

Effect of 0.2% Chlorhexidine Gel on Frequency of Dry Socket Following Mandibular Third Molar Surgery: A Double-Blind Clinical Trial

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Received 12 May 2014 and Accepted 22 June 2014

Abstract

Introduction: Alveolar osteitis (AO) is one of the most common postoperative complications after third molar surgery. Various techniques have been used to reduce the risk of AO. The aim of the current study was to evaluate the effect of Chlorhexidine (CHX) bioadhesive gel in preventing the development of AO. **Methods:** Patients with bilateral impacted mandibular third molars underwent surgical extraction of both teeth. One socket was randomly received CHX gel and the contralateral socket served as the control. The outcome variable was development of AO and the CHX gel application was the predictor variable. Data were analyzed using chi-square test with the confidence interval of 95%. **Results:** 41 patients (27 females and 14 males) with mean age of 24.15 ± 5.02 years underwent 82 surgeries. Total of 11 sockets (13.41%) developed AO. The frequency of AO in CHX gel (2 cases, 4.87%) side was significantly lower than control (9 cases, 21.95%) side (P -value < 0.05). No side effects observed following CHX gel application. **Conclusion:** Application of CHX gel could be an effective approach to reduce the risk of developing AO following mandibular third molar surgery.

Key words: Alveolar Osteitis, dry socket, chlorhexidine gel, mandibular third molar, impacted tooth.

Shaban B, Azimi HR, Naderi H, Janani A, Zarrabi MJ, Nejat AH. Effect of 0.2% Chlorhexidine Gel on Frequency of Dry Socket Following Mandibular Third Molar Surgery: A Double-Blind Clinical Trial. *J Dent Mater Tech* 2014; 3(4): 175-9.

Introduction

One of the most common complications following impacted tooth extraction is alveolar osteitis (AO) (1). Based on the previous reports the frequency of AO after non-surgical tooth extraction varies between 1% and 4%; however, the incidence of AO following surgical extraction of mandibular third molar has been 5% to 30% in different studies (2).

AO is marked by a severe and progressive pain, initiating 1 to 3 days after extraction along with halitosis, foul taste, or regional lymphadenitis. Although AO is resolved within 5 to 10 days with no intervention, the patient experiences decreased quality of life and requires several follow up visits (1-3).

Various protocols has been proposed to reduce the risk of AO development including antifibrinolytic and clot support agent application, steroidal anti-inflammatory drugs, systemic antibiotic regimen, local antibiotics application, chlorhexidine (CHX) mouthwash, and CHX gel application (4,5).

CHX is an antiseptic which is effective on both aerobic and anaerobic bacteria (6,7). Although there are various forms of CHX, the CHX mouthwash is the most extensively investigated form (8). While the bioadhesive gel form of CHX prolongs its bioavailability, promising results has been reported following its application in third molar surgery (9). The aim of the current study was to evaluate the effectiveness of CHX gel in reducing frequency of AO following mandibular third molar surgery. Our null hypothesis was that the frequency of the AO development has no significant difference between the sockets receiving CHX gel and control sockets.

Materials and Methods

The current study was performed at the Oral and Maxillofacial Surgery clinic of Mashhad University of Medical Sciences. The ethical committee approved the study protocol and all patients provided a signed informed consent.

To fulfill the study aim, authors designed a randomized, split mouth, double blind study. The study sample consisted of patients with bilateral impacted third molars referred to Oral and Maxillofacial clinic from March 2012 to September 2012. The inclusion criteria were: being 18 to 35 year old range of age, having American Society of Anesthesiologists physical status I or II, and having bilateral impacted mandibular third molars with moderate difficulty level of surgery based on Pederson classification on both sides (10).

Patients were excluded if they were smokers, lactating or pregnant, had received antibiotics regimen during the previous 2 weeks, were taking oral contraceptives, had any lesions on panoramic radiograph, were allergic to CHX, or had received more than 2 anesthesia cartridges during surgery.

The predictor variable of the current study was application of CHX gel in the socket after extraction. The outcome variable was AO. In addition, data regarding age, gender, and number of local anesthesia cartridges were recorded.

All surgeries performed by a single surgeon using the following protocol: application of povidine iodine extraorally, obtaining anesthesia using 2 cartridges of 2% lidocaine with 1:80000 epinephrine, elevating mucoperiosteal flap, removing bone and sectioning tooth, irrigating socket with sterile normal saline, suturing the flap with 3-0 silk suture. Patients were

prescribed to take an antibiotic regimen of amoxicillin (500 mg three times daily, n=21) and in case of pain to take acetaminophen (500 mg three times daily, n=21).

Both impacted third molars removed at one appointment. After surgery, CHX gel (Faculty of Pharmacology, Mashhad, Iran) randomly (based on flip of a coin) inserted into one socket and the contralateral socket remained as control. The gel insertion was performed by a blind operator.

Patients were asked to return after 7 days of operation to evaluate the healing process. In addition, patients were instructed to return in case of persistent and progressive pain during the first postoperative week. In this situation, a blinded operator evaluated patients for clinical signs of AO.

