lower molar). In Group B (Control Group), intraoperative pharmacologic measures were not undertaken. In all participants, postoperative assessment of pain, swelling in the face, and trismus was done on the day of surgery, followed by assessments at the third and seventh days post-operatively. Pain was quantified using a Visual Analogue Scale (VAS),[7] swelling in the face was marked based on a procedure described in a Figure 2,[9] while a measure of trismus was determined through interincisal opening between maxillary and mandibular incisors using a Vernier caliper.[9] Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 20). For descriptive statistic and independent sample t-test was used to assess the reliability of data. A p-value of ≤ 0.05 was considered as statistically significant. All the steps of procedure were explained in detail to the patients were agreed to share and gave

prepared consent following, and the patients who give the sign of consent in Kurdish or Arabic the instruction of the ethical committee in college of dentistry, Hawler medical university for the treatment were involved to the study Data collection was performed through direct patient interviews using a structured questionnaire, which included demographic and personal information such as the participant's name, sex, age, address, and contact number.

A B C

Figure 1. Intraoperative study group dexamethasone injection for masseter muscle: A, 60 Unit for originating point; B, 60 Unit for middle zone; C,60 Unit for insertion point.

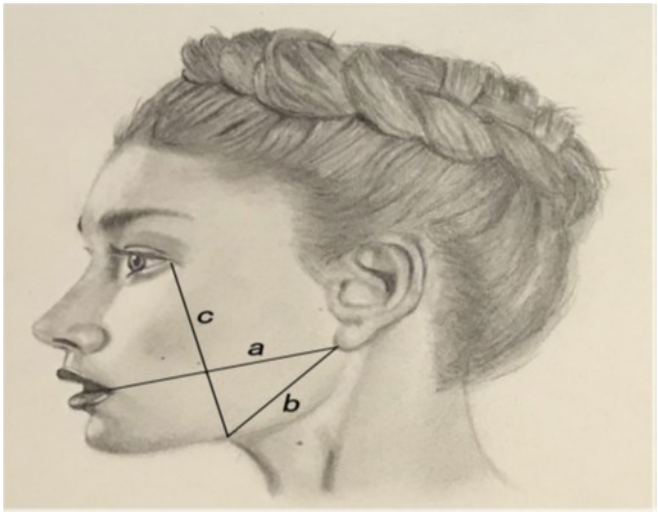

Figure 2. Schematic representation of facial swelling measurement. (A) The linear distance from the corner of the mouth to the earlobe on the extraction side; (B) the distance from the earlobe to the mandibular angle; (C) the distance from the external canthus to the mandibular angle

their signatures Kurdish or Arabic in the either
The overall facial measurement distance (X) was calculated using the following formula:

$$X = [(a + b)/2 + c]/2,$$

where a, b, and c represent the three measured distances (in millimeters). The mean value of X was obtained as the average of three consecutive measurements. The percentage of facial swelling was then determined using the formula:

$$\text{Facial swelling (\%)} = X1 - X0 / X0 \times 100$$

where X0 denotes the preoperative facial measurement and X1 represents the postoperative meas-

DOI: doi.org/10.15218/edj.2025.31

urement.[9]

RESULTS

A total of (40) removing impacted lower third molar for (20) patients, split mouth design, for 4 males and 16 females, as they distributed on two groups (Group A: study group patients receiving local dexamethasone 8 mg injection, Group B: control group patients with no any injection), and the surgical time from 20 minutes to 40 minutes. The mean age of participants was 22 years with a standard deviation of 3.29 years, while a range of 18 to 29 years was recorded with a median of 21.5 years as depicted in Table 3.1. A statistically significant difference in regard to gender distribution in the third assessment of pain was determined, but for swelling and maximum mouth opening and, in seventh day assessment there was no difference (P = 0.034, by in depended (t-test), as show in Table 3.2.

