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THE EFFECT OF CHLORHEXIDINE GLUCONATE 0,12% RINSE IN REDUCING DRY SOCKET FOLLOWING TEETH EXTRACTION IN SMOKER PATIENTS: RANDOMIZED CLINICAL TRAIL (TRIPLE BLIND)

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ABSTRACT

Dry socket is a potential postoperative complication of dental extractions. Smoking is a well-known factor to increase the risk of dry socket formation. Chlorhexidine is a biguanide antiseptic agent often used as an active ingredient in mouth-wash.

This randomized clinical study has been undertaken to clinically evaluate the efficacy a use of 0.12% chlorhexidine gluconate mouth rinse in prevention of dry socket at smoker patients, and was carried out on 53 smoker patients with mesial impacted mandibular third molar in both sides reported to department of maxillofacial surgery Syrian Private University, requiring extraction both side.

Surgical side and the rinse solution were chosen randomly.

Group A: the patients received a bottle of 0.12% chlorhexidine gluconate mouthwash with mint flavor to start using it on the day before and the day after the extraction twice daily for 7 days.

Group B: they received a bottle of aqua distillate with mint flavor to start using as directed in bottle A.

Patients were followed in the 3rd and 5th day postoperative for: pain, presence or absence of clot, alveolar bone.

In the side where the patients used battle A (with chlorhexidine gluconate) we diagnosed 13 cases (24,5%) of dry socket (p=0.041) significant difference, and in the control side where patients used bottle B (without chlorhexidine gluconate) we diagnosed 33 cases (62,26%) (p=0.039) significant difference.

0.12% chlorhexidine gluconate mouthwash following molars extraction before and after extraction for seven days significantly decreased the incidence of dry socket in smoker patients. Therefore, 0.12% chlorhexidine gluconate mouthwash may be preferably used over.

KEYWORDS: *dry socket, smokers, chlorhexidine gluconate, randomized third molar.*

INTRODUCTION

Dry Socket (DS) is a potential postoperative complication of dental extractions [*Torres-Lagares D et al., 2005*].

The most recent definition of DS is "postoperative pain in and around the extraction site, which increases in severity at any time between 1 and 3 days after the extraction accompanied by a partially or totally disintegrated blood clot within the alveolar socket with or without halitosis [*Bonine F, 1995*].

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The average DS rate for dental extractions is variable. Jaafar N. and Nor G. (2000) found DS in 3% to 4% of dental extractions, and a literature reports a range from 1-30% [*Bloomer C, 2000*]. The highest incidence (20-30%) generally occurs following the surgical extraction of impacted third molars [*Larsen P, 1995*].

Risk factors for DS mentioned in the literature include; traumatic surgery, remaining tooth fragment, [*Birn H, 1973; Alexander R, 2000*] smoking, oral contraceptives, advanced age, female gender, immunosuppression [*Sweet J, Butler D, 1979; Bonine F, 1995*] and lack of dentist experience which is associated with higher trauma during extraction [*Larsen P, 1992*]. Bacterial infection is a major risk

as the DS frequency increases in patients with poor oral hygiene, preexisting local infection such as periocoronitis and advanced periodontal disease [*Peñarrocha M et al., 2001*].

Smoking is a well-known risk factor for DS formation. In study of mandibular third molar extraction, smokers were found to be 5 times as likely to develop DS as nonsmokers [*Sweet J, Butler D, 1978; 1979*].

In review of 1305 extractions among 805 patients performed in a Palestinian dental teaching center, the incidence of dry socket was significantly higher among smokers 12% versus nonsmokers 4% [*Abu Younis M, Abu Hantash R, 2011*].

Smoking and degree of smoking were found to be associated with the development of DS with a significant odds ratio of 4.3, 4.5, and 12.3 respectively [*Bortoluzzi M et al., 2012*],

Smoking effects blood coagulation platelet aggregation, clotting dynamics, and fibrin structure [*Ambrus J, Mink I, 1964; Moschos C et al., 1976*]. Smokers exhibit a decrease in oral leukocyte function, are less responsive to periodontal treatment, and exhibit reduced bleeding in the extraction socket [*Eichel B et al., 1969; Meeshan J et al., 1988*]. Fibrinolysis and bacteria are the main etiological theories on DS [*Caso A et al., 2005*].

