

Effectiveness of 1% Versus 0.2% Chlorhexidine Gels in Reducing Alveolar Osteitis from Mandibular Third Molar Surgery: A Randomized, Double-Blind Clinical Trial

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ABSTRACT

Objective: One of the leading, recurrent and most familiar problem after extraction is alveolar osteitis (AO). This case was designed to compare and publish the effectiveness of chlorhexidine (CHX) gel in concentrations 1% and .2% in combating post-operative complication of AO especially after surgical removal of retained mandibular molars. Moreover, this study also aimed at assessment and analysis of quality of treatment after use of CHX gel on oral wellness.

Study Design: Observational Study

Place and Duration: This study was conducted at the department of Oral Medicine, Avicenna Dental College Lahore from January 2017 to 2019.

Material Methods: This case study was done on basis of practical clinical practice and on patients. The study was randomized. Total patients subjected to treatment were eighty eight. All the patients after post extraction were treated with CHX gel to overcome complication AO in concentration either 1% or .5%. About 41 patients were treated with 1% of CHX gel and 47 remaining were treated with .2% of gel after extraction. The instructions were given to patients to apply this gel twice a day for duration of one week at least. After a week, assessment was made regarding CHX gel application outcomes.

Results: With the assessment and careful observation, it was found that about 13% patient suffered from AO after application of CHX gel in concentration of 0.2% and about 7% patients suffered from AO after application of CHX gel in concentration of 1%. Such difference was not so important with respect to statistics. The pain and inflammation that patients suffered post surgically was almost same during whole one week duration.

Conclusion: In a nutshell, there is no significant difference post surgically found in patients after application of CHX gel either in concentration 1% or .2% in case of extraction of retained mandibular third molar.

Key Words: Alveolar osteitis, chlorhexidine gel, third molar.

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INTRODUCTION

One of the leading and most potent complication post surgically is alveolar osteitis (AO)¹ that has direct effect in damaging oral health quality of patients mouth².

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Another name given to AO is fibrinolytic alveolitis, alveolitis sicca dolorosa, dry socket and and localized osteitis. Dry socket name given to AO by Crawford in 1986. Currently, dry socket is defined as pain that occurs post operatively around the area of alveolus that increase in severity after 1 to 3 days post surgically along with clot displacement completely or partially without or with presence of halitosis. This new definition has been proposed by Blum³. According to different authors, the AO frequency of occurrence varied from percentage 3 to 4 “0%⁴. The cause of occurrence of AO post surgically is still unknown. There were two theories suggested regarding occurrence of AO post surgically that were fibrinolytics⁵ and secondly, the presence of bacterial infection⁶. From epidemiological point of view there were several risk factors involved in occurrence of AO like surgical trauma by dentist, oral contraceptives pills used by patients, patients poor immunity, gender especially in females, inexperience by dentist, faulty method of extraction, smoking, old age and poor oral

hygiene conditions of patients⁷. So prevention accordingly is always better than cure⁸. There were many drugs also suggested to be applied topically like antifibrinolytics, antibiotics and anti-septic agents in the prevention of AO post surgically but antibiotics and antiseptics has won the game against anti-fibrinolytic agent in combating AO⁴. The antiseptic agent used most commonly in clinical practice in prevention of AO is chlorhexidine (CHX). It has been proven by meta-analysis⁹ that CHX mouthwash usage on following day of extraction of third molar and topically application of CHX gel posts surgically twice a day for a week reduces incidence of AO by great extent. In a recent analysis, it has been shown that application of CHX gel 0.2% post surgically at extraction site twice a day for a week has been considered a best preventive measure against AO¹⁰ since it has no interfere with alveolar hemostasis locally¹¹. The application of CHX gel has shown rapid excellent and extraordinary antiseptic effects against antibacterial infection at extraction site than all the other agents in oral cavity¹². The effectiveness of CHX depends on concentration of CHX used in preparation of CHX gels. The CHX gels with higher percentage of CHX have higher success rates than low concentration gel formulations in treatments like periodontal diseases¹⁴, after the completion of surgical oral treatments¹⁵, in dental implant¹⁶, in controlling and prevention of plaque¹⁷, in prevention of caries¹⁸, and in promoting healing of wound¹⁹. So, this case was designed in order to make comparison of effectiveness between CHX gel in concentration of 1% and 0.2% post surgically when use twice a day over a span of 7 days after extraction of retained mandibular third molar and its impact on overall patients oral health quality.