Table 3.1 Distribution of dental impactions per a patient

Age	Frequency	Percent
18	4	10.0
19	8	20.0
20	4	10.0
21	4	10.0
22	4	10.0
23	8	20.0
26	4	10.0
29	4	10.0
Total	40	100.0

Table 3.2 Proportion of patients have a pain, swelling and limited mouth opening according to dexamethasone injection according to sex

variables	sex	N	Mean	Std. Deviation	P- value T-test
Pain: 3rd day	male	8	1.38	.518	0.034
	female	32	1.16	.369	
Swelling: 3rd day	male	8	.63	.744	0.506
	female	32	1.09	.689	
Maximum mouth opening: 3rd day	male	8	1.00	.000	0.313
	female	32	.97	.177	
Pain: 7th day	male	8	.38	.518	0.764
	female	32	.34	.483	
Swelling: 7th day	male	8	.25	.463	0.721
	female	32	.28	.457	
Maximum mouth opening: 7th day	male	8	.25	.463	0.721
	female	32	.28	.457	

In assessing the postoperative pain, a statistically significant difference was found between the groups on the third postoperative day (P = 0.034; P < 0.05). By the seventh day, this difference was

Table 3.3 Proportion of patients have a pain according to dexamethasone injection in 3rd day

		Moderate	Sever	Total
Study Group	N	17	3	20
	%	42.5%	7.5%	50.0%
Control Group	N	15	5	20
	%	37.5%	12.5%	50.0%
	N	32	8	40
	%	80.0%	20.0%	100.0%
p- value		0.65		

*Fisher's exact test

no longer detected (P = 0.764; P > 0.05) as shown in Table 3.3, as there was no statistically significant dif-

		Mild	moderate	Total
Study Group	N	14	6	20
	%	35.0%	15.0%	50.0%
Control Group	N	12	8	20
	%	30.0%	20.0%	50.0%
Total	N	26	14	40
	%	65.0%	35.0%	100.0%
p- value		0.741		

*Fisher's exact test

Table 3.5 Proportion of patients have a swelling according to dexamethasone injection in 3rd day

		Mild	moderate	Sever	Total
Study Group	N	6	12	2	20
	%	15.0%	30.0%	5.0%	50.0%
Control Group	N	4	8	8	20
	%	10.0%	20.0%	20.0%	50.0%
Total	N	10	20	10	40
	%	25.0%	50.0%	25.0%	100.0%
p- value		0.09			

DOI: doi.org/10.15218/edj.2025.31

ference between the groups.

Table 3.4 Proportion of patients have a pain according to dexamethasone injection in 7th day

In the evaluation of postoperative swelling, On the third day, there was no statistically significant difference between the two groups (P = 0.506; P > 0.05). By the seventh day (P = 0.721; P > 0.05), swelling had further subsided in both groups, and the difference remained statistically insignificant, as presented in Table 3.5.

In the assessment of maximum mouth opening, on the third postoperative day, there was no sta-

Table 3.6 Proportion of patients have a swelling according to dexamethasone injection in 7th day

		Mild	Moderate	Total
Study Group	N	17	3	20
	%	42.5%	7.5%	50.0%
Control Group	N	12	8	20
	%	30.0%	20.0%	50.0%
Total	N	29	11	40
	%	72.5%	27.5%	100.0%
p- value		0.155		

*Fisher's exact test

Table 3.7 Proportion of patients have a limited mouth opening according to dexamethasone injection in 3rd day.

		more than 30 mm	less than 30 mm	Total
Study Group	N	1	19	20
	%	2.5%	47.5%	50.0%
Control Group	N	0	20	20
	%	0.0%	50.0%	50.0%
Total	N	1	39	40
	%	2.5%	97.5%	100.0%
p- value		1.0000		

Table 3.8 Proportion of patients have a limited mouth opening according to dexamethasone injection in 7th day

		more than 30 mm	less than 30 mm	Total
Study Group	N	16	4	20
	%	40.0%	10.0%	50.0%
Control Group	N	13	7	20
	%	32.5%	17.5%	50.0%
Total	N	29	11	40
	%	72.5%	27.5%	100.0%
p- value		0.480		

*Fisher's exact test

tistically significant difference between the two groups (P = 0.313; P > 0.05). Similarly, by the seventh day (P = 0.721; P > 0.05), the difference remained statistically insignificant, as shown in Table 3.6.

