

## DIFFERENT MODALITIES USED IN CONTROLLING POSTOPERATIVE SEQUELAE AFTER SURGICAL REMOVAL OF IMPACTED MANDIBULAR THIRD MOLAR: A COMPARATIVE STUDY

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### ABSTRACT

**Objectives:** Comparing the effects of submucosal dexamethasone injection, Twin Mix injection, and drain placement on controlling the postoperative sequelae after surgical removal of impacted mandibular third molar

**Material and Methods:** 64 patients were selected randomly from Oral and Maxillofacial Surgery Department at Mansoura University. They were divided into four equal groups according to the surgical technique and its modifications. 16 patients were included in each group: The submucosal injection group received dexamethasone injection in the buccal vestibule preoperatively, the Twinmix group received Twin Mix solution injection in the pterygomandibular space preoperatively, the drain group received a tube drain placed submucosally at the buccal vestibule while the control group; had a conventional surgical technique applied. The participants were assessed for pain using visual analog scale (VAS), swelling using facial edema lines, and trismus by a maximum interocclusal opening (MIO) measurement at immediate postoperative period, two days and seven days follow up periods.

**Results:** The analysis of pain using VAS showed significant statistical differences in values recorded at all-time intervals. Meanwhile, evaluation of edema revealed that there was a significant statistical difference between the groups at values recorded at the second day follow up (P=0.005). Furthermore, no statistically significant difference was showed regarding MIO between all groups at all-time intervals

**Conclusions:** Submucosal and Twinmix groups had a better pain control than the drain and control groups. The submucosal group showed the best outcome with regards to swelling. None of the studied groups showed a significant difference concerning trismus.

**Key words:** Dexamethazone, impaction, submucosal, Twin Mix, Third molar.

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## INTRODUCTION

The surgical removal of third molars is the most common oral surgical procedure performed worldwide. Tooth impaction is a pathological situation in which a tooth cannot erupt into its normal functioning position. Meanwhile, the mandibular third molars are the most common teeth to be impacted in humans.<sup>(1)</sup> During their surgical removal, the procedure causes damage to soft and hard tissues leading to an inflammatory reaction. Pain, trismus, and swelling are the most frequently reported postoperative sequelae. They appear as a direct and immediate consequence of the surgical procedure.<sup>(2)</sup>

The literature is full of techniques and modifications that were developed to control the immediate inflammatory response associated with third molar surgery. These surgical modifications are concerned with the flap design, bone removal procedures, suturing protocols, drain placement, distal window technique, and other local measures.<sup>(3-4)</sup> Others introduced pharmacological therapy with different administration routes ranging from systemic to local.<sup>(5-7)</sup>

The use of corticosteroids within oral surgical interventions pre or postoperatively was advocated in the late 1960s.<sup>(5)</sup> The most commonly used types were dexamethasone and methylprednisolone because they are almost pure glucocorticoids with little mineralocorticoid effect. They have the most potent anti-inflammatory effect, the most prolonged half-life and have the least depressing effect on leukocyte chemotaxis. Different methods of administration have been introduced. There are several conventional methods of administering steroids, including either per-oral, intramuscular, intravenous, and submucosal routes.<sup>(8)</sup>

Nowadays, the modern practice of administration like an intra-space injection of dexamethasone within the pterygomandibular space as 'Twin Mix'.<sup>(9)</sup> Its advantages include ease of administration, single prick for dual drug delivery, the lesser sting

of local anesthetic injection due to altered pH of the combination, shortening the latency and prolonging the duration of the soft tissue anesthesia along with improving the quality of life in the postoperative period after surgical extraction of mandibular third molars.

Meanwhile, drainage has been adopted with different application techniques. Certain authors have applied various drains as tube drains, rubber drains, and drug impregnated gauze drain.<sup>(10,11)</sup> Moreover, some authors modify suturing techniques like a single stitch, multiple stitches, and sutureless techniques. The rationale of these drainage protocols is to minimize the postoperative sequelae through preventing any accumulation of excess exudates within tissue or hematoma formation under the flap.<sup>(12)</sup>

Based on the aforementioned debate, this study was directed to compare between three different modalities namely submucosal steroid injection, Twin Mix protocol, and buccal drain placement, used for controlling the postoperative sequelae after surgical removal of impacted mandibular third molar.

