

Effectiveness of locally applied clindamycin on the occurrence of alveolar osteitis following surgical removal of impacted mandibular third molars. A comparative study

Dashti Ali Mohammed¹, Ali H. Abbas Al Hussaini²

B.D.S, MSc, student College of dentistry University of Baghdad, Baghdad, Iraq¹
BDS, MSc, PhD, Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Baghdad, Iraq²



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ABSTRACT

One of the most frequent procedures in oral surgery units is the removal of a partially or completely impacted mandibular third molar under local anesthesia and it directly affects the patient's quality of life. The aim of this study is to make a comparison between the effect of the locally applied clindamycin and the systemic clindamycin on occurrence of postoperative alveolar osteitis following surgical removal of impacted mandibular third molars. Fifty patients who had undergone the surgical removal of an impacted mandibular third molar under local anesthesia participated in a randomized prospective clinical study. The patients were distributed in 2 groups. Study group included 25 patients treated with local application of clindamycin inserted inside the socket after surgical removal of impacted tooth, while control group comprised of 25 patients treated with systemic clindamycin one hour before surgical removal of the impacted tooth. The occurrence of alveolar osteitis was evaluated on the 2nd and 7th day postoperatively. Alveolar osteitis occurred on the 48 hours postoperatively. The total incidence of alveolar osteitis was 10%. The incidence of alveolar osteitis was more in control group (16%) when compared to study group (4%) and the difference was statistically significant. Local application of saturated gelfoam by clindamycin reduces the incidence of alveolar osteitis to a significant level when compared to systemic clindamycin.



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1. Introduction

A tooth that fails to reach its normal functioning position is said to be impaction. Third molars have a higher rate of impaction than other teeth [1]. Impacted mandibular third molar (IMTM) occurred due to lack of space between the distal of the second mandibular molar and the anterior border of the ascending ramus of mandible [2]. Impacted teeth may not cause any symptoms or may be associated with a variety of conditions including caries, pericoronitis, cysts, tumors, and also root resorption of the adjacent tooth [3].

Surgical extraction of IMTM is commonly encountered in routine dental practice and mainly associated with postoperative complications including pain, swelling, dry socket and trismus [4]. Dry socket or alveolar osteitis (AO) is a common postoperative complication following surgical removal of IMTMs and defines as an intense pain within and around socket of the extracted tooth, had an onset between the 1st and 3rd day after the extraction with a complete or partial blood clot disintegration. It is interruption in healing process that disturb the conversion of the mature blood clot into granulation tissue [5]. Many researchers attempt to find a successful method for prevention of AO including local and systemic antibiotic such as cefixime, azithromycin, doxycycline, erythromycin, utilizing chlorhexidine rinse or gel, steroid, eugenol containing dressing, antifibrinolytic agent, low energy laser therapy, biodegradable polymers, topical hemostatic, oxidized regenerated cellulose, and dextranomer granules [6], [7]. It is well known that clindamycin has a very favorable spectrum of efficacy against anaerobic infections [8], [9]. Additionally, gram-positive cocci, gram-positive and gram-negative anaerobes, and certain protozoa are all included in clindamycin's antimicrobial spectrum [10]. The mechanism of action of clindamycin is by inhibiting the bacterial ribosome's 50S subunit, which is involved in protein synthesis. Early chain elongation is the main stage of protein synthesis that is suppressed by interfering with the transpeptidation process [11]. Clindamycin is the drug of choice in the prevention of AO due to anaerobic properties and has good penetration into bone [12], [13].

2. Materials and Methods

The patients who participated in this randomized prospective clinical study were collected from patients who attended the Oral Surgery Clinic/ Department of Oral and Maxillofacial Surgery /College of Dentistry/ Teaching Hospital / University of Baghdad and from Al-Salam Specialized Health Center of Dentistry / Oral Surgery Clinic, in Kirkuk governorate from December 2021 to June 2022. The sample-included patients who have partially or completely IMTMs indicated for surgical removal. Medically compromised patients, local pathological lesion associated with the impacted tooth, heavy smokers (more than 20 cigarettes/day), pregnant and lactating women, patients have allergy to clindamycin, have gastrointestinal diseases, and who are already on antibiotic medication were excluded from this study.

The study's protocol was authorized by the College of Dentistry/University of Baghdad research ethics committee, and each participant gave their informed consent to take part in the investigation. Along with clinical examination a preoperative panoramic radiograph was obtained to examine the IMTMs, relevant vital structures as inferior alveolar canal, associated pathological condition, direction, position and depth of IMTM, relation to adjacent second molar, in addition to evaluation of root formation, shape, number, and pattern. Cone beam computed tomography sometimes needed for accurate assessment of the proximity of impacted teeth to the inferior alveolar canal.

Under local anesthesia, one operator performed all of the surgical procedures. One hour before surgery, for control group ask the patient to take 600 mg clindamycin (4 capsules, each 150 mg). The patient instructed to rinse his/her mouth with 0.12% chlorhexidine mouthwash for 30 seconds, then a triangular flap was reflected. Unless bone removal or tooth sectioning was required, elevators and coupland's chisels were utilized to remove the teeth. In study group; the socket packed with gelfoam saturated with 2 clindamycin capsules (300 mg) that prepared as following: Two clindamycin capsules poured in a sterile container and mixed with 1 mL normal saline solution. A piece of gelfoam (10×10×10 mm) immersed in the prepared solution. The saturated gelfoam immediately inserted in the socket after tooth extraction. Following that, the two-sided flap was replaced and stitched with simple interrupted sutures made of 3:0 black silk. The length of the procedure was measured in minutes, beginning with the first incision and ending with the last suture.

