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EFFECTIVENESS OF DEXAMETHASONE INJECTION EMPLOYING VISUAL ANALOGUE SCALE AFTER THIRD MOLAR IMPACTION SURGERY

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ABSTRACT
Introduction: Surgical removal of impacted mandibular third molars is commonly associated with significant postoperative pain, which can affect patient recovery and comfort. Local administration of dexamethasone may reduce inflammation and pain, improving postoperative outcomes without additional invasive interventions.
Material and Methods: A randomized clinical trial (NCT07538375) was conducted at the Department of Oral and Maxillofacial Surgery, 28 Military Dental Centre, Lahore, Pakistan, from October 2025 to March 2026. A total of 144 patients aged 20–40 years were randomly assigned into two groups (n = 72). Group A received an inferior alveolar nerve block with 2% lignocaine and epinephrine, while Group B received the same block plus 1 ml (8 mg) dexamethasone locally at the surgical site. Pain intensity was measured using VAS at baseline, 24, 48, 72 hours, and day seven. Analgesic consumption was recorded, and data were analyzed with SPSS version 23.
Results: The preoperative parameters did not change significantly ($p > 0.05$) between the two groups, with an average subject age of 38.47 ± 9.86. The group that received dexamethasone required fewer total analgesics within the first 24 hours after surgery ($p < 0.001$) and had significantly reduced pain levels at 24, 48, 72, and 7 days postoperatively ($p < 0.001$). The total amount of analgesic medicine utilized at any other time point did not differ significantly ($p > 0.05$).
Conclusions: Administering dexamethasone during the intraoperative phase is an efficient way to manage postoperative pain without the need for invasive treatments.

KEYWORDS: Dexamethasone; Third molar impaction; Postoperative pain; Visual Analogue Scale; Analgesic consumption

INTRODUCTION

An impacted tooth is one that partially or completely fails to achieve the normal occlusal height within their normal eruption time in the oral cavity. Third molars are the most common teeth that are impacted in the oral cavity as compared to their maxillary counterparts.[1] Mandibular third molar impaction falls between the bracket of 9.5% to 68% in different populations.[2] Frequency of third molar impaction among males and females came out to be almost equal (50.7% females versus 49.3% males) according to different authors.[3] Individuals between the ages of 20-30 years commonly seek dental treatments for symptomatic impactions.[4]
Third molar impaction surgery is very common among dental surgical procedures.[5] Symptomatic third molars present with various pathologies namely caries, pain, paresthesia, swelling, various cysts and tumors.[6] Postoperative complications after third molar surgery comprises of pain, bleeding, swelling, trismus, dry socket and nerve damage.[7] Pain after third molar surgery is a consequence of inflammation caused by tissue injury.[8] Post operative pain heightens the anxiety of patient and has an influence on wound health and healing predictability.[9] In the past, several medications have been administered to combat pain following third molar surgery. Dexamethasone, a corticosteriod is an effective medication used to combat post operative pain.[10] It primarily acts as an anti-inflammatory and has the added advantage of reducing nausea and vomiting after surgery . It is more beneficial when administered pre-operatively rather than post operatively.[11] A study by Baxendale BR et al indicated that 8mg dexamethasone injected preoperatively through the pterygomandibular space resulted in reduction of pain on third post extraction day, pain scores in this group came out to be 14.2mm as calculated on visual analogue scale with pain scores in control group being 23.3mm with a significant P value of 0.1 [12] Another study of Gozali et al indicated pain reduction with the sublingual route administration of dexamethasone. The results of his study indicated that on third post extraction day the pain score on visual analogue scale in the dexamethasone group came out to be 3.93±5.06 mm in comparison to the placebo group with pain scores of 16.02±8.28 mm and a significant P value of 0.00[13] The surgical site injection of dexamethasone as compared to I/M or I/V is less traumatic , less painful and is more effective is minimizing post operative discomfort to the patient.[14]
While the efficacy of dexamethasone as an anti-inflammatory drug has been extensively documented, the mode of administration which yields the greatest level of pain relief with the least amount of systemic exposure has yet to be determined. This is especially true regarding its local application near the surgical incision, as there is

insufficient scientific evidence to support this mode of treatment in our environment. This study seeks to determine the efficacy of dexamethasone in combination with nerve block anesthesia in alleviating postoperative pain.