## MATERIALS AND METHODS

### Study population and entry criteria

The present study was conducted in accordance with the seventh revision of Helsinki Declaration in 2013 and approved by Ethical Committee of Faculty of Dentistry, Mansoura University, Egypt number (A13060819). Patients were selected from outpatient clinic in the Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Mansoura University, for surgical removal of their impacted third molars. The inclusion criteria included patients over 18 years of age, medically free and diagnosed with impacted lower wisdom with moderate to severe difficulty score on Pederson score index (5-10). The exclusion criteria included Pregnant or breastfeeding women, allergy associated with any of the study drugs, poor patient cooperation, acute inflammatory status of the wisdom or pericoronitis, and trismus.

### Study Design and Sample Distribution

Sixty-four patients were diagnosed clinically and radiographically with an impacted lower third molar and were classified according to their surgical difficulty using Pederson's score to be included in the study. The study design was conducted as a prospective randomized, double-blind clinical trial. The randomization of the patients was done by one of the senior residents in the department, not included in the study, and not aware of any related treatment protocol. All patients were operated by the same blind operator and neither involved in the evaluation nor the distribution process. The assessor did all the evaluation steps during the follow up periods and completely blind with the treatment protocol.

A brief explanation of the procedures, the possible postoperative complications, and periods of follow-ups were informed to all patients. All the patients were included for the study after they signed a written informed consent for the trial. Patients were distributed into four equal uniform groups of the same moderate to severe difficulty score surgical:

**First group:** it included sixteen patients who received 1ml Dexamethazone 8mg/2ml as a submucosal injection in the buccal vestibule near the site of surgery preoperatively.

**Second group:** it included sixteen patients who received 2.8 ml of Twin Mix solution in the pterygomandibular space preoperatively

**Third group:** it included sixteen patients who had a surgical tube drain inserted buccally for two days.

**Fourth group:** it included sixteen patients who underwent the conventional technique with no modification as a control group.

The personal data, past dental and medical history, chief complaint, and a thorough clinical and physical examination were collected from each patient through an examination sheet. All

patients underwent radiographic examination using Orthopantomogram (OPG), and Pederson score was calculated. No antibiotics nor anti-inflammatory drugs were prescribed to any of the patients prior to surgery.

### Surgical procedures

Patients were asked to rinse with a mouth rinse (Hexitol, Arab Drug co., Egypt). Local anesthesia is administered as an inferior alveolar and long buccal nerve blocks except for the Twin Mix group. Twin Mix is prepared as a mixture of a 1.8ml Mepivacaine - HCL 2% with levonordefrin (1:20000) (Mepivacaine -L 2%, Alexandria co., Egypt) and 1ml Dexamethasone (Dexamethasone, Medical Union Pharmaceuticals MUP, Egypt) forming a 2.8 ml solution that was injected in the pterygomandibular space in the Twin Mix group by using spinal needle (gauge 27- Grey colored) attached to 3 ml plastic syringe.<sup>(8,9)</sup> In cases of the submucosal group, after anesthesia administration 1ml Dexamethasone was injected in the buccal vestibule.

A full mucoperiosteal envelope flap extended to include the second molar tooth to permit access to the impacted tooth and surrounding bone was done using no.15 surgical blade mounted on Bard Parker handle no.3. The flap was reflected using molt no.9 mucoperiosteal elevator. A deep vertical gutter alongside the buccal aspect and distal one, when required, was done. According to the type of impaction, a tooth lock removal (mesially or distally) or crown sectioning or decapitation was done to facilitate tooth delivery without the need for extra bone removal.

In the drain group, a white colored surgical tube drain of about 2mm bore, and 2 cm long was placed under the flap buccally allowing its end to come out through a 3mm incision in the buccal vestibule opposite to the first and second molar contact in the envelope flap. Those patients were instructed for drain removal after the second postoperative day.

After tooth delivery, any bony irregularities should be smoothed using a bone file, and the tooth follicle should be removed using a bone curette. The flap was repositioned in its original place and sutured using non-resorbable 3/0 silk suture (Silk, GMS, Alexandria, Egypt) in a single interrupted manner. All patients were prescribed amoxicillin/ clavulanic acid (Augmentin, GlaxoSmithKline GSK, England) tablets 1gm twice daily for three days, 500 mg paracetamol tablets (Paracetamol, El Nasr, Egypt) twice daily for three days and chlorhexidine 0.125% mouth rinse three times daily for seven days. After one week, the sutures were removed.