MATERIALS AND METHODS

The results of this current case was based on clinical trials along with consort statement (20). This case study was totally randomized and consists of comparison between two groups. This study took place from January 2017 to 2019 in private dental hospital in Lahore, involving both the genders of age groups from 18 years to 44 years. All the patients presented in these departments had retained mandibular third molar along with difficulty index according to Korean score ranging from 4 through 7 (21). The two expert maxillofacial surgeons rated this difficulty index. Things that were excluded in case study include aids, pregnancy and lactation in women, antibiotics and analgesics taken before procedure, patients allergy to CHX, paracetamol, ibuprofen, articaine, the simultaneous extraction of two third molars, patient's psychological issues, jaw pathologies, or prolonged extraction time (over 30 min). The informed consent was taken from all of the patients as part of ethics. There were two different concentration of CHX gel were used in this case pharmaceutically

these forms were 0.2% (laboratorios kin s.a., barcelona, spain) and secondly, 1% (glaxosmithline consumer healthcare, dublin, ireland). At the start of this extraction assessment, the maxillofacial surgeons taught patients to note following variables during the whole week from day 1 to day 7 by using mill metric ruler that include edema presence during basal and day 1,2 and 7th day post extraction and interincisal aperture basal and at day 1,3 to 7th. In order to measure edema, landmarks that were taken into account by patients were tragus, lateral canthus, mandibular angle, pogonion (at operated site), nasal wing at base, labial commissure. Patients were advised to note pain as well as inflammation that occurred post surgically basal,3 and 7 hourly and at days 1,3 and 7th. The inflammation and pain were noted on special analogical visual scale that ranged from 0 to 100. In order to reduce pain and numb the surgical site local anesthesia (articaine 40mg/ml-epinephrine 0.01%; laboratorios normon s.a., madrid, spain) was given to the lingual, long buccal and inferior alveolar region. In order to gain access to the extraction site a triangular flap was made by maxillofacial surgeon to have an easy access to third molar. Moreover, osteotomy and dental sectioning was performed where requirement was there. After the tooth had been extracted, the alveolar site of third molar was rinsed, sharp bony edges were smooth, the surrounding granulation tissue and follicular remnants were removed and CHX in concentration 0.2% was applied deep inside the alveolar region. At the end of procedure, the wounded site was sutured with 4/0 silk stitches. The patients after extraction were divided into two groups. On one group about 47 patients CHX in 0.2% concentration was applied and in other group about 41% of CHX was applied. This distribution was made using a simple computer program. All the patients vividly and clearly instructed to apply CHX gel at day of extraction till 7th day post extraction. The patients were also instructed to apply gel at surgical site after cleaning their teeth with soft surgical brush twice a day. In order to reduce pain patients were instructed to take ibuprofen 600 mg every 8 hourly along with paracetamol 12 hourly. The physical appearance is of alveolitis was taken as main variable 7 days after extraction. More over diagnostic criteria given by Blum as followed³. All the patients were free to make telephonic communication with doctors for follow ups. The patient's tolerance to treatment was assessed from day 1 to day 7 using analogical scale of 1 to 5. Then finally in end, a questionnaire designed suggested by Savin and Ogden²² was used that had five dimensions and sixteen items. The measurement of sample size was done by simple generalized rule. 0.6 was considered as standardized difference. SPSS windows 15.0 (spss inc., chicago, il) was used to analysis data..

RESULTS

Table No 1: Description and comparison of patients (n=88).