METHODOLOGY

The randomized clinical trial was conducted in the Department of Oral and Maxillofacial Surgery at 28 Military Dental Centre, Lahore, for a period of six months from October 2025-March 2026. The sample size was determined based on previously reported data regarding the postoperative pain (VAS scale) after extraction of third molars. According to the data obtained on the first day after surgery, the difference in the means was 16.79, while the pooled standard deviation was 21.4.[18] With two-sided significance of 5% and 90% power, the minimum sample size was estimated at about 35 people per group. Nonetheless, in order to increase the robustness of the research, minimize variability in the subjective assessment of pain, and ensure higher accuracy and validity of the results, the sample size was increased to 72 people per group (n = 144 in total). It led to the achievement of a statistical power of almost 99.6%. A total of 169 patients were initially recruited for this study, after which 25 patients dropped out and a final sample of 144 patients completed the trial (Figure 1).

The inclusion criteria included healthy individuals who are not above 40 and not below 20 years old, either female or male, having at least one impacted third mandibular molar classified as either Class A or B and Classes I or II. In addition, their impacted molar wasmesioangular, horizontal, vertical or distoangular based on the Pell and Gregory classification as determined by radiography. Only those free of systemic illnesses such as diabetes mellitus, hypertension or ischemic heart disease were included. Patients with recent use of analgesics or other similar medication, who are pregnant, who have allergy to corticosteroids or those with teeth associated with cysts or tumours were excluded.

Approval was obtained from the Institutional Review Board vide letter no. 107/Civ/Trg/OMFS/19/2025 as well as the College of Physicians and Surgeons Pakistan before starting the study. The trial was registered in clinical trials.gov (NCT07538375). Written informed consent was taken from each patient after informing about the purpose, process, risks, and benefits of the research. Two groups were made from eligible subjects by means of non-probability sampling. The first group was treated with the inferior alveolar nerve block with the use of 2% lignocaine mixed with 1:100,000 epinephrine for the third molar extraction surgery. In addition to this anesthesia technique, the second group was provided with 1 ml (8 mg) of dexamethasone.