All patients were assessed immediately preoperative (T0), immediately postoperative (T1), two (T2) and seven days (T3) postoperatively. Pain threshold measured through Visual analog scale (VAS).<sup>(10)</sup> The maximum interincisal opening (MIO) was measured between the incisal edges of upper and lower incisors at the dental midline by a Boley gauge.<sup>(11)</sup> Facial edema was assessed through three lines using a thread with two mosquitoes to measure distances from center of tragus to soft tissue pogonion, center of tragus to commissure of mouth, and lateral palpebral fissure to the angle of the mandible. The sum of the three distances is used as an indicator for facial swelling.<sup>(12)</sup>

### Statistical Analysis

Data were analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Qualitative data were described using the number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution of the quantitative data. Student t-test was used to compare between two studied groups. While, a two-way ANOVA test was used to compare between more than two periods or stages, and Post Hoc test for pairwise comparisons for more than one variable. Mann Whitney test for assessment of quantitative variables was used to compare between the two studied groups. Significance of the obtained results was judged at the 5% level.

## RESULTS

### Demographic data

This study was conducted on 64 patients divided equally into four groups. The patients were composed of 40 females (62.5%) and 24 males (37.5%). The patient's ages ranged from 18-45 years, with an average mean  $26 \pm 6$  years. There was no statistically significant difference regarding gender, age as well as Pederson score between different groups ranging from 5-9 with an average mean of  $5.78 \pm 0.82$ . (Table 1)

The most commonly impaction type according to winter classification in this study was the mesioangular (41.37%), followed by the vertical (24.13%), then the horizontal and distal equally presented (17.25% each). There was no side predilection. All patients were randomly distributed among different groups according to Pederson difficulty score. None of the patients were lost to follow-up visits nor failed to complete the required post-operative follow up questionnaire. The surgery time ranged from 25 to 40 min. There were no cases with wound infection, dehiscence, alveolar osteitis, or any other complication not included in the study.

### Pain assessment using VAS

The analysis of pain using the visual analog scale showed no significant statistical differences between different group values at T0 ( $P=0.849$ ). However, there were statistically significant differences in values recorded at T1, T2, and T3 ( $P=0.03$ -  $<0.001$ -  $<0.001$  respectively). Additionally, it is worth mentioning that there were statistically significant differences between groups (I) and (IV) at T1, T2, T3 ( $p=0.006$ ,  $0.001$ ,  $0.008$  respectively), and between-group (II) and (IV) at T2, T3 ( $p=0.003$ ,  $0.018$  respectively). Moreover, there were statistically significant differences between groups (I) and (III) at T1, T2, T3 ( $p=0.016$ ,  $<0.001$ ,  $<0.001$  respectively) and between-group (II) and (III) at T2, T3 ( $p<0.016$ ,  $p=0.001$  respectively). (Table 2)

Notably, there is no significant statistical difference between group (I) and (II) as well as between subgroups (III) and (IV) during all different time intervals of assessment.

**Swelling assessment using facial edema lines**

Regarding edema assessment, there were no statistically significant differences between different subgroups at T0 (P=0.052). Meanwhile, the evaluation of edema revealed that there was a significant statistical difference between the

included groups at values recorded at T2 (P=0.005), although there were no statistically significant differences on values recorded at T1 and T3 (P=0.03, 0.608 respectively). Also, there was a statistically significant difference between groups (I) and (IV) at T2 (p=0.003). (Table 3)

Naturally, there were no statistically significant differences between different group values at T0 (p=0.942). But also, no statistically significant differences were detected at T1, T2, and T3 (P=0.094 - 0.108 - 0.179 respectively). (Table 4)

TABLE (1): Baseline characteristics of the subjects in the different study groups (Age, sex, Pederson score).

Groups	I Sub mucosal (n = 16)		Group II Twin Mix (n = 16)		Group III Drain (n = 16)		Group IV Control (n = 16)		P
	No.	%	No.	%	No.	%	No.	%	
<b>Sex</b>									
Male	6	37.5	6	37.5	4	25.0	8	50.0	0.957
Female	10	62.5	10	62.5	12	75.0	8	50.0	
<b>Age (years); mean ±SD</b>	25.0 ± 5.29		28.50 ± 8.07		25.0 ± 5.63		25.25 ± 5.09		0.607
<b>Pederson score; mean ±SD</b>	5.50 ± 0.53		5.88 ± 1.13		5.75 ± 0.89		6.0 ± 0.76		0.685

*P: significance difference value between the studied groups (\*: means statistically significant at P≤0.05)*

*SD: standard deviation*

TABLES (2): VAS scores; the mean, standard deviation, and level of significance.

