

## Preoperative Versus Postoperative Effect of Dexamethasone on Postoperative Complications Following Mandibular Third Molar Surgery

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### Abstract

**Objectives:** Dexamethasone is a steroid that has been widely used during third molar surgery to reduce acute complication associated with mandibular third molar surgery. This study compared the effect of preoperative versus postoperative oral dexamethasone on swelling, pain and trismus following impacted mandibular third molar surgery. **Materials and Methods:** A total of 138 subjects with impacted mandibular third molar referred for surgical extraction at the Oral and Maxillofacial Surgery Department of the Lagos State University Teaching Hospital Ikeja were enrolled for the study and randomised into two groups. Group A subjects had 8mg of oral dexamethasone tablets one hour before surgical extraction while group B subjects had 8mg of oral dexamethasone tablets immediately after surgery. Pain, swelling and trismus were evaluated in both groups at days 2, 5 and 7. Statistical analysis was carried out using SPSS (IBM version 23). P-value was set at <0.05. **Results:** There were 61 males and 76 females with an age range of 21-57 years and an average age of 30.7 years and 29.6 years for groups A and B respectively. The results of the study indicated that there was no statistical difference in the reduction of pain, swelling, and trismus after mandibular third molar surgeries in both groups. **Conclusion:** Therefore, dexamethasone can be used either pre-operatively or postoperatively in minimising postoperative swelling, pain and trismus following mandibular third molar surgery provided there are no contraindications to its use.

**Keywords:** Dexamethasone, preoperative, postoperative, pain, swelling, trismus.

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### INTRODUCTION

The most frequent minor surgical procedure performed by dental surgeons is the surgical extraction of the impacted third molar [1]. Morbidity from the third molar has received numerous attention in the literature [2,3]. Common sequelae associated with third molar extractions are pain, swelling and trismus [4], but less associated are sequelae such as severe infection, nerve damage, mandibular bone fracture, temporomandibular joint dysfunction and dry socket [5]. The quality of life is also adversely affected by third molar extractions which have been reported to be responsible for the loss of several useful working hours [6]. Postoperative pain, swelling and trismus are acute reversible complications of surgical removal of the impacted third molars [7]. They are generally regarded as short term outcome of third molar surgery [7]. The enormous amount of tissue injury during

impacted third molar surgery usually leads to acute inflammation in the peri-surgical period. Swelling may be significant when the surgery is prolonged and when large amounts of bone, gingiva and oral mucosa are manipulated. Proper considerations should be given to flap design, suturing technique, irrigation, medication in reducing complications and sequelae.

Surgical technique carried out with care is useful and desirable in minimising tissue damage as well as swelling. Also, a prolonged period of tooth elevation and soft tissue retraction should be avoided. Localised inflammatory pain of varying degree is the type of postoperative pain experienced following surgical removal of an impacted third molar. The release and synthesis of several biochemical mediators such as histamine, bradykinin and prostaglandins are as a result of tissue and cellular destruction [8]. Drugs such as analgesics (with anti-inflammatory effect),

long-acting local anaesthetics and corticosteroids are prescribed and used for effective reduction of pain and swelling after third molar surgery [9]. Other non-pharmacological interventions that have also been shown to reduce postoperative pain include a proper and careful surgical technique as well as a careful reflection of the flap and the use of irrigation for cooling [10].

Corticosteroids have long been used to minimise inflammatory symptoms [11]. Some publications have reported that dexamethasone (a type of corticosteroid) reduces swelling and trismus by reducing inflammatory mediators from injured tissue [11-13]. A systematic review shows a difference in post-surgical sequelae outcome following a different route of administration of glucocorticoids in third molar surgery [14]. Oral administration of dexamethasone is a simple, painless, non-invasive and cost-effective approach to minimising postoperative sequelae. There are fewer studies that compared both the preoperative and postoperative effects of dexamethasone on the sequelae of third molar surgery. Therefore, this study evaluated the effect of preoperative versus postoperative administration of oral dexamethasone on postoperative pain, oedema and trismus following impacted mandibular third molar surgery.

