

# The Effects of Intraoperative Placement of Tetracycline, Tetracycline + Gelatin Sponge, and Placebo on Postoperative Dry Socket Incidence After Mandibular Molar Extraction: (A Comparative Prospective Study)

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## Abstract

**Background:** The aim of the study evaluation Of tetracycline, tetracycline plus gelatin sponge efficacy in lowering dry socket incidence among patients experienced extraction procedure for mandibular molars compared to control group..

**Material and Methods:** The sample was divided into three groups each group have 30 patients (34 male and 56 female) :

- Group A (patients dealt without intra-socket tetracycline) in which only applying figure of 8 suturing and dressing adhesive material for sockets.
- Group B (patients managed with intra-socket tetracycline alone) in which patients managed after extraction with tetracycline solution, figure of 8 suturing and dressing adhesive material.
- Group C (patients managed with intra-socket tetracycline plus gelatin sponge complex) in which patients managed after extraction with tetracycline-gelatin sponge vehicle, figure of 8 suturing and adhesive dressing material.

**Results:** Dry socket following extraction was encountered in 4 female patients, with an incidence of 4.4%. Group A reported the highest number.

**Conclusions:** In spite of the limits of this clinical trial, the placement of tetracycline as intra-socket medicament serve in a good choice for treating extracted socket, by reducing bacterial load that will result in lowering the possible chances of infection thus relieving pain, on the other hand the Ora-aid dressing material serve a good way accompanied with suturing in avoiding dry socket occurrence.

- (Thai Clinical Trial Registry TCTR20230724006).

**Keywords:** Dental extraction, dry socket, dental pain, mandibular molar extraction

## INTRODUCTION

Tooth extraction is considered to be the most used procedure which is done by dentists; it is often associated with trismus, swelling and pain. As a result of extraction it will cause pain

which differs from one patient to another and it differs in the same patient among his or her other teeth [1].

Complications are events that tend to increase the morbidity, beyond what could be expected from procedure under normal situations. They could range from common ones, like dry socket, to uncommon and serious ones [2]. postoperative complications, like mouth opening limitation, swelling, dry socket, pain and inferior alveolar nerve injury, however, may be associated with the extraction of an impacted third molar [3]. Further, dry socket is a post-extraction socket where some or all of the bone within this socket, or around it, are exposed in the days following the dental extraction, because the bone having not been covered by an initial and persistent blood clot or having not been covered by a layer of vital, persistent, healing epithelium [4].

The basic treatment for dry sockets is to irrigate out the food particles or bacterial material by using normal saline solution or chlorhexidine and then occupy the socket with a medicament [5]; the operator might suture the lesion for retaining the medicament or blood clot. The objective of treating a dry socket is to optimize the lesion so that the socket could optimally be capable of forming an enduring layer of epithelium that covers the exposed bone inside the socket and around the socket occlusal perimeter [6].

Dressings the sockets is the most useful healing medicaments including broad spectrum antibiotics specifically tetracycline and clindamycin. Gelatin-sponge, are used as clot stabilizing sockets [7]. Tetracycline is a bacteriostatic antibiotic which acts active against Gram + and Gram – bacteria, by blocking the protein synthesis and binding to the ribosomal subunit [8].

The gelatin sponge (Gelfoam), as an effective and economical clot stabilizer, is purified porcine skin gelatin without which the sponge would simply slough from the socket [9]. However, as an attachable intraoral wound dressing, the Ora-aid presents a reasonable advantage as the manufacturer illustrates that it:

1. protects intraoral wounds from food, bacteria, and cigarette smoking,
2. aids in hemostasis,
3. protects suture thread from tongue irritation,
4. is a self-adhesive with saliva and strong adhesion,
5. is easy to cut into different shapes\sizes, and
6. contains vitamin E.

## MATERIAL AND METHODS

This clinical prospective comparative study was conducted from December 2021 to August 2022 in the College of Dentistry Teaching Hospital, Department of Oral and Maxillofacial Surgery/oral surgery Unit/ University of Baghdad and Al-Shaab Specialized Dental Center. A total of 90 Iraqi patients aged 18-60 years (56 females and 34 males) met the eligibility criteria and enrolled in this study. The sample was divided into three groups:

- Group A includes patients treated without intra-socket tetracycline and to which only was a figure of 8 suturing and dressing adhesive material for sockets applied.
- Group B includes patients treated with intra-socket tetracycline alone and dealt after extraction with tetracycline solution, a figure of 8 suturing and dressing adhesive material.
- Group C includes patients treated with intra-socket tetracycline plus gelatin sponge complex and managed after extraction with tetracycline-gelatin sponge vehicle, a figure of 8 suturing and adhesive dressing material.

## Ethical Approval

The Research Ethics Committee at the College of Dentistry, University of Baghdad approved the protocol of this study, protocol reference number 416121, and every patient signed an informed consent to participate in

this study. The Thai Clinical Trial Registry (TCTR) assigned this study registration number **TCTR20230724006**.