Since the role of bacteria in this process is proven, the most effective method for reducing DS has been through the use of agents that systematically or topically reduce the oral bacteria within the wound [*Larsen P, 1991; Bonine F, 1995*]. Systemic and topical antibiotics such as topical tetracycline have been proposed and used for the prevention of DS [*Swanson A, 1989*].

Some measures were suggested in the literature for the prevention of DS including washing with saline solution, eugenol dressings to provide relief, anti-fibrinolytic agents and tranexamic acid or using chlorhexidine solution [*Bloomer C, 2000; Delilbasi C et al., 2002; Torres-Lagares D et al., 2005*].

Chlorhexidine (CHX) is a biguanide antiseptic agent often used as an active ingredient in mouthwash designed to reduce dental plaque and oral bacteria population [*Larsen P, 1991*]. It has been shown to have an immediate bactericidal action and a prolonged bacteriostatic action due to adsorption onto the pellicle-coated enamel surface. [*Jenkins S et al., 1988*]. Since, rinsing with CHX is known to reduce oral microbe population; several studies have reported that the pre- and postoperative use of 0.12% CHX decreases the frequency of DS after mandibular third molar removal [*Ragno J, Szkutnik A, 1991; Hermesch C et al., 1998; Sridhar V et al., 2011*].

Pre-surgical and post-surgical oral rinsing with 0.2% chlorhexidine has been reported to yield 45–80% reduction in DS rates [*Charles B et al., 1998*].

This study has been undertaken to clinically evaluate the efficacy of using 0.12% chlorhexidine gluconate (CHXG) mouth rinse in prevention of dry socket at smoker patients.

Materials and methods

During this triple randomized clinical trial study, which was performed in the Department of Oral and Maxillofacial Surgery of Syrian Private University Faculty of Dentistry, 106 permanent tooth extractions with surgical technique were performed in 53 smoker patients (over 20 cigarettes per day) with bilaterally symmetrical mesial impacted mandibular third molars requiring surgical extraction over a period of 6 months, from 1 August 2016 to January 5 2017.

Exclusion criteria was patient on antibiotic prophylaxis, known to be allergic to CHXG, with systemic disorders, epinephrine contraindications or breast feeding women and who are on oral contraceptives.

This study followed the Declaration of Helsinki on medical protocol and ethics, and the approval of Ethics Committee of the Syrian Private University was obtained.

All patients were informed about the objectives of the study and informed consent had to be signed. All required information was documented in the questionnaire paper regarding name, age, gender, mobile number, file number, smoking, medical condition, tooth indicated for extraction, preoperative pain and halitosis.

Teeth extractions were done under local anesthesia, 2% Lidocaine with 1:80,000 epinephrine. Third molars were anesthetized by combination of inferior alveolar nerve block and buccal infiltration.

The same surgeon in all patients did the extractions.

Surgical site was chosen randomly by asking the patients to choose one card out of two in which site was written on its back (left or right). Solutions

were divided randomly into two parallel group and we asked the patients to choose one card out of two in which the bottle number was written on its back.

Group A: the patients received a bottle of 0.12% CHXG mouthwash with mint flavor to start using it on the day before and the day after the extraction twice daily for 7 days.

Group B: the patients received a bottle of Aqua distillate with mint flavor to start using as directed in bottle A.

Both groups were undergone surgical treatment with 21 days between the first and the second treatment to make sure that the effect of the solution whatever the kind was should be gone.

Patients were followed in the 3rd and 5th day postoperative for:

1-Pain: pain was recorded objectively using visual analogue scale 1 to 10, (0-1) no pain, (1-3) mild, (3-6) moderate, (6-10) severe.

2-Presence or absence of clot: extraction socket was examined for blood clot clinically and recorded as present or absent.