DISCUSSION

Third molar removal is often the first painful and perceived severe postoperative symptom for third molar removal patients.[3] Pain was assessed on the third and seventh postoperative days. On the third day, the scores of mean pain were slightly higher in males (1.38 ± 0.518) than in females (1.16 ± 0.369), and this difference reached statistical significance (p = 0.034). These outcomes suggest that gender may influence pain perception or reporting; however, the relatively smaller number of male participants could have amplified this observed effect. For this purpose, Fisher exact test of comparing pain between dexamethasone and control groups showed no statistically significant differences either on third (p = 0.65) or seventh (p = 0.741) postoperative day. In this case, we see that local dexamethasone injection had not brought about a decline in the intensity or frequency of postoperative pain in comparison to no use of the corticosteroid.[11] The findings are in line with some previous studies that have reported that dexamethasone may diminish inflammation-related symptoms, such as swelling, without changing from placebo on analgesic effect; and that this diminishing may not be causally significant when a single dose is administered locally. Nevertheless, some studies have indicated that corticosteroids might decrease prostaglandins and hence reduce nociceptor sensitization and pain perception.[3] Possible mechanism for the discrepancy in findings is that of dosage, timing of administration, mode of delivery (systemic vs. local) or variation in the individual pain threshold.[12] Another common postoperative complication is swelling and this peaks 48 to 72 hours after surgery. In this study, swelling severity was classified as mild, moderate, or severe. On the third postoperative day, a lower incidence of severe swelling was seen in the study group (5.0%) than in the control group (20.0%). On the contrary, a higher incidence of moderate swelling was recorded in the study group (30.0%) than in the control group (20.0%). Mild swelling was also seen in 15.0% of the study group versus 10.0% in the control group. While these trends indicate a lovely look at the positive impact of dexamethasone to decrease the enormous postoperative swelling, the variation was not significant statistically (p = 0.09). Likewise, by the seventh postoperative day, swelling had decreased in all groups, and no discernible statistically difference (p = 0.155). More importantly, fewer study group patients had only mild swelling as early as the seventh day compared to patients in control group who experienced a slower resolution of postoperative inflammation.[13] This is consistent with what we know about the known anti-inflammatory properties of corticosteroids, can prevent the synthesis

DOI: doi.org/10.15218/edj.2025.31

of inflammatory mediators such tumor necrosis factor alpha and interleukins. Specifically, the long-acting steroid dexamethasone can have anti edematous effects by stabilizing cellular membranes and decrease capillary permeability.[14] However, trends observed in this small sample were not statistically significant, but these trends do indicate potential clinical relevance and thereby justify the use of dexamethasone for reducing postoperative swelling to attain better patient comfort and quicker aesthetic recovery.[15]

An example of inflammation of the masticatory muscles and surrounding soft tissue of the cheek, following extraction of a lower third molar, is trismus, which is a condition where there is limited mouth opening. Trismus was defined as the ability (or inability) to open the mouth more than 30 mm in this study. With the exception of one patient in the study group, the vast majority of patients in both groups remained with mouth opening ≤ 30 mm in the third day and most of them could not even reach 30 mm with the exception of one our patient.[16]

The study group had higher percentage of subjects with ability to open the mouth more than 30 mm by the seventh day, and 40.0% versus 32.5%, in the control group. However, the statistical analysis among the groups was not significance ($p = 0.480$). The implications of these results are that although dexamethasone may decrease trismus more rapidly than would otherwise happen, and particularly during the peak inflammatory phase (between third to seventh day), it may not be strong enough to reach statistical significance even in a small cohort.[17] Like swelling, trismus is primarily mediated by inflammatory responses of adjacent muscles and the surrounding tissues. An improvement in mouth opening in the treatment group might be explained by dexamethasone's mechanism of reducing muscle stiffness, as well as interstitial fluid accumulation. However, additional evidence in a larger scale would be required to confirm these trends with confidence.[18,19] Although local administration of dexamethasone demonstrated favorable clinical effects, the results did not reach statistical significance, which may be attributable to the limited sample size and the short follow-up period. Future research directed to optimizing administration protocols for beneficial patient outcomes should be used to consider its use in the context of broader patient specific factors.

CONCLUSION

On the whole, it would appear that, based upon the results of this study, local dexamethasone administration after surgical removal of impacted lower third teeth may have an effect in reducing pain, swelling, and trismus.

ETHICAL CONSIDERATION

All the steps of procedure were explained in detail to the patients, and the patients who given the consent to the treatment that involved to the study.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

FINANCIAL SUPPORT AND SPONSORSHIP

None.