## MATERIALS AND METHODS

138 patients, aged between 21 and 57 years, with impacted mandibular third molar referred for surgical extraction at the Oral and Maxillofacial Surgery Department of the Lagos State University Teaching Hospital Ikeja. Health Research and Ethics Committee of the Lagos State University Teaching Hospital approved this study. Subjects were randomly allocated through balloting into two groups. Group A subjects had 8mg of oral dexamethasone tablets one hour before surgical extraction while group B subjects had 8mg of oral dexamethasone tablets immediately after surgery. Exclusion criteria included subjects with a history of allergy to dexamethasone and who are on steroid therapy, contraceptives and previous radiotherapy to head and neck region. Other exclusion criteria included subjects whose dentition lacks natural opposing central incisors or prosthetic equivalent, which would not allow standardisation of the measurement of the maximum inter-incisal opening, pregnant or lactating women, subjects below 18 years of age, and subjects with underlying systemic conditions for example ulcer and uncontrolled hypertension.

All the baseline data including age, gender, weight, height, preoperative facial width (swelling) and inter-incisal distance were measured in all studied subjects before the surgical extraction. All patients received oral antibiotics (Amoxicillin capsules (Beecham) 500mg 8 hourly for 5 days, Metronidazole tablets (Loxagyl) 400mg 8 hourly for 5days), analgesics

(Diclofenac 50mg 12 hourly for three days) and post-surgical extraction instructions.

All measurements (pain, swelling and trismus) were taken in both groups at four intervals, namely; preoperatively and at days 2, 5 and 7 postoperatively. The pain was measured using the Visual Analogue Scale (VAS), which consists of a 10cm (100mm) line, where subjects indicated their current pain intensity. The line extended from 0 to 10, where 0 represented no pain and 10 represented agonising pain. Volumetric variation (facial width /swelling) of the face was recorded using indelible ink to mark the following facial landmarks: angle of the mandible, tragus of the ear, lateral canthus of the eye and angle of the mouth. The measurement was carried out using a tape rule (Figure 1). Each measurement was repeated twice, and the mean reading was recorded. Trismus was evaluated by measuring the maximum interincisal distance using a divider. The measurement was taken from the incisal edge of the upper right central incisor to the incisal edge of the lower right central incisor.

Statistical analysis was done using the Statistical Package for Social Sciences (IBM) 23.0 version. The significant level was set at a p-value of <0.05 at 95% Confidence interval

## RESULTS

138 patients who satisfied inclusion criteria consented and participated in the study. The male to female ratio was 1: 1.3. While the overall mean was  $\pm$ SD 30.07 $\pm$ 8.2 years. The minimum and maximum age were 21 and 57, respectively. Age range between 25-29 years was the most represented.

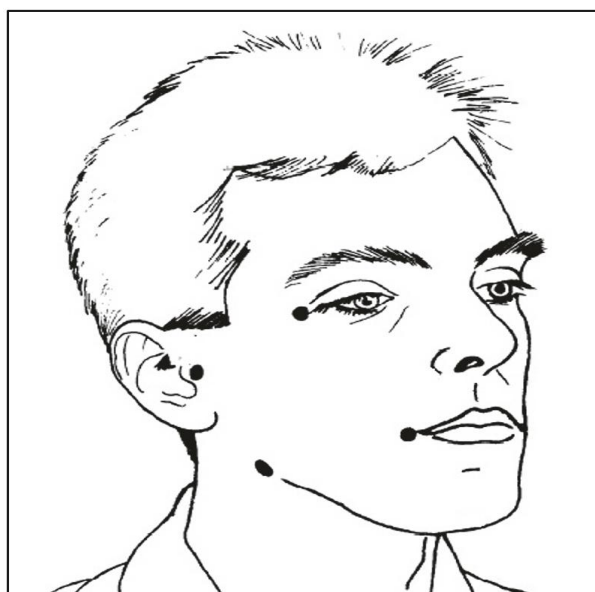
The median VAS of pain for both groups at baseline was 0(0.0, 0.3). While the median VAS of pain for both groups at different days showed no significant difference ( $p>0.05$ ) Table 1.

Mean length of the angle of the mouth to tragus in the group A at baseline was 11.91 $\pm$ 0.8 while it was 11.94 $\pm$ 0.2 in group B. There was no significant statistical difference between baseline length of the two groups ( $p=0.842$ ). Also, mean length of the angle of mouth to tragus showed a minimal increase in group B compared to group A at day 2, 5 and 7, although not statistically significant ( $p>0.05$ ) Table 2.

