



Evaluation of Hard and Soft Tissue Changes Due to Implant Surgery First Phase with or without Using Topical Antibiotic (Tetracycline) Applying under Screw Cover

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Abstract: Despite the fact that today the process of implant treatment is introduced as a common oral and dental treatment, it is therefore necessary for a surgeon and dentist to provide a specified umbilical cord to prescribe antibiotics for patients with this treatment plan. Bacterial agents have a direct relationship with early failure of dental implants. One of the main causes for possible infections until the second surgery and the threat to the success of the dead space implant among the screw cover, the interior of the implant fixture, the presence of infectious and infectious agents, including saliva and blood there. Also, these cases have led some surgeons to use a 1% prophylactic ointment in the area of the internal surface of the fixture and under the cover of the screw to prevent possible complications

Purpose: The aim of this study was to determine the relationship between the use of 1% ocular tetracycline ointment in the treatment of dental implants and the reduction of fistula and inflammation, as well as the reduction of bone erosion in subsequent follow-up.

Materials and methods: In the case of fistula and inflammation of the data, a clinical observation was carried out by examination by the surgeon to examine the indices of cervical sinus and redness of the tissue. In the context of bone erosion, pre-apical radiographs of patients were calculated approximately 3 months after processing photos in the Photoshop program with a digital caliper with a precision of 0.01 mm.

Results: The result of this study was not statistically significant in relation to bone erosion ($p>0.05$). Regarding the study of inflammation and fistula, also it was not statistically significant ($p>0.05$). Another one was the ease of opening the screw cover in the test group, which is considered an advantage. But since the overflow or lack of flow of the screw cover bacteria has not been proven and not to be significant of data in this study, protocols cannot be used for the use or non-use of topical tetracycline.

Keywords: implant surgery; cover screw; cervical sinus; topical antibiotic

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Introduction

In recent years, the use of intra-bone implants for the rehabilitation of full-teeth or partial patients has been successful in replacing missing teeth with at least changes in other teeth and other tissues in the mouth [1]. This progress began when the term "Osseo Integration" was started by two Branemark and Schroeder research groups [2, 3]. Long-term studies on various types of dental implant systems have shown high success rates (about 90%) over a period of 5 to 10 years [4, 5]. The mucous around the implant has several tissue features. The mucous around the implant has a crack which acts like an obstacle and the functional epithelium is exposed by the layers of the base and hemidesmosomes to the implant surface [6]. The dimensions of the functional epithelium are about 2 mm and are about 1 mm thick in the transplantation area. In the first enclosure of the oral implant, a mucosal attachment with the least dimensions is required to protect the Osseo Integration process [7]. Dentists and other doctors often hesitate in prescribing prophylactic antibiotics for oral surgery, such as dental implants. However, dentists decide to prescribe antibiotics in the some cases, because they will cause major problems in the treatment of oral infections [8]. According to a study (2000) on dentists' treatment, 40% of dentists gave antibiotics to patients without any patient's history. This is a major concern because, according to the Canadian Dental Association, the process of dental implant treatment is now introduced as a common oral and dental treatment. Therefore, it is essential for dentists to be provided with a specified protocol for the prescription of antibiotics to patients with this treatment plan [9].

Several factors play a role in the initial failure of dental implants [10]. It seems that bacterial factors have a relationship with the initial failure of the dental implant [11]. The most important infections that have shown a stronger relationship with the early failure of the implant treatment include streptococci, anaerobic gram positive coccus and anaerobic gram negative rods. Therefore, proper selection of bactericide with minimal toxicity is important for the treatment and improvement of implant and delayed ulcers [12, 13].