### **Eligibility criteria**

These criteria include:

1. patients over 18 years of age.
2. absence of general medical contraindications for oral surgery procedures like jaws pathology, uncontrolled diabetes, uncontrolled hypertension).
3. mandibular molar teeth indicated for extraction.

### **Exclusion criteria**

These criteria include:

1. patients who were immune-compromised with systemic disease, pregnant or lactating women.
2. patients with acute, chronic infection.
3. teeth with peri-apical cyst.
4. patients allergic to tetracycline.
5. poor compliance.
6. mandibular molars requiring surgical extractions (either sectioning or flap releasing).
7. impacted mandibular third molar.

### **Preoperative assessment, clinical and radiological examinations**

#### **History**

Patients were inquired in details about medical, dental and family history to see if they had any systemic diseases that might affect pain intensity.

#### **Clinical examination**

##### **Extraoral**

A clinical examination was performed for the patients to evaluate regional lymph nodes, facial profile.

##### **Intraoral**

The intraoral examination assessed mouth opening, oral hygiene, and periodontal status. All teeth are inspected for caries and gingival condition, and checking the accused tooth who met the criteria of the study.

### **Radiographical, periapical radiograph**

For some patients, a periapical radiograph was taken for the accused tooth in order to exclude the presence of any lesion patient's preparation. First of all, the extraction procedure was explained to the patients in simple words with the possible intra-operative and post-operative complications. Following the verbal approval of the patients to participate with the current study, they signed a special consent form. This was followed by the application of disposable sterile surgical drapes.

### **The Extraction Procedure**

Block anesthesia for the inferior alveolar nerve along with buccal infiltration for the long buccal nerve was established. After few minutes the anesthetic effect will be secured, a dental probe is utilized to separate the tooth from the surrounding soft tissue, after that the extraction procedure started by mandibular molar forceps for teeth that had grasp with forceps or elevator / chisel for retained roots. Those elevators\ chisels were used to luxate the unrestorable severely damaged tooth / root and gain an reasonable mobility; this is followed by using the lower mandibular molar forceps for extraction if needed and squeezing the socket.

### **Group A**

In the control group, the attached gingiva surrounding the socket was sutured with a figure of 8 suturing technique at the extraction site by using 3\0 black silk sutured via a needle holder followed by dryness of the soft tissue around the extraction site in order to apply the Ora-aid dressing material.

### **Group B:**

In the first study group, the preparation of the tetracycline solution is conducted by the powder of 250 mg tetracycline cap in a disposable cup mixed with 0.5cc of saline solution which are mixed together and converted into a yellowish solution that is drained into a disposable syringe.

After the extraction, a 3\0 black silk is used to close the socket with a figure of 8

suturing technique, followed by the insertion of the previously made tetracycline into the socket by applying it directly to the socket of the extracted molar; following this step a small piece of gauze is used to dry the soft tissue around the extraction site in order to apply the Ora-aid dressing material:

- No tetracycline solution was used to be inserted inside the socket, this mixture was so thick that it could retain inside the socket, along with the sutures and dressing material.
- It was retained for the first day, strictly the first 2 hours after extraction as the Ora-aid retained 2 hours and then they slough. From the 2 hours to the rest of the first day, the patient does not spit/rising the mouth.
- the new thing in this technique is to eliminate the usage of systemic antibiotics as well as pain killers. Although, the uses of broad spectrum tetracycline locally to the supposed source of pain and decreasing the chances or percentage of inflammation. Group C:

In the 2<sup>nd</sup> study group, the preparation of the tetracycline-gelatin sponge complex is prepared by putting a 0.5 cc of saline solution in a disposable cup then adding the powder of 250 mg tetracycline capsule, after mixing both of them the gelatin sponge is added to the tetracycline solution and mixed until the gelatin sponge is fully saturated with the tetracycline solution.

The empty socket was dried by using a small piece of cotton, then the application of the previously made tetracycline-gelatin sponge, after that figure of 8 suturing technique is although used followed by drying the soft tissue at the extraction site in order to apply the Ora-aid dressing material.

#### **Instructions and Postextraction Care**

1. The patient is instructed not to remove the Ora-aid dressing material neither disrupt the sutures.

2. The patients were instructed not to rinse their mouth at the day of extraction, starting in the second day with gently rinsing with warm salty water for 30 seconds every morning after breakfast. During the daytime rinsing every 3 hours for 3 days with approximately teaspoonful of salt dissolved in a cup of warm water.
3. The patients were informed not to eat for 2 hours after extraction to allow blood clotting not to be disturbed. Then, they should begin with a liquid diet, always cool and not to take any hot foods or liquids during the first 24 hours.
4. Begin brushing of teeth one day following extraction, it is important to brush all the teeth and gently near the extraction site for proper healing that plaque and food are not allowed to collect near the extraction field.
5. after the 7<sup>th</sup> day the patient instructed to attend for suture removal.