REFERENCES

1. Fischer A, et al. Mechanisms of swelling after dental extractions and potential therapeutic approaches. J Clin Dent. 2020;45(3):212-218.
2. Gomes AC, et al. Radiographic and clinical indications for third molar extraction. Int Dent J. 2015.
3. Samad, A. A. (2017). Lingual nerve injury following surgical removal of mandibular third molar. *Zanco Journal of Medical Sciences (Zanco J Med Sci)*, *21*(3), 1884–1888. https://doi.org/10.15218/zjms.2017.047
4. Grossi GB, et al. Preoperative versus postoperative administration of dexamethasone in oral surgery. Oral Maxillofac Surg Clin North Am. 2016.
5. Bamgbose BO, et al. Effectiveness of corticosteroids in third molar surgery: A comprehensive review. J Oral Maxillofac Surg. 2019.
6. Majid OW, Mahmood WK. Effectiveness of dexamethasone in controlling postoperative swelling, trismus, and pain after third molar surgery. J Oral Maxillofac Surg. 2011.
7. Fatah LM, Alzubadee AF, Khalid RF, Samad A, Al-Kamali R. Prevalence and Patterns of Upper and Lower Third Molar Impaction: A Radiographic Retrospective Study based on a population in Erbil, Iraq. EDJ [Internet]. 2025 Jun. 30 [cited 2025 Aug. 2];8(1):93-101. https://doi.org/10.15218/edj.2025.11
8. Sugragan C, Sirintawat N, Kiattavornchareon S, Khoo LK, Kc K, Wongsirichat N. Do corticosteroids reduce postoperative pain following third molar intervention? J Dent Anesth Pain Med. 2020;20(5):281.
9. Breivik H, Borchgrevink PC, Allen SM, Rosseland LA, Romundstad L, Breivik Hals EK, Kvarstein G, Stubhaug A. Assessment of pain. British journal of anaesthesia. 2008 Jul 1;101(1):17-24.
10. Zhou, W., Liu, F., Fang, J. *et al.* Dexamethasone in preventive

analgesia alleviates pain and complications after jaw cyst enucleation: a randomized controlled trial. *BMC Anesthesiol* **22**, 344 (2022). https://doi.org/10.1186/s12871-022-01895-z

11. Marinelli F, Lezcano MF, Alarcón J, Navarro P, Fuentes R. A novel technique to accurately measure mouth opening using 3d electromagnetic articulography. Bioengineering. 2022 Oct 19;9(10):577.
12. Graziani F, D'Aiuto F, Arduino PG, Tonelli M, Gabriele M, Nibali L. Perioperative dexamethasone reduces short-term pain and swelling in oral surgery: A systematic review and meta-analysis. J Clin Periodontol. 2006;33(10):803-810.
13. Shaikh S, Bhat M, Kamath AT, Shigli A, Verma K. A comparative study to evaluate the effect of single-dose preoperative intramuscular dexamethasone on postoperative discomfort after third molar surgery. J Dent Anesth Pain Med. 2020;20 (3):143-149.
14. Antunes AA, Avelar RL, de Oliveira Neto PJ, do Nascimento LS. Effect of methylprednisolone on pain, swelling, and trismus after third molar surgery: A randomized, triple-blind, placebo-controlled clinical trial. J Oral Maxillofac Surg. 2011;69(6):e26-e31.
15. Filho JRL, de Oliveira MG, Maia LC, de Moraes M. Effect of preoperative dexamethasone on postoperative pain, swelling and trismus in lower third molar surgery: A systematic review. Braz Oral Res. 2008;22(3):229-237.
16. Bamgbose BO, Akinwande JA, Adeyemo WL, Ladeinde AL, Arotiba GT, Ogunlewe MO. Effects of co-administered dexamethasone and diclofenac potassium on postoperative complaints following third molar surgery. Head Face Med. 2005;1:11.
17. Lima TCC, Silva LM, Barbosa JS, Santos JN. Preemptive analgesia with dexamethasone in third molar surgery: A meta-analysis. J Craniofac Surg. 2016;27(3):638-644.
18. Grossy JJ, Rulli LE, Fetter TR. Evaluation of Pell and Gregory classification in impacted third molar surgery. Int J Dent. 2007;2007:69235.
19. Al-Shamiri HM, Shawky M, Hassanein N, Ahmed MA. The efficacy of single dose of preoperative dexamethasone injection on postoperative pain, swelling, and trismus after surgical removal of third molars. Saudi Dent J. 2013;25 (3):113-117.

DOI: doi.org/10.15218/edj.2025.31