According to "The American Heart Association", amoxicillin and penicillin have been suggested as the first line treatment due to the longer absorption of serum levels. However, nowadays clindamycin is a more appropriate substitute due to the high sensitivity of the population to penicillin. The use of antibiotics in dental implants is still controversial. One of the main concerns about the use of antibiotics is drug resistance. Based on CAD, prophylaxis with antibiotics is essential in all dental procedures, especially when there is severe oral bleeding or the risk of contamination of oral tissues [14, 15]. Several studies have suggested the use of antibiotics in the form of single dose prior to the onset of the process and their use after dental implant process to reduce the implant's filler treatment [16]; however, according to another study (2007), antibiotic use is only allowed for patients at high risk for infection [17, 18]. Despite numerous studies that have examined the beneficial effects of antibiotics in the dental implant process [19, 20], and there are different perspectives on the effects of antibacterial effects on dental implants so far [21, 22].

Therefore, the purpose of this study was to evaluate the soft and hard tissue changes following the first phase of implant surgery following the use or non-use of 1% tetracycline ointment as a local antibiotic when closing the lido in the dentistry clinic; because the dead space between the air curtain and the surface area of the fixture can be a good place to accumulate the microbial plaque and cause a localized infection.

Materials and Methods

The aim of this study was to evaluate the effect of topical 1% tetracycline ointment on soft and hard tissue surrounding the implant following the first phase of implant surgery. A total of 87 implants were made from an implant system and bone level in 20 patients. Of these, 4 patients were excluded from study in the area of bone surface around the implant due to lack of pre-apical radiography or inappropriate quality of images in some implants. Finally, 57 implants were accepted for examination of the bone surface. Of these, 27 implants without tetracycline ointment (1%) were used as control group and 30 with tetracycline as test group. In the examination of soft tissue and fistula, all 87 implants were acceptable, 40 as control and 48 implants as test group.

Surgical Steps

After referral to a private dental clinic and examination of candidates for implant treatment, patients who were admitted to study were selected. After all, the terms of the work were explained to all people and they entered the investigation after consent. It should be noted that since all the patients with the implant treatment plan had already been informed about the implant's subsequent evaluations, all the cases and radiographs except implant treatment plan had no problems with ethical considerations. In addition, patients had the right to leave the study at any stage if they did not agree. Implant surgeries of all patients were performed by a practitioner (expert in maxillofacial surgeries) under local anesthesia and with an implant system with bone surface implants. It should be noted that this is a two-stage operation and surgical procedures have been carried out in accordance with the standard method mentioned in the services of the maxillofacial surgery with the requirements of the implant company guidelines, including bone drilling. The distance between the implants and the tooth was at least 1.5 mm, the distance of border to border of two adjacent implants was at least 3 mm and in the buccal and lingual region there was at least 1 mm of bone on the implants.

According to the observations of routine radiographs, patients had a good quality and quantity of bone. After local anesthetic with Lidocaine, a shear was given by the Surgical Blade No. 15 at mid crystal flap and Mucco-periosteal flap was set off by Periostostomoselevator. After the drill was completed, a bone level fixture was placed. Some of the fixture was slightly submerged below the corset. Afterwards, 3% of the anti-tetracycline impregnated screw covers were randomly soaked, and the flap was stitched up with non-absorbent yarn. All patients had the same recommendations and the identical version of the antibiotic amoxicillin 500 mg every 8 hours for one week, stained acetaminophen or ibuprofen 4-6 hours in the event of pain for 3 days and chlorhexidine mouthwash 20.1% was given twice a day for one week. The time for unstitch was one week after surgery, and at the same time from the patient's implants, photographic radiography was taken and recorded in the case for further examinations. Needless to say, all patients were referred to a specialized radiology clinic. Further referrals of patients were the time to detect implants that were located in maxilla 4 and in jaw, 3 months after the fixation, and simultaneously from the implants photographic radiography was taken and this image was also recorded for the subsequent examination.