All patients received Ibuprofen tablet 400 mg, two times daily and paracetamol tab. 500 mg three times daily for three days. All the patients were instructed to avoid taking any antibiotics postoperatively.

Forty-eight hours (T1) and 7 days (T2) postoperatively, the surgical site was checked for the occurrence of AO. It should have a moderate to severe pain and partial or complete blood clot loss with or without foul odor to be considered it as an AO. This diagnosis was done by an expert surgeon other than the operator. The criteria of pain to be considered moderate to severe, it should have a score 6 or above of numerical rating scale (NRS) at the time of checking.

The data were analyzed using SPSS Statistics for Windows, Version 26. Descriptive data analysis was presented as frequencies, percentage, mean, standard deviation and standard error. To accept or reject the statistical hypotheses, inferential data analysis was used which included the following: a matched paired-samples t-test compares the means of two variables for a single group, a two independent-samples t-test compares means for two groups of cases, homogeneity-of-variance: computes the Levene statistic to test for the equality of group variances, and repeated measures analyzes groups of related dependent variables that represent various measurements of the same attribute.

3. Results

Fifty patients participated in this study, included 30 females (60%) and 20 males (40%). Their age range was 18-32 years. Of these 50 cases of IMTMs there were 26 (52%) right side and 24 (48%) left side. The mean operative time was 15.82 ± 3.39 minutes for control group and 16.05 ± 2.90 for study group. According to the surgical difficulty which as recommended by Park [14], 14 (28%) were slightly difficult, 32 (64%) were moderately difficult and 4 (8%) considered as very difficult.

Regarding AO, the result showed significant differences at T1 between control and study groups regarding blood clot loss and foul odor, while no significant difference concerning the pain (Table 1) and no incidence of AO at T2 as illustrated in (Table 2).

Table (1): Comparisons of alveolar osteitis parameters between the study samples at 48 hr. postoperatively.

Parameters	Groups		Levene's Test for Equality of Variance		T-test for Equality of Means		
	Control Mean	Study Mean	F	Sig.	T	Df	Sig.
Blood clot loss	0.24	0.04	12.042	0.001	4.290	48	0.004
Foul odor	0.16	0.04	9.348	0.004	3.981	48	0.007
Pain	7.25	8.00	1.200	0.451	1.342	3	0.272

Df: Degree of freedom

Table (2): Incidence of alveolar osteitis.

Alveolar	Control group	Study group	Total	P-value

osteitis	T1	T2	T1	T2		
Presence	4(16%)	0 (0%)	1 (4%)	0 (0%)	5 (10%)	T1 P=0.002
Absence	21 (84%)	25 (100%)	24 (96%)	25 (100%)	45 (90%)	S T2 P=1.0
Total	25 (100%)	25 (100%)	25 (100%)	25 (100%)	50 (100%)	NS

4. Discussion

Postoperative complications following surgical removal of IMTMs are frequently characterized by pain, soft tissue swelling, dry socket, and also some degree of trismus. Inflammation is the main side effect throughout the healing period and the postoperative recovery procedure usually lasts around 7 days. [15].

In this study, the total incidence of AO was 5 cases (10%). One case (4%) in study group and 4 cases (16%) in control group among 50 cases during the 1st follow up checking (T1). The results showed significant differences at T1 between the control and study group regarding blood clot loss and foul odor, while there is no significant difference concerning the pain.

The results of this study come in line with other studies utilizing clindamycin locally after extraction of impacted teeth.

[16] concluded that local application of clindamycin, regardless of the patient being a smoker or not, AO appeared in only 3.3% cases. In cases when they did not apply clindamycin, regardless of the patient being a smoker or not, AO appears in 31.7%.

[17] reported in their double-blind clinical study that locally applied clindamycin was effective in reducing the incidence of AO formation after surgical removal of IMTMs. The incidence of AO in control group and those getting non-clindamycin antibiotic treatment ranged from 15% to 31%, while it was 0.65% in patients receiving clindamycin locally [18]. The low incidence of AO in the present study when compared to other studies might be attributed to the limited sample size and to the avoidance of some AO risk factors as the surgery performed with minimum trauma as possible, exclusion of medically compromised and heavy smoker patients, and no attendance of female patients using oral contraceptives. Supporting that, there is a positive link between increased surgical difficulty and AO, since trauma led to delayed healing through compression of the thin compact alveolar bone of the socket, thrombosis in underlying vessels, reduced tissue resistance, that predisposes the wound to infection [19].

According to [20], smokers and women who use oral contraceptives had considerably greater incidences of AO than non-smokers/former smokers and women who do not use oral contraceptives, respectively.

Sucking action of smoking might involve in mechanical dislodgement of the clot, and nicotine may delay wound healing through vasoconstriction causing localized ischemia. Also, oral contraceptives drug may promote the early breakdown of the clot by raising local plasmin levels [21].

5. Conclusion

The local application of clindamycin immediately following surgical removal of IMTMs reducing the

incidence of AO to a significant level in comparison to systemic use of clindamycin.

6. References

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