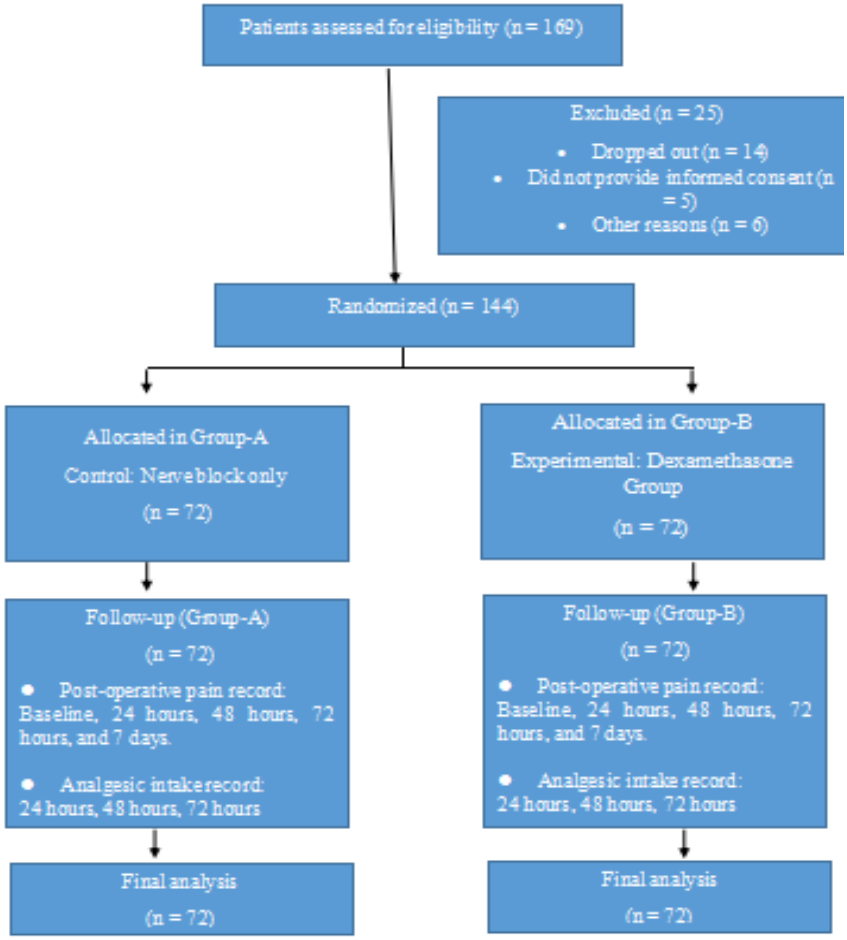


Figure 1. Patient flow diagram

The same technique of surgical management was used for both groups, i.e., flap raising, bone guttering, tooth sectioning, extraction of the third molar, and closure with 4-0 vicryl sutures. Dexamethasone was injected into the buccal vestibule of the patients of Group II.
VAS was applied on postoperative days 1st, 2nd, 3rd and 7th to assess the level of postoperative pain through telephonic interviews. The patients were also required to keep track of their analgesics usage on the first three days after surgery. All subjects were given the same analgesic dosage (Ansaid 100 mg). On the seventh day post-surgery, the subjects came back for stitch removal, and the analgesic records was also collected from them.
The analysis of data was done using statistical package for social sciences (SPSS) version 23. For categorical variables frequency and percentages and for continuous variables, mean, and standard deviation were computed. Shapiro-Wilk test was done for testing the normality of the data. The independent sample t-test was used to compare the difference in pain score between both groups. A significance level of 0.05 was used.

RESULTS

A total of 144 patients included in the study had a mean age of 38.47 ± 9.86 years with 71 (49.30%) males and 73 (50.69%) females. The groups had equivalent age and gender distribution with no statistical differences at the p value of 0.05 (Table I). The preoperative pain levels for both groups were statistically similar (p value > .05). Patients in Group B reported diminished pain levels at 24-, 48-, and 72-hours post-surgery, as well as 7 days post-operatively (p<.001) (Table II). Group B exhibited a statistically significant decrease in analgesic consumption 24 hours post-operatively (p<.001); however, no statistically significant differences in analgesic consumption were observed between groups at 48 and 72 hours post-operatively (p>.05) (Table III).

Table I. Baseline demographic characteristics of participants in the two study groups (n = 144).

Variables	**Study Groups**		**p-value**
	Group-A (n = 72)	Group-B (n = 72)	
Age Mean ± SD	39.07 ± 10.60	37.78 ± 9.01	0.432
Gender n (%)			
Male	34 (47.22%)	37 (51.39%)	0.739
Female	38 (52.78%)	35 (48.61%)	

Table II. Comparison of preoperative and postoperative pain scores (VAS) between the two study groups at different time intervals (n = 144).

Pain	**Study Groups**		**p-value**
	Group-A (n = 72)	Group-B (n = 72)	
Pre-op pain	7 (2)	7 (1)	0.084
Post-op pain 24 hours	8 (1)	7 (1)	<0.001
Post-op pain 48 hours	6 (1)	5 (1)	<0.001
Post-op pain 72 hours	4 (0)	2 (1)	<0.001
Post-op pain 7 days	1 (1)	0 (1)	<0.001

Table III. Comparison of postoperative analgesic intake between the two study groups at different time intervals (n = 144).

Analgesic Intake	**Study Groups**		**p-value**
	Group-A (n = 72)	Group-B (n = 72)	
At 24 hours	2 (1)	1 (1)	<0.001
At 48 hours	0 (1)	0 (0)	0.064
At 72 hours	0 (0)	0 (0)	0.732

DISCUSSION

The present randomized controlled trial was conducted to examine the efficacy of local dexamethasone application in alleviating pain after impaction surgery of mandibular third molars. The use of dexamethasone after surgery has proven to lead to less intense pain (assessed within 24, 48, and 72 hours after surgery) and (assessed after 7 days after surgery) in the intervention group than in the control group. Moreover, the consumption of analgesics in the intervention group was significantly lower than in the control group within the

first 24 hours after surgery; however, the significance of the difference decreased ($p>0.05$) with increasing periods of time, suggesting that dexamethasone can be used in the treatment of acute post-operative pain.