Variable	CHX 0.2% (n=47)	CHX 1% (n=41)	p-value
Sociodemographics			
Sex (Men-Women) (%) ^a	49-51	49-51	0.845 ^f
Age (14 to 24, 25-44) (%)	54-47	43-57	
Age (mean±sd)	25.7±6.8	26.7±6.2	0.605 ^g
Educational level (Primary-Secondary-University) (%)	21-28-51	21-31-48	0.764 ^h
Clinical chart			
Systemic disease (No-Yes) (%)	95-5	94-5	□1 ⁱ
Contraceptives (only women ^b) (No-Yes) (%) Good oral	78-22	81-19	□1 ⁱ
Hygiene (Yes-No) (%)	71-29	72-29	0.837 ^f
Pre-pericoronaritis (No-Yes) (%)	71-29	82-19	0.445 ^f
Tobacco (No-□10 cig./day->10 cig./día) (%)	75-9-17	75-17-9	0.951 ^h
Surgical procedure			
Molar (38-48) (%)	56-44	54-47	0.962 ^f
Surgeon (MRP-DSL) (%)	76-34	47-53	0.096 ^f
Extraction time min. (mean±sd)	12.5±6.6	10.8±5.8	0.214 ^g
Difficulty in extraction (mean±sd)	5.47±1.06	5.34±1.21	0.557 ^g
Exposure (Included-Semierupted) (%)	30-70	38-62	0.595 ^f
Osteotomy (No-MV-MVD-MVDO) (%)	67-9-15-9	57-3-26-14	0.283 ^j
Odontosection (No-Yes) (%)	86-16	75-25	0.311 ^f
Flap enveloped or triangular (%)	92-8	82-17	0.411 ^f
After surgery			
Alveolitis (No-Yes) (%) Tolerance (mean±sd) ^h	86-14 ^d 4.36±0.87	93-6 ^e 4.49±0.76	0.487 ⁱ 0.523 ^g

Total patients underwent surgical extraction were 88 for retained mandibular third molar. About 47 patients were treated with 0.2% CHX gel and 41 patients were treated with 1% CHX gel. The age range of patients ranged from 18 to 44 years. Out of total 88 patients, about 41 patients were male and remaining 47 were female. About nine women were on oral contraceptive pills and about 22 patients among males were smokers. The list of risk factors in terms of surgical procedure, clinical variables and sociodemographic variables were listed in table 1. Statistically no visible difference were found in both these groups as there were 13% patients reported with AO after application of CHX gel in concentration 0.2% and about 7% patients reported AO after application of 1% gel CHX gel (table 1). The variables like inflammation and pain post surgically during a week was found among both groups member. The figure 1 clearly depicts that no significant difference was found among the both groups. The figure 2 depicts the maximum interincisal aperture before surgical removal of retained mandibular molar and at first, second and seventh day post surgically. It was found that no statistically significant differences were seen among both groups when compared. The evolution of edema and baseline levels are shown figure 3 that once again prove no significant differences are there among both groups. There was none adverse effects of treatment shown by patients. The oral health related quality of treated patients over the period of 7 days has been shown by table 2.

There was no significant difference could be marked among two groups in terms of day 1 and day 7. There was improvement in each directions with the use of this treatment in these two groups except psychosocially. The variables like inflammation and pain post surgically during a week was found among both groups member. The figure 1 clearly depicts that no significant difference was found among the both groups. The figure 2 depicts the maximum interincisal aperture before surgical removal of retained mandibular molar and at first, second and seventh day post surgically. It was found that no statistically significant differences were seen among both groups when compared. The evolution of edema and baseline levels are shown figure 3 that once again prove no significant differences are there among both groups. There was none adverse effects of treatment shown by patients. The oral health related quality of treated patients over the period of 7 days has been shown by table 2. There was no significant difference could be marked among two groups in terms of day 1 and day 7. There was improvement in each directions with the use of this treatment in these two groups except psychosocially.

DISCUSSION

Due to the repeated occurrence of AO post surgically specially in mandibular third molars that are retained⁴, and the effect of AO on oral health quality of patients²³, it was necessary to find remedy for AO. prevention from occurrence post surgically. The exact cause of AO has not been identified yet²⁴, but it was

Table No. 2. OHRQoL of patients, at days 1 and 7 After Rsurgery (n=88).

