Influence of perioperative chlorhexidine mouthwash regimen on immediate failure rate of orthodontic miniscrews

Amir Mohammadi [a], Saeid Foroughi Moghaddam [b]

Abstract

Aim: Infectious complication which is reduced by chlorhexidine application may contribute to immediate orthodontic miniscrew failure. This study was determined to assess the influence of this agent on miniscrew immediate failure rate.

Materials and Methods: The study sample consisted of 62 miniscrews inserted in 31 patients that their treatment plan consisted of placing one miniscrew on each side of their maxillary arch between first molar and second molar (2 screws for each patient). Fifteen patients were given a chlorhexidine regimen.

Results: In the first six weeks after miniscrew insertion and before their loading 13.33 % of miniscrews in chlorhexidine group failed but the failure rate in non-chlorhexidine group was 6.25 %. According to Fisher's exact test the difference in failure rate was not statistically significant. Also there was no significant relation of failure rate to any category of the measured insertion torques or placement side (left or right) of miniscrews.

Conclusion: Using chlorhexidine does not affect the miniscrew immediate failure rate. Also, insertion torque value and placement side (left or right side of the jaw) in the maxilla do not seem to have influence in miniscrew failure rate.

Keywords: Chlorhexidine, Mouthwash, Orthodontic treatment, Mini screw.

Anchorage control is one of the most important aspects of orthodontic treatment, which is necessary to obtain optimal treatment goals. [1, 2] The introduction of miniscrews to the field was a great progress for confident anchorage control.[3]

[a]Assistant professor, Department of Orthodontics, Faculty of Dentistry, Tabriz University of Medical Sciences, Tabriz, Iran
[b]Postgraduate student, Department of Orthodontics, Faculty of Dentistry, Tabriz University of Medical Sciences, Tabriz, Iran

Corresponding author:
Dr Saeid Foroughi
Saidforoughi@gmail.com

Miniscrews have many advantages such as, diminished size, noninvasiveness, availability, and low cost.[4] But on the other hand, they have a high failure rate in comparison to endosseous implants.[5,6] Failure of miniscrews is categorized to two types; immediate and delayed failure. Immediate failure or loosening is related to initial phase of miniscrew healing. Improper insertion site and/or handling are possible factors of this type of failure. [5]

Besides considering all these factors, maybe infection control is one of the ways to increase initial stability and success rate of miniscrews. Some authors have suggested using prophylactic mouthwashes such as chlorhexidine can decrease failure rate.[7]

Chlorhexidine is a widely used agent in dentistry and has recognized fungicidal and bactericidal properties. [8] As Lambert et al. showed using chlorhexidine in immediate perioperative period caused a significant decrease in the number of infectious complications which subsequently resulted in a sixfold reduction in dental implants failure rate. [7]

The aim of this study was to evaluate effect of 0.2 % alcohol free chlorhexidine mouthwash on immediate success/failure rate of miniscrews. The study had a special design to take into consideration other confounding factors related to miniscrew failure such as side of insertion (left or right side of the dental arch) and miniscrew insertion torque.

Materials and methods

Sixty two miniscrews inserted in 31 patients whose orthodontic treatment plan included placement of one miniscrew in each side of their maxillary jaw in the interradicular space between second premolar and first molar from buccal side were selected (2 miniscrews were inserted in any patient). No patient with any metabolic bone disease such as osteoporosis, osteopetrosis, and etc. were engaged in the study. The patients were informed orally of the goals of the study and all of them gave their written informed consent. Ethics committee of Tabriz University of Medical Sciences had approved the study design. All miniscrews had 1.6mm diameter and 8mm length (Jeil Company) (figure 1). Immediately prior to the insertion of miniscrews 15 patients (the first 15 patients in order of referring) rinsed their mouth with the chlorhexidine mouthwash and were instructed to continue a daily regimen (2 times a day) of the rinses for one week.