In order to enhance the quality of the images, each photo was photographed and converted to the computer using Photoshop Sharpness and Contrast. For better visibility, Zoom was used. After that, the distance between the implant shoulder and the first contact of the bone with a fixture by a caliper with a precision of 0.01 mm was calculated on both sides of the mesial and distal in the primary and secondary sights. It should be noted that the bone that was above the fixture shoulder was a positive number and, if the bone was lower, a negative number was given. On the other hand, for the purpose of

reducing the probable error and eliminating any magnification in the image, the implant length criterion, which was fixed, was used as a reference. For example, if the length of the 10 mm implant was 15 mm in radiography (50% greater than the actual length), the numbers obtained on both sides of the mesial and distal were also corrected, and the differences were considered in the respective tables. In order to prevent the application of tastes during the process of measuring the crystal bone erosion in radiographic images, the calculator did not have any awareness of which implant was in which group of research.

Statistical Method

SPSS software was used to analyze the data. Chi-square test was used to determine the presence of fistula with tetracycline. T-test was used for independent samples in order to compare the mean of both distal bone analysis in two groups with and without tetracycline and comparison of mesial bone marrow in two groups with and without tetracycline.

Results

Findings on gender distribution in the samples are presented in Tab. 1 and Fig. 1. Based on these findings, there were 42 males (47.7%) and 46 females (52.3%).

Tab. 1 Distribution of Implant Number in Gender in the Samples

%	Frequency	
47.7	42	Male
52.3	46	Female
100.0	88	Total

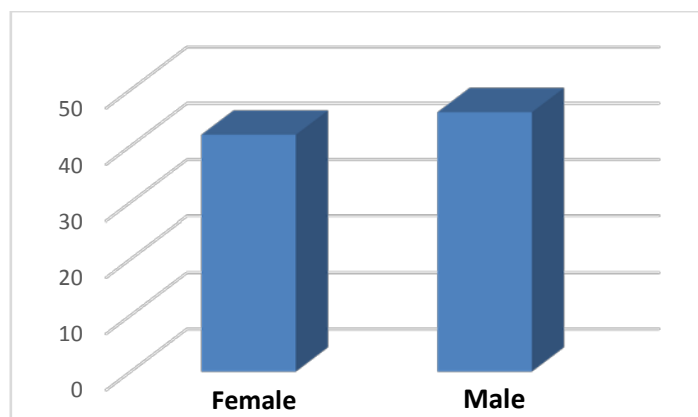


Fig.1 Distribution of Implant Number in Gender in the Samples

Findings on the age distribution in the samples are presented in Tab 2 and Fig 2. Based on these findings, most samples were in the age group of 30-40 years old (37.5%).

Tab.2 Distribution of age in the samples

%	Frequency	
20.5	18	Less than 30 years old
37.5	33	30-40 years old
26.1	23	40-50 years old
15.9	14	More than 50 years old
100.0	88	Total