Groups	I) Sub mucosal (n = 16)	II) Twin Mix (n = 16)	III) Drain (n = 16)	IV) Control (n = 16)	P
<b>Immediate Before (T0)</b>	5.0 ± 1.31	4.63 ± 1.60	5.25 ± 2.05	4.13 ± 1.46	0.489
<b>Immediate After (T1)</b>	4.0 ± 1.31	5.25 ± 0.89	6.0 ± 1.31	6.25 ± 2.19	0.030*
Pcontrol	0.006*	0.273	0.742		
Sig bet groups	P1=0.100	P2= 0.016*	P3=0.443		
<b>2 day (T2)</b>	3.25 ± 0.89	3.50 ± 1.07	7.0 ± 0.76	6.25 ± 1.39	<0.001*
Pcontrol	0.001*	0.003*	0.552		
Sig bet groups	P1=0.745	P2<0.001*	P3<0.001*		
<b>7 day (T3)</b>	1.13 ± 0.35	1.25 ± 0.46	4.25 ± 1.75	4.0 ± 2.73	<0.001*
Pcontrol	0.008*	0.018*	0.337		
Sig bet groups	P1=0.778	P2<0.001*	P3=0.001*		

*P: significance difference value between the studied groups (\*: means statistically significant at P≤0.05)*

*Pcontrol: P value comparing between control and other groups*

*P1: P value comparing between submucosal and Twinmix groups*

*P2:P value comparing between submucosal and drain groups P3:P value comparing between Twinmix and drain groups*



TABLES (3): Swelling measurements; the mean, standard deviation, and level of significance.

Groups	I Sub mucosal (n = 16)	II Twin Mix (n = 16)	III Drain (n = 16)	IV Control (n = 16)	P
Immed Before (T0)	37.71 ± 0.93	38.91 ± 2.07	37.50 ± 1.23	37.02 ± 0.60	0.052
Immed After (T1)	38.82 ± 1.14	39.66 ± 2.01	38.82 ± 1.92	38.85 ± 0.90	0.655
2 day (T2)	38.04 ± 1.05	39.42 ± 2.25	40.35 ± 2.25	41.34 ± 0.57	0.005*
P control	0.003*	0.0135	0.0659		
Sig. bet. groups	P1=0.392	P2=0.053	P3=0.659		
7 day (T3)	37.80 ± 1.05	38.88 ± 2.10	38.37 ± 2.31	38.76 ± 1.08	0.608

*Trismus assessment using MIO values*

TABLE (4): MIO measurements; the mean, standard deviation, and level of significance.

Groups	I Submucosal (n = 16)	II Twin Mix (n = 16)	III Drain (n = 16)	IV Control (n = 16)	P
Immed Before (T0)	39.75 ± 6.61	41.63 ± 7.09	41.0 ± 6.97	40.25 ± 5.20	0.942
Immed After (T1)	35.0 ± 5.40	36.63 ± 6.14	32.75 ± 4.62	30.75 ± 1.39	0.094
2 day (T2)	39.38 ± 4.84	40.25 ± 4.65	33.75 ± 9.69	35.0 ± 2.93	0.108
7 day (T3)	40.38 ± 5.58	43.25 ± 5.09	40.0 ± 6.28	37.50 ± 2.20	0.179

**DISCUSSION**

Morbidity following lower third molar surgery still remains a great concern to many clinicians since it is considered as the most common oral surgical procedures.<sup>(1)</sup> Authors believed that the local administration of steroids seemed to have a significant role in pain control since eicosanoids act locally on the tissues from which they are released. The steroids act directly on such eicosanoids and hence prevent inflammatory processes. Moreover, locally applied glucocorticoids have a direct inhibitory effect on signal transmission in nociceptive C-fibers.<sup>(13)</sup>

The advantages of submucosal injection appear in terms of its repository action owing to the high drug concentration near the surgical site, avoidance of an additional injection and low

systemic absorption of the drug minimizing its systemic effects.<sup>(5)</sup> Meanwhile, the advantages of the intra-space injection of dexamethasone in the pterygomandibular space as Twin mix protocol includes ease of administration, a single needle prick (used in anesthesia of inferior alveolar nerve block), less sting on injection (due to increase in the pH of the anaesthetic solution), short latency and prolonged duration of the soft tissue anaesthesia along with improving the quality of life in the postoperative period after surgical extraction of mandibular third molars.<sup>(4)</sup>