Figure 1. Miniscrew (1.6 mm diameter, 8 mm length) (Jeil Company)

The rest of the procedure was identical for all patients. Local anesthesia was used for insertion of miniscrews and no incision or mucoperiosteal flaps were used and no loading of miniscrews was intended before six weeks after insertion, the period of which was intended to evaluate initial success of miniscrews. In the final turn of the insertion of each miniscrew, the insertion torque was measured by the Orthonia digital appliance of torque measurement (Jeil Company) (figure 2). Any clinically visible loosening of the miniscrews in the first six weeks after their insertion was considered an immediate failure of the device. The mean age of subjects in chlorhexidine group was 17.28 years and 19.63 years in non-chlorhexidine group which reflected a randomly homogenized age distribution in the two groups.





Figure 2. Orthonia appliance for torque measurement

Statistical analysis

The statistical package for social sciences release 13.0 (SPSS) was used to analyze data. A fisher's exact test was used to assess the significance of the difference in miniscrew failure rate of two groups. The same test was also used to assess the relation of side of insertion and insertion torque of miniscrew with the failure rate. A p value of less than 0.05 was considered statistically significant.

Results

Thirty one patients participated in this study, so 62 miniscrews were used during the investigation period. Fifteen patients used the chlorhexidine protocol and the remaining 16 did not. In the first three weeks after miniscrew insertion 4 of 30 miniscrews in chlorhexidine group failed but the failure in non-chlorhexidine group was 2 out of 32 miniscrews. According to fisher's exact test the difference in failure rate was not statistically significant (p value 0.418).

Of the 6 failed miniscrews 2 were in the right side and the other 4 were in left side. Again the p value of 0.671 showed no statistically significant difference (Table 1).

Table 2 shows the number of failed miniscrews of various insertion torques. Different statistical analysis for various groups of insertion torques showed no significant relation of failure rate to any category of the measured values.

Table1. Relation of failure rate with Insertion side of miniscrews and chlorhexidine use

		side		chlorhexidine	
		left	right	Yes	No
Loosening	No	27 (87.1%)	29 (93.5%)	26 (86.7%)	30 (93.7%)
	Yes	4 (12.9%)	2 (6.5%)	4 (13.3%)	2 (6.3%)
Total		31	31	30	32

Table2. Insertion torque and failure relation

		Miniscrew insertion torque (Ncm) *						Total
		5	10	15	20	25	30	
Loosening (failure)	No	11	22	16	3	2	2	56
	Yes	1	3	1	0	1	0	6
Total		12	25	17	3	3	2	62

* Newton centimeters

Discussion

Electronic database search revealed there was no study on the effect of the chlorhexidine on the failure rate of the orthodontic miniscrews. Lambert et al. assessed the chlorhexidine effect on osseointegrated dental implants and showed a sixfold reduction in failure rate.[7] However, our study showed no significant difference in failure rate of the two groups. Similarly Park et al. investigated orthodontic miniscrew management factors including oral hygiene which did not show any statistical contribution to success rate of the miniscrews.[9] However, Park's study revealed interesting findings: side of miniscrew placement (right or left), and inflammation showed significant differences in success rates. Right side of the jaw was a relative risk factor in the logistic regression analysis and when excluding mobility, inflammation around the screw implants was added to the risk factors. [9]

However, Moona et al. in their study of factors influencing miniscrew success concluded that there is no significant difference in the success rate according to the odds ratio of sex, age, placement site, soft tissue management, and placement side in the maxilla. [10] Miawaki et al. reported that they could not find a significant association between the success rate and the variables such as location of screw implantation.[11] The same results were also confirmed by our study which showed no significant difference of success rate due to placement side in the maxilla.

Chaddad et al. examined 32 miniscrews in 10 patients and get to the point that insertion torque statistically affected the success rate of the mini-implants and a measurement of more than 15 Ncm of torque value appeared to be critical for screw to survive during treatment.[1] Motoyoshi et al [12] recommended an mini-implant placement torque range of 5 to 10 Ncm. Their recommendation was based on the observation that higher torque values did not yield higher success rates. However, our study did not get to the same point.

Conclusion

Using chlorhexidine does not affect the miniscrew immediate failure rate.

Insertion torque value and placement side in the maxilla do not seem to have influence in miniscrew survival rate.

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