Results from the current study are well supported by a considerable amount of randomized control trials and systematic reviews. Thus, Fernandes et al. showed that the addition of dexamethasone to local anesthetics had a positive impact on postoperative pain at 1, 3, and 7 days after third molar surgery.[15] Furthermore, a triple-blind randomized controlled trial of Bravo et al. found significantly lower VAS pain score values in the dexamethasone group for days 1, 2, and 7 after surgery ($p < 0.001$) and reduced analgesic use.[16] These results are in line with those obtained in the current research, since a similar decrease in pain was observed for all postoperative periods. Troiano et al. studied the two different routes (intramuscular, IM vs submucosal) of administering Dexamethasone and found that neither were statistically different. In their comparison of these two methods, they provide the following for the days of study; Day 1: 0.05 (95% CI = (-0.55 to 0.65); p=0.87), Day 3: 0.12 (95% CI = (-0.51 to 0.75); p=0.71), and Day 7: 0.07 (95% CI (-0.19 to 0.33); p=0.58. Further, even though they did not compare the two routes of administration statistically, it was felt that the route presented as a submucosal administration method provided a positive benefit when administrated following surgery for pain control purposes.[17]

However, there are partially contradicting results from other studies. Results from the study carried out by Latt et al. reveal that individuals that were administered Dexamethasone had significantly low levels of pain intensity during their operation as measured through the visual analog scale on both the day of operation (mean visual analog scale score of 25.3 ± 23.1 versus 51.5 ± 29.1) and the next day (mean visual analog scale score of 18.6 ± 17.2 versus 35.39 ± 24.89), with statistically significant differences in pain scores on day one ($p = 0.00$) and day two ($p = 0.01$) of the operation.[18] The results from this study can be considered confirmatory of those presented in the current study. Some other research studies show opposite results and state that the analgesic effect of dexamethasone decreases over time. The reasons for such results might be found in different design characteristics of the studies like a difference in dosage (4 mg versus 8 mg), the time of administration (preoperatively versus postoperatively), and routes (IM, IV, and submucosal). Furthermore, differences in surgical complexity, operators' expertise, and patients' sensitivity to pain might also influence the findings.

The described effect of dexamethasone on pain might be accounted for from the point of its pharmacology. As it is a potent corticosteroid, dexamethasone inhibits phospholipase A2 release, therefore blocking the arachidonic acid pathway.[19,20] Inhibiting this pathway reduces the production of inflammatory mediators (e.g., prostaglandins, leukotrienes).[21] Therefore, there is minimal edema, reduced permeability of the blood vessels, and nociception. Topical application of dexamethasone in the affected area will enhance the drug concentration at the site of tissue injury.[22] It ensures that the drug exerts anti-inflammatory effects without being systemically absorbed.[23]

There is no doubt about the early effectiveness of dexamethasone, considering the significant reduction in analgesics' intake by patients after 24 hours. The lack of difference at the subsequent time intervals could be attributed to the healing process of inflammation.[24] Postoperative inflammation peaks during the first 24 to 48 hours before subsiding.[25] Personal behavioral factors that include medication adherence and pain threshold should also be considered.

While there is considerable support in the literature for these findings, there are some limitations of this study. One limitation includes the non-probability sampling to conduct the study, which limits the ability to generalize the study's conclusions to the larger population. Another limitation is that it did not take into consideration some important variables such as the degree of complexity of the procedure and/or the type of procedure performed. The follow-up period in this study was seven days, which might not provide long-term effects. In addition, the aspect of blinding was not mentioned in this study, thus introducing some bias in the outcomes.

The outcome of this study has many implications for clinical practice. Using local applications of dexamethasone appears to be a compliant and non-invasive option for managing postoperative pain from third molar surgery. This treatment option may reduce the use of systemic analgesics and reduce the possibility of adverse reactions. At a policy level, implementation of such a protocol for third molar surgery can lead to improved patient outcomes and optimal resource allocation.

Further studies should include large-scale randomized clinical trials with uniform protocols in order to prove the results of this trial. Comparing dexamethasone doses, timings, and routes of application is necessary. Moreover, it is important to analyze the impact of dexamethasone on such postoperative outcomes as swelling and trismus.

CONCLUSION

Thus, the results of this study emphasize the importance of dexamethasone in postoperative pain reduction and analgesic sparing after third molar surgery. These results lend validity to its integration into standard clinical practice to improve patient satisfaction and surgical recovery.

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