3-Alveolar bone: extraction socket was examined clinically and recorded as covered or uncovered.

The data was collected and subjected to statistical analysis. Statistical analysis was carried out in the environment of the program Statistica 12.0 using parametric (Student's T-test)..Comparisons between groups were determined by a one-way ANOVA with a post-hoc Student t-test (SPSS Inc., Chicago, IL). Probabilities of $p<0.05$ were considered statistically significant.

Mann-Whitney U testing was conducted to study the significant differences in the degree of pain recurrence between group A (with CHXG) and group B (without CHXG).

Kai square test was conducted to study the significant differences in presence of blood clot recurrence between Group A and Group B in the research sample.

The statistics specialist was unaware of the containment of the bottles A and B, and dealt with only the numbers.

RESULTS

This study was carried out on 53 patients with symmetrically bilaterally mesial impacted mandibular third molar reported to department of maxillofacial surgery Syrian Private University, requiring extraction of impacted mandibular third molars of both side.

There were 31 (58.49%) males and 22 (41.51%) females. Age ranged from 18 to 26 years old.

Pain, blood clot, and alveolar bone socket all this three fisting were observed in both sides.

Studying the degree of pain: It was given the degree of pain increasing value according to its intensity, no pain 0, mild pain 1, moderate pain 2, and severe pain 3.

In patient of group A, mouthwash with CHXG, the pain degree was distributed as following: 23 (43.4%) case no pain, 15 (28.3%) case mild pain, 10 (18.8%) case moderate pain, and 5 (9.5%) cases severe pain, while in group B, mouthwash of aqua distillate with mint flavor, the pain degree was; 5 (9.5%) cases no pain, 16 (30.2%) case mild pain, 19 (35.8%) case moderate pain, 13 (24.5%) case severe pain).

Mann-Whitney U testing was conducted to study the significant differences in the degree of pain recurrence between group A (with CHXG) and group B (without CHXG) in our sample, the pain's degree ranks in Group A was 47.88, while the pain's degree ranks in Group B was 81.12.

The significance level value was smaller than the value 0.05, which means that when the confidence level 95% there are significant differences in pain degree recurrence between Group A and Group B in the sample. And by studying the average ranks of pain degree, it was noticed that pain's degree average ranks in Group A (patients that had been using mouthwash with CHXG) was less than Group B (patients that had been using mouth wash without CHXG), thus we conclude that the pain degree in Group A was less than Group B.

Studying the presence of blood clot: In patients of Group A, the presence of blood clot was distributed according to the following: (40 (75.4%) there is blood clot, 13 (24.6%) no blood clot), while in patients of Group B the presence of blood clot was distributed as following: 24 (45.2%) there is blood clot, 29 (54.8%) no blood clot.

It was noticed that the presence of blood clot in Group A was more than Group B in our complete sample.

Kai square test was conducted to study the significant differences in presence of blood clot recurrence between Group A and Group B in the research sample, Kai square test value was 7.56, as shown in table 1.

Shows that the significance level value was smaller than the value 0.05, which means that when the confidence level 95% there are significant differences in the presence of blood clot recurrence between Group A and Group B, and by studying recurrence table and percentages, it is noticed that the absence of blood clot in Group A was less than in Group B in our research sample.

Studying the Alveolar socket closing or not: The closing of the alveolar socket with nearby tissues according to CHXG application was distributed as following; 47 (88.6%) closing case, 6 (11.4%) cases no closing, while in Group B the closing of alveolar socket was distributed as following; 44 (83%) closing case, 9 (17%) cases no closing).

It is noticed that the closing of the socket degree in Group A according to CHXG application was more than Group B in the sample.

Kai square test was conducted to study the significant differences in the degree of the socket closing recurrence between Group A and Group B in the research sample, and the value was 10.8 as mentioned (Table 1).

The significance level value in this case was smaller than the value 0.05, which means that when the confidence level 95% there are significant differences the closing of the socket degree recurrence between Group A and Group B, and by studying recurrence table and percentages, it is noticed that the closing of the socket degree in Group A was more than in Group B in our research sample.