AO was treated with socket irrigation and intra-alveolar placement of Alvogyl iodoform (Septodont, Cambridge, Canada). Moreover, systemic analgesic and systemic antibiotic regimen prescribed in some cases.

Data were reported with appropriate descriptive statistics. To analyze data, chi-square test performed using SPSS version 11.5 software (Chicago, IL) with the confidence interval of 95%.

Results

At first, 43 patients met the inclusion criteria; however, two patients excluded as they received more than two anesthetic cartridges in one side. Hence, 41 patients (27 females and 14 males) with mean age of 24.15 ± 5.02 years underwent 82 surgeries. According to the study design (split-mouth), demographic variables including age and gender had no significant differences between two sides (P-value = 1.000).

Among 82 extractions, 11 cases developed AO during the first postoperative week with the frequency of 13.41%. Based on the chi-square analysis, there were no significant association between frequency of AO and demographic variables (Table 1).

According to the chi-square test, there was a significant association between the frequency of AO and application of CHX gel (Table 2). The relative risk of developing AO in sockets received CHX gel was 0.22 of the control sockets.

Table 1. Distribution of AO according to the demographic variables

Variable	AO		P-value
	Yes (%)	No (%)	
Sample size	11 (13.4)	71(86.6)	-
Gender			
Male	3 (27.3)	25 (35.2)	0.741
Female	8 (72.7)	46 (64.8)	
Age			
18-22	5 (45.4)	34 (47.9)	
23-26	2 (18.2)	25 (35.2)	0.259
>27	4 (36.4)	12 (16.9)	

Table 2. Frequency of AO based on CHX gel application

	AO		Total
	Yes	No	
CHX gel*	2 (18.2)	39 (54.9)	41
Control†	9 (81.8)	32 (45.1)	41
Total	11	71	82

* The frequency of AO was significantly lower in sockets receiving CHX gel in comparison to control sockets (relative risk = 0.22, 95% confidence interval: 0.06-0.712; P-value = 0.047).

† Reference group

Discussion

The aim of the present study was to evaluate the effect of CHX gel application on the frequency of AO following surgical extraction of impacted mandibular third molar teeth. Our null hypothesis was rejected as the frequency of AO in CHX gel group was significantly different from that of the control group.

There were no significant differences between various age groups or males and females regarding the frequency of AO. The overall frequency of AO was significantly lower when the CHX gel was applied in comparison to the control sockets with the relative risk of 0.22.

One of the most common complications following impacted mandibular third molar extraction is AO (1). The reported frequency of AO in different researches varies between 5% and 30% (2). The frequency of AO in current study (13.41%) was in compliance with the previous reports.

Based on the results of the present study, the frequency of AO was significantly lower in CHX gel group. In compliance with our study, Torres-Lagares et

al (11), Babar et al (12), and Hita-Iglesias et al. (9) found significant reduction in the development of AO following 0.2% CHX bioadhesive gel application.

CHX mouthwash has been reported to be effective in reducing risk of AO development. However, Hita-Iglesias et al (9) observed that the gel form of CHX is more effective than the mouthrinse. This could be explained by the fact that the bioadhesive gel provides higher exposure period and releases CHX continuously during the first postoperative day (11). While CHX gel eliminates the need of patient cooperation, it also lacks the tooth discoloration, mucosal irritation, and alteration in taste changes which are side effects reported in rinsing with CHX mouthwash (9).

The lower frequency of AO in CHX gel group compared with control group could be attributed to the antibacterial properties of this agent. It has been reported that bacterial infection and release of their byproducts enhance the fibrinolytic activity in the extraction socket; the result is loss of clot integrity and dissolution, which further lead to AO (13, 14). By decreasing bacterial load and blocking the bacterial activity, CHX inhibits the possible increase in fibrinolysis activity following extraction. The result is a decrease in AO development demonstrated in the present study too.

The amount of trauma during surgery is one of the risk factors in development of AO that could be affected by the difficulty level of surgery; harder surgeries require higher amount of bone removal and tooth sectioning. In addition, the experience of the surgeon affects the amount of trauma (15, 16). To eliminate these confounding variables, a single experienced surgeon performed all surgeries and also all patients had impacted tooth with similar difficulty level.

Development of AO is age dependant as most of the reports indicating the peak age of 20 to 40 years old (17-20). However, in the present study no significant association was found between age group and frequency of AO.

Local anesthesia using epinephrine could attenuate the bleeding and oxygen tension in extraction area; it results in higher fibrinolysis activity of the socket and increased risk of AO development (2). In the current study, this variable was eliminated by excluding patients who had received more than two anesthetic cartridges in either side of surgery.

The current study had a split-mouth design that enabled eliminating the confounding factors. However, the sample size was one of the limitations of this study. In addition, further researches are required to evaluate the effectiveness of CHX gel in surgeries with higher difficulty levels in which the risk of AO development is higher.

Conclusion

Pertaining to the limitations of our study, CHX gel was effective in reducing the risk of AO development. Hence, it could be applied as a prophylactic approach especially in patients with high risk of developing AO.

Acknowledgment

The authors would like to thank staff of oral and maxillofacial clinic.

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