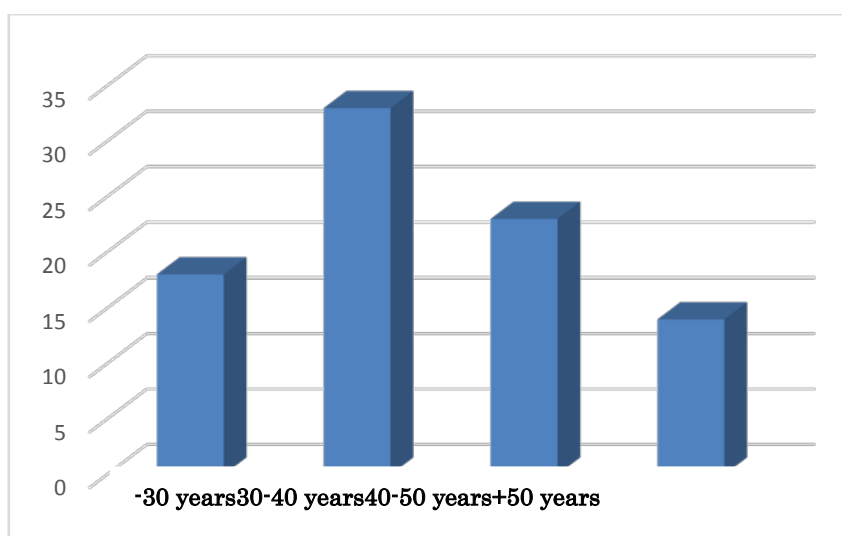
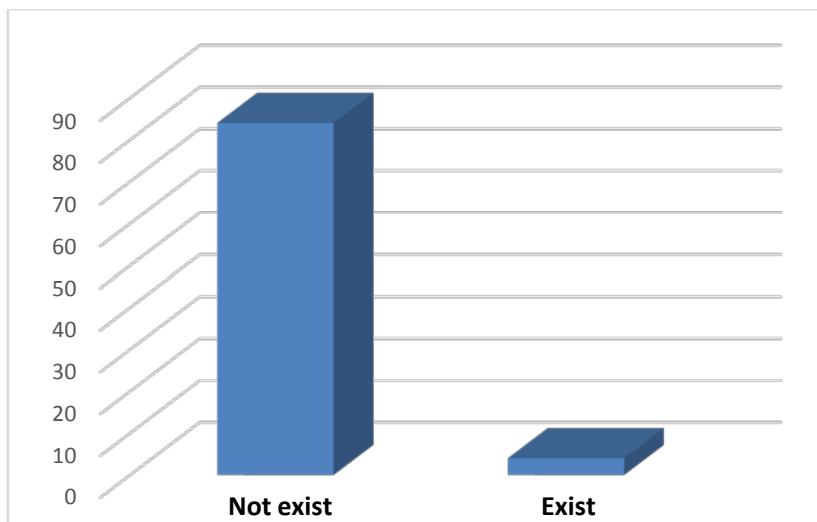


Fig. 2 Distribution of age in the samples

Findings on presence of inflammation in the samples are presented in Tab 3 and Fig 3. Based on these findings, most samples did not have any inflammation.

#Tab. 3 Distribution of the presence of inflammation in the samples

%	Frequency	
95.5	84	Not Exist
4.5	4	Exist
100.0	88	Total



#Fig. 3 Distribution of the presence of inflammation in the samples

Findings on presence of fistula in the sample are presented in Tab 4 and Fig 4. Based on these findings, most samples did not have any fistula.

Tab. 4 Distribution of the presence of fistula in the samples

%	Frequency	
98.9	87	Not Exist
1.1	1	Exist
100.0	88	Total

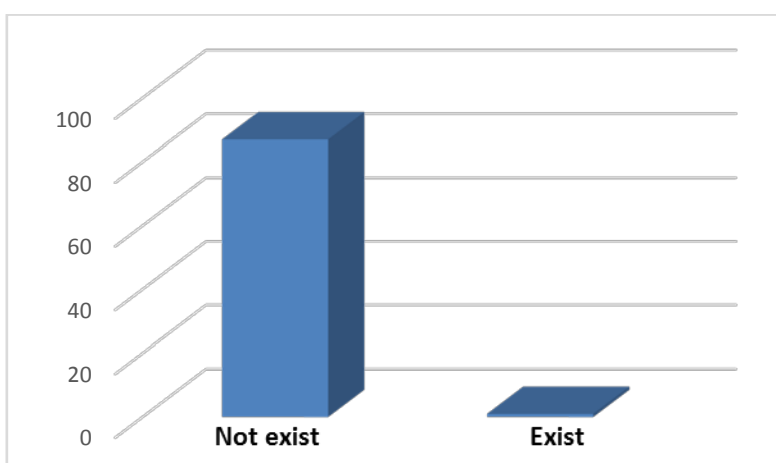


Fig. 4 Distribution of the presence of fistula in the samples

Chi-square test was used to determine the presence of inflammation with tetracycline. The

results are presented in Tab 5. As we can see, there was no significant correlation between the observed frequency of inflammation with tetracycline ($\chi^2 = 1.475$; $p=0.224$).