The result: In the side where the patients used battle A (with CHXG) we diagnosed 13 cases (24, 5%) of DS which is statistically significant (p=0.041), and in the control side where patients used B (without CHXG) we diagnosed DS in 33 patients (62, 26%) which is statistically significant (p=0.039).

Table 1

Kai square tasting to study the significant differences in infection degree between sides used bottle A and sides used bottle B in presence of blood clot recurrence

Studied variable = presence of dry socket × (Try)		
	presence of blood clot	infection degree
Number of cases	106	106
Kai square value	7.56	10.8
Freedom degrees	1	1
Significance level value	0.006	0.001
Indication of differences	There are significant differences	

Discussion

CHX gluconate (a poly biguanide) is water-soluble and readily dissociates, releasing the positively charged CHX at physiologic ph. The bactericidal effect of the drug is due to cationic molecular binding to extra microbial complexes and negatively charged microbial cell walls. This has a net effect of altering the osmotic equilibrium of the cell, resulting in electrolyte loss followed by cell lysis [*Hugo W, Longworth A, 1964; Bonesvoll P, 1977; Goldstein G et al., 1986*].

The results of our study showed that the pain degree average ranks was less in patients that had been using mouthwash with CHXG and Presence of blood clot more than in control side in our research sample. In addition, closings of alveolar sockets were higher in patients when they did use 0.12% chlorhexidine glouconate mouthwash.

In 1977, Legarth J studied the effect of 0.2% chlorhexidine on dry socket prevention and noted a 45% decrease in a group of 60 patients. Similar to this in our study, there was 75% reduction in a group of 53 patients.

Tjernberg A. in his study found that only one patient in a test group of 30 using 0.2% chlorhexidine rinse preoperatively had alveolar osteitis as opposed to 5 of 30 patients in the control group which is statistically significant. In our study, we found that 13 patients had alveolar osteitis in a group of 53-smoker patient's .in the control side, where as in test side there was 33 incidence of alveolar osteitis which is also significant [*Tjernberg A, 1979*].

Hermesch C. and co-authors conducted a randomized, double blind, placebo controlled, parallel group study among 279 subjects, in which 0.12% chlorhexidine was used preoperatively (7 days before and 7 days after the surgical extractions). There was a statistically significant reduction in the incidence of alveolar osteitis similar to our study wherein, among 53 subjects who used 0.2% chlorhexidine rinse preoperatively (1 day before and 7 days after the surgical extractions) there was 13 incidence of alveolar osteitis, which is statistically significant [*Hermesch C et al., 1998*].

Larson conducted a prospective randomized

double-blind placebo-controlled study with 139 patients (278 bilaterally impacted mandibular third molars), wherein there was a 60% reduction in the incidence of alveolar osteitis reduction rates after the perioperative use (7 days before and 7 days after the surgical extractions) of 0.12% of chlorhexidine mouth rinse. It supports our study, in which there was 75% reduction in the incidence of alveolar osteitis in a group of 53 patients [*Larson PE, 1991*].

Fredric L. Bonine conducted a nonrandomized prospective study over a three-year period, 371 patients received either no treatment (Group 1), 2 weeks of twice daily chlorhexidine rinse post-surgery (Group 2), or one rinse pre-surgery (Group 3) and found 60% reduction in group 2. But in our study patients used 0.2% CHXG mouth rinse twice daily for 7 days before surgery and 7 days after surgery and we found 75% reduction in the incidence of alveolar osteitis which is statistically significant (p=0.041) [*Bonine F, 1995*].

The present study is the only study, which compared the efficiency of CHX rinse on smoker patients the prevention of DS postoperatively.

Conclusion

0.12% chlorhexidine gluconate mouthwash following molars extraction before and after extraction for seven days significantly decreased the pain, preserved the blood clot and significantly decreased the incidence of DS in smoker patients. Therefore, 0.12% Chlorhexidine Gluconate mouthwash may be preferably used over.

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