Variable ^a	Day 1				Day 7				Comparisons			
	CHX 0.2% (n=47) [A]		CHX 1% (n=41) [B]		CHX 0.2% (n=47) [C]		CHX 1% (n=41) [D]		A vs B ^e	C vs D ^e	A vs C ^f	B vs D ^f
	% ^d	mean±sd	%	mean±sd	%	mean±sd	%	mean±sd				
Eating. since your intervention, have you noted any changes in your...?	6-34-37-21 22-44-26-9	2.73±0.86 2.22±0.89	2-35-36-27 19-57-14-10	2.85±0.86 2.14±0.84	28-47-25-2 59-33-6-2	2.00±0.77 1.52±0.72	34-32-31-6 69-19-7-5	2.06±0.91 1.47±0.83	0.571 0.626	0.757 0.450	<0.001 <0.001	<0.001 0.001
ability to chew food	9-48-28-15	2.50±0.86	7-38-31-24	2.71±0.92	56-30-13-0	1.56±0.72	52-31-12-5	1.69±0.86	0.258	0.603	<0.001	<0.001
ability to swallow diet	13-37-26-24	2.61±1.00	10-31-29-31	2.81±0.99	54-28-13-4	1.67±0.87	43-33-19-5	1.85±0.89	0.341	0.285	<0.001	<0.001
enjoyment eating taste	39-41-17-2	1.83±0.80	36-33-14-17	2.12±1.09	65-22-11-2	1.50±0.78	57-26-12-5	1.64±0.87	0.294	0.417	0.033	0.006
speech. since your intervention, have you noted any changes in your... voice?	59-33-4-4	1.54±0.78	60-33-5-2	1.50±0.71	83-13-4-0	1.21±0.51	95-5-0-0	1.04±0.21	0.889	0.060	0.023	<0.001
ability to speak?	26-47-24-4	2.07±0.83	26-45-21-7	2.10±0.88	70-20-9-2	1.43±0.75	69-21-10-0	1.40±0.66	0.936	0.988	<0.001	<0.001
physical effects. since your intervention, have you... experienced pain?	4-47-26-24	2.70±0.89	5-64-24-7	2.33±0.69	33-41-20-6	2.00±0.89	33-45-14-7	1.95±0.88	0.047	0.782	<0.001	0.037
felt ill?	54-22-22-2	1.72±0.89	52-36-12-0	1.60±0.70	67-22-9-2	1.45±0.75	64-19-12-5	1.57±0.88	0.705	0.643	0.031	0.711
appearance. since your intervention	37-44-15-4 6-26-56-11	1.87±0.83 2.72±0.75	38-40-19-2 10-14-60-17	1.86±0.81 2.83±0.82	67-17-11-4 2-22-33-44	1.52±0.86 3.17±0.85	64-29-2-5 10-29-29-33	1.47±0.77 2.85±1.00	0.986 0.356	0.968 0.143	0.030 0.005	0.024 0.808
has your appearance changed? is it as you expected? ^b												
psychosocial effects. since your intervention...	83-13-4-0 41-26-22-11	1.22±0.51 2.02±1.04	90-7-2-0 45-21-10-24	1.12±0.40 2.12±1.23	89-6-4-0 65-20-9-6	1.15±0.47 1.56±0.91	93-7-0-0 60-19-5-17	1.07±0.26 1.78±1.13	0.286 0.870	0.513 0.448	0.225 0.004	0.500 0.033
has your self-confidence changed?	78-15-6-0 15-33-30-22	1.28±0.58 2.59±1.00	69-24-7-0 19-38-26-17	1.38±0.62 2.40±0.99	89-9-0-2 28-33-13-26	1.15±0.51 2.37±1.16	83-14-2-0 26-24-24-26	1.19±0.45 2.50±1.15	0.358 0.384	0.444 0.601	0.093 0.088	0.060 0.449
have you taken off time at work? has your social life changed?	21-37-27-16	2.34±0.98	28-34-27-11	2.21±1.00	35-28-15-22	2.23±1.15	31-31-21-17	2.23±1.07	0.534	0.931	0.490	0.852
would you undergo surgery again? ^b would you recommend treatment? ^b												
total score ^c		34.1±7.8		34.0±7.7		27.4±7.7		27.7±8.2	0.891	0.914	<0.001	<0.001