Tab. 5 Chi-square Test results for the relationship between inflammation and tetracycline

		Groups		Total
		With Tetracycline	Without Tetracycline	
Inflammation	Not Exist	47	37	84
	Exist	1	3	4
Total		48	40	88
Chi-Square		1.475	p-value	.224

Chi-square test was also used to determine the presence of fistula with tetracycline. The results are presented in Tab 6. According to these findings, there was no significant relationship between the observed frequency of fistula and tetracycline ($\chi^2 = 1.214$; $p=0.271$).

Tab. 6 Chi-square test results for the relationship between inflammation and tetracycline

		Groups		Total
		With Tetracycline	Without Tetracycline	
Fistula	Not Exist	48	39	87
	Exist	0	1	1
Total		48	40	88
Chi-Square		1.214	p-value	.271

T-test was used in order to compare the mean of distal bone analysis in two groups with and without tetracycline as it was shown in Tab 7. According to findings of this study, the mean comparison of distal bone erosion in tetracycline group was -0.440 ± 0.442 and the comparison of distal bone erosion in non-tetracycline group was -1.014 ± 2.531 . T-test showed no significant difference between two groups ($t=1.156$; $p= 0.252$).

Tab. 7 Independent t-test results for comparing the mean of comparison of distal bone analysis in both groups with and without tetracycline

	Number	Mean	Deviation	T-test		
				t	df	probability
Without Tetracycline	27	-1.0144	2.53176	1.156	55	0.252
WithTetracycline	30	-0.4428	0.44055			

T-test was also used in order to compare the mean comparison of mesial bone marrow in both groups with and without tetracycline. As we can see in Tab 8, the mean of the comparison of mesial bone erosion in the non-tetracycline group was -0.679 ± 1.751 and the comparison of distal bone analysis in the tetracycline group was -0.471 ± 0.862 . T-test showed no significant difference between both groups ($t=0.156$; $p= 0.577$).

Tab. 8 Independent t-test results for comparing the mean of comparison of mesial bone analysis in both groups with and without tetracycline

	Number	Mean	Deviation	T-test		
				t	df	probability
Without Tetracycline	27	-0.6796	1.75122	0.561	55	0.577
With Tetracycline	30	-0.4709	0.86196			

Based on the findings in Tab. 9, the mean of bone erosion analysis in the non-tetracycline group was -0.847 ± 2.117 , and the rate of bone analysis in the tetracycline group was -0.456 ± 0.525 . T-test showed no significant difference between the two groups ($t = 0.931$; $p=0.356$).

Tab. 9Independent t-test results for comparing the mean of bone fracture analysis in both groups with and without tetracycline

	Number	Mean	Deviation	T-test		
				t	df	probability
Without Tetracycline	27	-0.8470	2.11731	0.931	55	0.356
With Tetracycline	30	-0.4569	0.52565			

Discussion

Despite the fact that today the process of implant treatment is presented as a common oral and dental treatment, therefore it is essential for a surgeon and dentist to provide a specified protocol for the indication of antibiotics to patients with this treatment plan [9]. Typically, in the first and second stages of implant surgery, loss of bone support or bone erosion happens, and this problem occurs only clinically when the fixer is not properly covered [23, 24]. Several factors seem to play a role in losing bone support [25]. However, many researchers believe that sealing or flowing between implants and the oral cavity in the development of the Osseo Integration process [26, 27]. Reducing bone loss and reducing inflammation in implant surgery is essential for the success of this treatment, which indicates the importance of the negative effects of saliva and bacteria on the success of implant therapy [28, 29]. Therefore, bacterial agents have a direct relationship with the early failure of dental implants [30].