Follow up and Data Collection (the answers will be below the questions)

When the patients had signs and symptoms of dry socket, which is dedicated by clinical examination, they were treated by conventional protocol (socket debridement, irrigation with normal saline solution, since it's already sutured, a dressing material (Ora-aid) is used over the sutures to protect the blood clot from dislodgment, and take medications:

1. Co-amoxiclav 625 mg tablet three times per day for 5 days.
2. Azythromycine 500 mg tablet one time per day for 3 days for those who have pencilline allergy.
3. Metronidazole 500 mg tablet three times per day for 5 days.
4. Acetaminophen 500 mg taken on need.
5. 3.1 Results

Ninety patients aged from 18-60 years with an average of 30.88 years and standard deviation (SD)  $\pm$  9.82 contributed to this study.

Patients enrolled in the study were 45 patients < 30 years and the same number was  $\geq 30$  years was with no significance for age with a P-value of 0.875. This study included 32 male

and 58 female patients (35.56% and 64.44% respectively) with no significance the day before extraction.

**Table (1): Distribution of teeth among groups.**

Tooth number	Group No. (%)			Total No. (%)	P-value
	A	B	C		
#6	7 (23.33%)	8 (26.67%)	12 (40%)	27 (30%)	0.585
#7	10 (33.33%)	10 (33.33%)	6 (20%)	26 (28.89%)	
#8	13 (43.33%)	12 (40%)	12 (40%)	37 (41.11%)	

Dry socket following extraction was encountered in 4 female patients, with an incidence of 4.4%. Group A reported the highest number (2 cases).

**Table (2) : Distribution of dry socket incidence among groups.**

Groups	I	T
A	2	#
B	1	#
C	1	#
Total percentage and number	4	4

## Discussion

The research has registered a **significant difference** in group C compared to group A (**0.018**) and group B (**0.014**); these findings may be explained by the presence of gelatin sponge material which aim to stabilize the blood clot with the aid of both suturing material and Ora-aid dressing material, tetracycline bacteriostatic effect on bacterial load and the closure of the wound with figure of 8 suture. **No significant difference** scored between group B compared to group A (1.00); this may contributed to the tetracycline low effect in changing the results.

Patil et al., 2021 declared the same findings of this study, the comparison between tetracycline and gelatin sponge and control group showed statistically **significant**

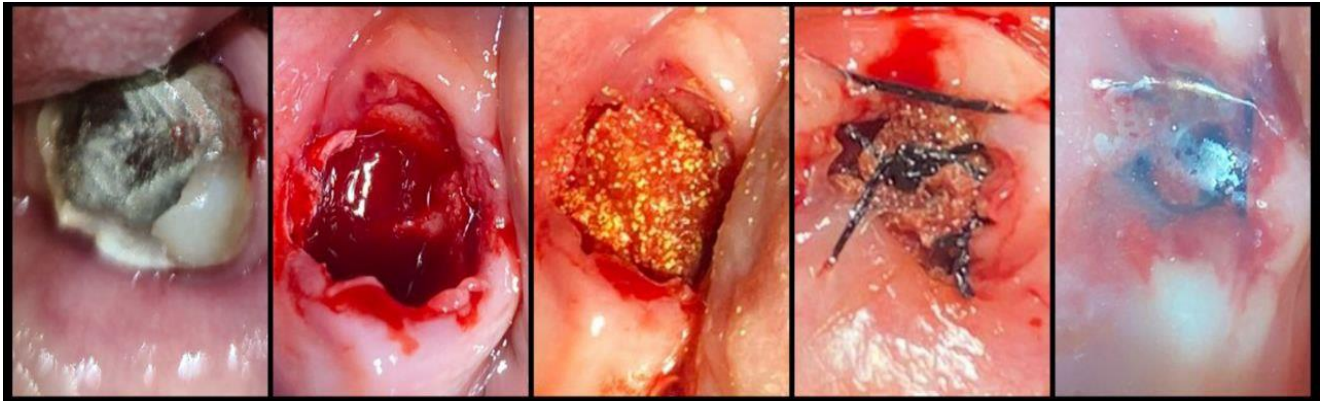
**difference** between the groups (0.009, 0.001, and 0.017) respectively, and the comparison between tetracycline alone and control group demonstrated **no significant difference** (0.031 and 0.017) respectively [10].

However, the delivery of tetracycline as powder and/or suspensions, may be transported via gauze or gelatin sponge, although it has been suggested that practically adding anything into the alveolus, including plain gelatin sponge, will result in the improvement in dry socket symptoms which pain is one of these symptoms [11].

## Conclusion

Age does not affect the dry socket incidence, but gender seems to be influenced, four dry socket cases among female patients while 0 cases for male patients.





### Funding Statement:

This research is self-funded regarding the research itself and publication.

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