MRP-surgeon 1, DSL-surgeon 2. MV=mesio-vestibular, MVD=mesio-vestibular-distal, MVDO=mesio-vestibular-distal-occlusal.a: Percent distribution rounded to integers for clarity. b: n=24 and n=22 in 0.2% - and 1%-groups, respectively.c: A scale from 1 (low) to 5 (high). d: Corresponds to n=6 alveolitis, with two of them also abscess. e: Corresponds to n=3 alveolitis, with and 2, also with abscess or cellulitis, respectively.f: Chi squared with Yates correction. g: Student t Test for independent samples. h: Mann-Whitney test. i: Bilateral Fisher's exact test. j: chi-squared.

This case study is randomized, double-blindness supported clinically, following consort statements²⁰.The results of this case study showed that no significant difference was found clinically and at patients level from both the concentrations of CHX for AO treatments. So any statement that support any particular treatment was not justified and highly unlikely. One of the short coming for this case study was that no control

group (without any treatment) was selected and observed. The definition of AO given by Blum (3) was mostly used in epidemiological studies¹⁰.Regarding oral health quality of patients a questionnaire was designed that was also used previously in third molar surgery^{22,23}.This questionnaire was simple and easily understandable by patients and researchers^{4,9,10}who worked to find out cure and preventive measure AO occurrence post surgically. Tetracycline is considered very effective as a local antibiotics against AO occurrence⁴, but its use intra alveolar is not recommended to its side effects like systemic toxicity and hypersensitivity reactions²⁴. CHX gel is safe to you for prevention of AO with very less side effects²⁵. Meta-analysis of CHX gel was published by Caso et al which states that use of CHX gel post surgically of retained third molar extraction is associated with no serious side effects and frequency of incidence of AO also appeared to be much less . One of the shortcomings of this meta analysis by Caso was that it only encounter solution form of CHX. One case study

regarding positive effects of CHX gel states that application of CHX gel 0.2% concentration at alveolar site post surgically¹⁵ reduced the occurrence of AO by percentage about 19% (a significant difference) as compare to control group where no treatment was given post surgically at alveolar site after extraction. This is a significant difference. From these conclusions of treatment it has been decided to treat both group of patients with 0.2% CHX gel at alveolar site postsurgically. It becomes protocol to use CHX gel every 12 hourly for seven days by patient at extraction site. CHX in gel form is more expensive than in solution form but it is regarded as best treatment against AO prevention by recent systematic review¹⁰. Our main aim for this case study is that to improve the results of AO prevention by usage of 0.2% of CHX gel²⁶. The effectiveness of CHX is dependent on its dosage. The more the concentration of CHX, the more will be substantivity¹³ and more over more its anti-bacterial effectiveness²⁷. Evidences also show that greater the viscosity of CHX gel harder will be displacement of active agent at extraction site²⁸. It is also noted that use of 1% of CHX gel at extraction site has more positive effects at different clinical level for prevention of AO (14-18). So we can say by increasing concentration of CHX gel by 5% we can more reduce the occurrence of AO post surgically.

CONCLUSION

The difference of AO occurrence by using 1% vs. 0.5% was about half in percentage (7.3% vs. 13%) but from statistics point of view it was not significant. The finding of this case can be found similar to Hita et al.²⁶. Hita et al used the same method and made analysis based on clinical results that AO found after usage of 0.2% was 7.5% as compared to other group where patients suffered 25% from AO after using CHX in concentration 0.12% in mouth rinses. This was a good difference of these two groups when compared but in our case study lack of difference between two groups was due to the others factors that we also observed like inflammation, level of pain, interincisal aperture and secondly in both our groups CHX in gel form (0.5% and 1%) used that it self-reduced the incidence of AO by 19% when applied inside alveolus¹⁵. So it is concluded that clinically 0.2% concentration of CHX is used in alveolus against AO prevention against 1% CHX gel because of its fewer possible side effects²⁹ and secondly, due to its lower concentration, it can better be retained at extraction site in oral cavity by forming mono layer as compare to high concentration that is just over saturation of CHX concentration³⁰.

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