Also, no significant difference in the mean length of the angle of the mandible to external canthus of the eye in groups A and B at different days ( $p>0.05$ ) Table 3.

The mean length of the angle of the mandible to the angle of the mouth showed no significant difference in both groups at different days ( $p>0.05$ ) Table 4.

In addition, there was no significant difference in the inter- incisal distance in both groups at different days ( $p>0.05$ ) Figure 2.



**Fig-1: Facial landmark used in assessing, Pain, swelling and trismus**

**Table-1: Median comparison of VAS of pain between the groups at the different days**

	Group A Median (Q1, Q3)	Group B Median (Q1, Q3)	U-value	p-value
Before intervention	0.0 (0.0, 3.0)	0.0 (0.0, 3.0)	-0.379	0.705
Day 2 after intervention	1.0 (1.0, 2.0)	1.0 (1.0, 2.0)	-0.318	0.750
Day 5 after intervention	1.0 (0.0, 2.0)	1.0 (0.0, 2.0)	-0.299	0.765
Day 7 after intervention	1.0 (0.0,2.0)	1.0 (0.0, 1.0)	-0.969	0.333

Q1: First quartile, Q3: Third quartile; U-Man Whitney U value

**Table-2: Mean comparison of the length of the angle of the mouth to tragus in study groups**

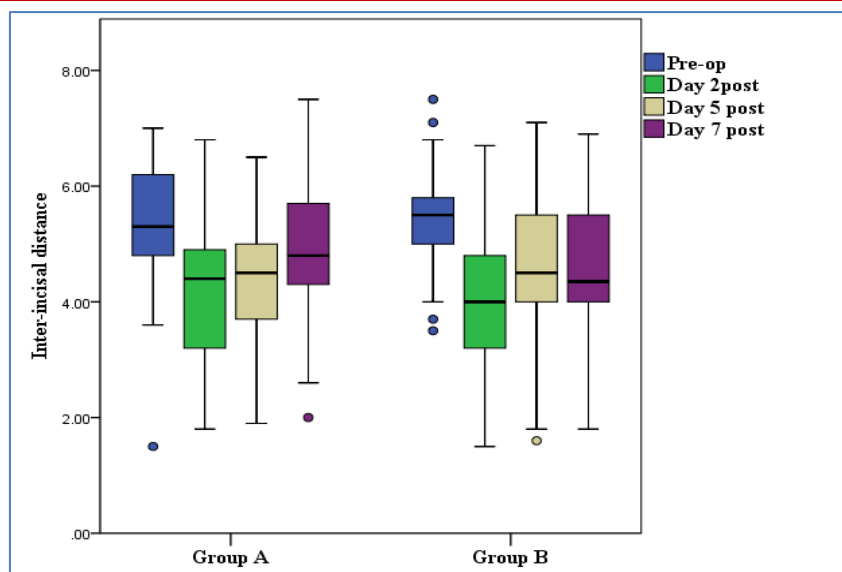
	Group A Mean±SD	Group B Mean±SD	t-value	p-value
Before intervention	11.91±0.8	11.94±0.2	-0.201	0.842
Day 2 after intervention	11.87±0.8	11.94±0.8	-0.383	0.702
Day 5 after intervention	11.84±0.9	12.09±0.7	-1.403	0.165
Day 7 after intervention	11.81±0.8	11.91±0.7	-0.682	0.497

**Table-3: Mean comparison of the length of the angle of the mandible to external canthus of the eye in study groups**

	Group A Mean±SD	Group B Mean±SD	t-value	p-value
Before intervention	10.84±0.8	10.80±0.7	0.282	0.779
Day 2 after intervention	10.91±0.8	10.77±0.7	0.851	0.397
Day 5 after intervention	10.81±0.7	10.71±0.7	0.639	0.525
Day 7 after intervention	10.74±0.7	10.65±0.7	0.574	0.567

**Table-4: Mean comparison of the length of the angle of the mandible to angle of the mouth in study groups**

	Group A Mean±SD	Group B Mean±SD	t-value	p-value
Before intervention	9.98±1.0	9.75±0.8	1.256	0.213
Day 2 after intervention	10.03±0.9	9.95±0.7	0.418	0.677
Day 5 after intervention	10.04±0.9	9.96±0.7	0.438	0.662
Day 7 after intervention	9.91±0.7	9.85±0.7	0.386	0.701