Alternatively, the drain protocol was introduced as a drug-free procedure to control postoperative sequelae, eliminating pharmacological side effects. It combines the benefit of complete wound closure allowing primary healing and minimizing

dehiscence as well as draining any exudates that share in postoperative discomfort.<sup>(14)</sup>

Concerning pain assessment using VAS, our results showed an intergroup statistically significant difference between the submucosal group and the control group at all time intervals. Our findings were compliant with Chugh A et al,<sup>(5)</sup> who noted that the preoperative submucosal use of steroids could reduce pain after the surgical removal of impacted mandibular third molars at all time intervals. In contrast to our finding, Grossi GB et al,<sup>(15)</sup> and Mojsa I,<sup>(16)</sup> revealed that there was no significant difference between submucosal and control groups at all time intervals.

Our findings revealed that there was no intergroup statistically significant difference between submucosal group and Twin Mix group at different time intervals. Such outcome was consistent with the study of Bhargava D et al,<sup>(4)</sup> who noted that intra-space injection of dexamethasone in the pterygomandibular space as Twin mix had similar clinical effects to conventional administrative routes.

The effects of corticosteroids on pain may be attributed to the decrease in lipoxigenase and cyclooxygenase products resulting from the suppression of phospholipase, a reduction in bradykinin and an increase in the concentration of the nerve proteins secreted from the peripheral nervous system.<sup>(17,18)</sup>

In concurrence with our study, kumar B et al,<sup>(19)</sup> found that there was no inter group statistical significant difference between drain modification and the standard triangular technique with regard to pain at different time intervals. In contrary to our results, koyuncu B et al,<sup>(14)</sup> and Handa I et al,<sup>(20)</sup> found that there was a significant difference in favor of the drain modification associated with triangular flap.

About the edema assessment, there were no statistically significant differences between values of all groups at all time intervals. Such finding can

be explained according to the study performed by Moraschini V et al,<sup>(21)</sup> who stated that flap elevation and tissue manipulation during surgery could affect the concentration of the injected drug and impede its absorption.

With regard to the drain group, there was no statistically significant difference between different follow up time intervals. This result was in contrast with the findings of different studies who found the facial swelling to be significantly less with drain group.<sup>(14,19,20)</sup>

Authors believed that administering dexamethasone can affect the early stages of the inflammatory process by inhibiting the generation of leukotrienes and prostaglandins, thus lessening the tissue exudate and subsequent edema. The onset of facial swelling is gradual, with a peak at 48 hours after surgery. Such a role can explain the direct positive impact of submucosal dexamethasone application rather than the use of the Twin Mix protocol.

Upon evaluating trismus, our results showed no statistically significant difference between submucosal and control groups at all time intervals. These results were in agreement with the findings of the meta-analysis study performed by Moraschini V et al,<sup>(21)</sup> and the study by Grossi GB et al,<sup>(15)</sup> where they both found no statistically significant difference between the submucosal and the control groups at all time intervals regarding trismus.

Contradicting our findings, are Chugh A et al,<sup>(5)</sup> and Mojsa I et al,<sup>(16)</sup> who found a statistically significant decrease in trismus with the submucosal group. Bhargava D et al,<sup>(4)</sup> noted that the intra-space injection of dexamethasone resulted in a substantial reduction in trismus in favor of Twin mix protocol when compared with the control group.

The explanation of the sub-optimal effect of the drain is attributed to some drawbacks over other techniques. The surgery duration was found to be longer with the drain group, due to the time needed for insertion of the small tube drain. The psychological effect of the drain's presence makes the patient

uncomfortable to widely open his/her mouth in fear of embarrassment or dislodgment. Drains act as a two-way conduit, and the use of it must be weighed against possible ensuing infection. Additionally, the presence of a drain in a surgical wound for two days may cause delayed healing. Finally, Liu S et al,<sup>(22)</sup> thought that frictional irritation to buccal cheek and masseter muscle insertion associated with the tube drain leads to a decrease in the ability of mouth opening due to the resulting discomfort.

Within the limitations of the study, we note that the submucosal injection of dexamethasone, and Twinmix groups showed an optimal reduction in the signs and symptoms resulting from impacted third molar surgery, especially pain. The drain protocol resembles a drug-free alternative only if pharmacological techniques are contraindicated. None of the studied groups showed a significant difference concerning trismus.

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