Regarding the two-stage surgical procedure, after the improvement of the soft tissue segmentation area, an appropriate flame occurs between the implant and the oral cavity; thus, one of the main factors for possible infections until the second surgery and the threat to the success of the dead space implant between the screw cover and the interior of the implant fixture and the presence of infectious and infectious agents, is existence of saliva and blood there [31, 32]. Since the reference books and articles refer to the bacterial flow, the cover has not been screwed up; this can be considered a factor for inflammation of the fistula and bone erosion in the first phase of implant surgery [33]. Also, these cases have led some surgeons to use a tetracycline ointment 1% like prophylactic and ophthalmic in the internal surface area of the fixture and under the cover of the screw to prevent possible complications [34, 35]. It is important to say that although the type of ointment is 3% and it has more concentrated [36], it should not be used on the surgical site due to not to be sterilized [37].

Although no research has been done on the effect of using tetracycline during implantation screw closure, or at least not available in our available resources, therefore due to the lack of similar research, we did not have much and completely related resources to compare our results.

Concerning bone analysis in this study, the results of the analysis showed that the mean of the analysis in test group was like this: mesial: -0.471 ± 0.861 mm; distal: -0.443 ± 0.44 mm; mesial and distal: -0.456 ± 0.525 mm. The results of the analysis showed that the mean of the analysis in control group was like this: mesial: -0.679 ± 1.751 mm; distal: -1.014 ± 2.531 mm; distal and distal: -0.847 ± 2.117 . We see a decrease in amount of analysis in the mesial and distal dimensions of both groups in test group compared to the control group. But this difference is not statistically significant ($p > 0.05$). Perhaps, if our statistical society were higher, the results would be meaningful. Regarding the relationship between inflammation and fistula, there was no significant difference in the number of inflammation and fistula in the test group compared to the control group ($p > 0.05$).

Another thing that we got in the second surgery while opening the screw cover was the ease of opening the screw cover in the test group, which is an advantage, because in some cases, opening of the screw cover due to the phenomenon of cold welding is a challenge and it requires a lot of force and aggressive methods. But tetracycline ointment acts as a mediator due to the lubrication property and as an intermediate substance, which reduces the likelihood of cold welding and makes the lid easier to open.

In Safari's study, they achieved similar results in bone erosion studies, which despite a reduction in bone erosion in the use of oral amoxicillin antibiotics after surgery or prophylactic prior to surgery, but the results were not statistically significant. In the case of inflammation and fistula, Safari's results were meaningful in the first month. The reason for this difference can be the use of oral antibiotic

which is wider than local use. But in 3-month study, the results of Safari's study were similar to our study in inflammation [38]. Compared with the "Tan" intervention study that looked at the effects of prophylactic antibiotics in patients undergoing implant surgery, the results were similar and antibiotics did not play a role in reducing the complications of surgery [39]. In Esposito's interventional study, the use of antibiotic amoxicillin in reducing implant failure was useful, but he did not succeed in influencing the absolute and beneficial effects of antibiotics [40]. In some ways, the results of his study were similar to the results of this study. In Eta's intervention study, the results showed that the positive effect of antibiotics was on reducing the implant failure. The reason for this controversy may be the wider impact of oral antibiotic, or the statistical population is different from the criteria for entering and leaving the study, as well as the impact of surgeons and various implant systems [41, 42].

Conclusion

The findings of this study showed that despite lower inflammation and fistula and bone erosion in the test group, there was no significant difference between the two groups in terms of statistical analysis. Also, the ease of opening the screw cover in second surgery is an advantage and it is clearly easier to see in the test group. But since the overflow or lack of flow of the screw cover has not been proven, and given the lack of data in this study, protocols cannot be used for the use or non-use of topical tetracycline. It is better that surgeons – who do not have sufficient experience in implant surgery, and to whom the isolation control in saliva control is difficult, as well as implant systems in which the opening of the screw cover in second stage of the challenge surgery – use tetracycline ointment.

Suggestions

Analysis of the status of the patient's marginal bone for analysis up to one year after the insertion of the prosthetic piece because we know that this is the most frequent bone analysis of this period. It is likely that the use of tetracycline will effect on bone quality and Osseo Integration. Therefore, marginal bone analysis is recommended in this period.

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