Group A: F-value=0.321, p=0.611, Group B: F value=1.45, p=0.431

**Fig-2: Box plot showing the Inter- Incisal distance within group A and B**

## DISCUSSION

The extraction of the impacted mandibular third molar is one of the most frequently performed procedures in oral and maxillofacial surgery and can lead to immediate postoperative discomfort [15]. Despite the numerous studies on the impacted mandibular third molar, postoperative swelling, pain and trismus remain a subject of great concern to many clinicians [16, 17]. Significant affectation of patient's daily activities following third molar surgery has been well documented, and most authors postulate that postoperative quality of life in this type of surgical intervention can lead to a transitory functional alteration in the masticatory functions [18-20]. The anti-inflammatory effects of glucocorticoids are well documented [21, 22]. The primary mechanisms of action are thought to involve suppression of leucocyte and macrophage accumulation at the site of the inflammation and prevention of prostaglandins formation [23]. In this study, dexamethasone was chosen because of its higher potency, low sodium retaining ability and longer half-life [22]. Also, 8mg dexamethasone was used because it was the least amount with the best benefits that can be achieved. The daily output of cortisol is nearly 15-25mg, but up to 300mg of cortisol can be released in a time of crisis and the 8mg dexamethasone is almost equivalent to this amount of free cortisol [24]. The method used was simple, appropriate and readily accepted by the patient.

Also, oral dexamethasone administration involves later onset of effect, which is inherent to its pharmacokinetics and requires patients' cooperation. However, it is a convenient, safe and low-cost route. Our study showed that oral dexamethasone was effective to control pain and oedema during the studied period.

In this study, both groups did not have pain, as shown in the baseline values table. Both groups had 50mg diclofenac tablets, twelve hourly for three days. The synergistic effects of both drugs were responsible for the mild pain felt through days 2, 5 and 7, and this concurs with some studies which have also reported none to mild pain [24, 25]. This is in contrast to studies which say pain experienced by patients undergoing surgical extraction of the third molar has its highest intensity in the first three days postoperatively which gradually diminishes in intensity to postoperative day seven [26, 27].

Post-surgical facial oedema is challenging to quantify because it involves three dimensions of measurement with an irregular convex surface and can manifest itself both internally and externally as well [28]. Measurement of craniofacial reference point was used to determine facial swelling in this study. Although this technique is not as reliable as computerised tomography (CT) scan or magnetic resonance imaging (MRI) for making accurate measurements of facial soft tissue swelling, it is a non-invasive, simple, cost-effective and time-saving method which provides numerical data for determination of soft tissue contour changes. Many clinicians have used this method with a satisfactory outcome [29, 30]. In this study, it could be inferred that there was no swelling along the plane from the tragus of the ear to the angle of the mouth because at day 7 the mean value was less than the baseline values in both groups. Swelling along the external canthus of the ear and the angle of the mandible peaked on day 2 and gradually reduced at day 5 and 7 in both groups. Similarly, swelling along the angle of the mandible and angle of the mouth peaked at days 2 and 5 for both groups and reduced at day 7. In both groups, the swelling reduced, and there was no statistical difference between the two groups. This is

inconsistent with reports that the intensity of swelling peaks in the first days (48-72 hours) postoperatively but diminishes at day 7 [26, 27].

It is generally reported that there is a mutual correlation between trismus, swelling and pain [31, 32] and that severity of postoperative pain determines the extent of trismus [33]. The time course for trismus and concurrent limitation in oral function described in the current study agree with findings that indicate that trismus reached a peak on days 1 and 2 postoperatively and gradually resolved by day 7 [34]. Considering the measurement of the mouth opening before intervention and measurement after day 7, it was observed that there was no statistical difference between the two groups, this is in agreement with findings of previous reports [12, 13, 32, 35].

## CONCLUSION

This study showed that there is no difference in the effect of preoperative and postoperative administration of oral dexamethasone. However, the study was able to demonstrate a significant benefit of using dexamethasone and analgesics in minimising postoperative complication following mandibular third molar surgery.

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