

Comparison of Bone Loss around Bone Platform Shift and Non-Bone Platform Shift Implants after 12 Months

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Abstract

Objectives: The aim of the present randomized clinical trial was to evaluate marginal bone loss around two types of implants modified at the neck area: Nobel Active and Nobel Replace Groovy, both manufactured by Nobel Biocare.

Materials and Methods: A total of 25 Nobel Active and 21 Nobel Replace Groovy implants were included in the present study. The implants were placed based on the relevant protocol and patient inclusion and exclusion criteria. The amount of bone loss around implants was compared at six- and 12-month intervals using digital periapical radiographs.

Results: The mean bone loss values in the Nobel Active and Nobel Replace Groovy groups were 0.682 mm and 0.645 mm, respectively, with no statistically significant difference based on the results of independent t-test ($P=0.802$).

Conclusion: Use of both implant types yielded favorable results with high durability. The two implant types exhibited no superiority over each other in terms of bone loss.

Key words: Bone Loss; Dental Implant-Abutment Design; Platform Switching
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INTRODUCTION

It has been demonstrated that bone remodeling occurs after dental implant placement surgery, which will result in a decrease in bone volume in both horizontal and vertical dimensions [1]. The etiology of this bone loss has not been completely elucidated but based on an existing hypothesis the following factors are believed to be the main cause: trauma to the bone and periosteum during surgery, lack of biomechanical balance in relation to force application, the size of microgaps between the implant and the abutment, bacterial

colonization at the implant sulcus, the biologic width and loss of equilibrium between the host and parasites. Although a small amount of bone loss after implant placement will not have a negative effect on its success, evaluation of changes in the level of crestal bone around the implant over time is considered a standard criterion for implant success [2]. At present, many attempts are under way to preserve marginal bone, which include a change in the length and design of implant neck, surface characteristics of implant, implant diameter and its placement

depth, an increase in microthreads, use of one-piece implants and platform switching technique [3]. Platform switching technique was used for the first time in mid-1980s. At that time, implants with greater diameters were used; however, corresponding abutments were not available; therefore, narrower abutments were used. Long-term follow-up of this technique with the use of radiographic evaluations showed that the amount of vertical crestal bone loss was less than expected [1,4], which might be attributed to an increase in the distance between the alveolar crest and the implant–abutment interface, with a role in protection against the existing microflora. In addition, further research showed that use of the platform switching technique significantly decreases stresses imposed on the crestal bone and due to the extension of the rough titanium surface to the shoulder of the implant, osseointegration takes place along the entire length of the implant [5,6].

Platform switching has gained popularity among implant manufacturers compared to conventional platform-matched implants [7]. It is claimed that platform shift implants form a bony ring along the crestal bone around the coronal portion of the implant, increasing the remaining bone volume around the implant neck. The following advantages have been mentioned for this technique: A decrease in mechanical stresses imposed on the crestal bone, placement of the papilla on the bony ring and provision of blood supply to the bone, especially when the distance between the implants decreases. Also, the platform shift technique may reduce the risk of bone loss in comparison to conventional implants with matching prosthetic component diameters [5,6,7]. Although theoretically this technique has many benefits, further studies are needed to evaluate the clinical success of this type of platform shift implants [8]. The aim of the present study was to compare the amount of bone loss around bone platform shift and non-bone platform shift implants.

MATERIALS AND METHODS

In the present clinical trial (IRCT 201204029358n1) with a parallel design, a total of 25 non-platform shift implants and 25 platform shift implants were placed in the posterior mandibles in the first and second premolar and first and second molar areas, as the case and control groups, respectively, in patients referring to the Department of Implantology, Faculty of Dentistry, Tehran University of Medical Sciences. Pass II software (DOE option) was used to randomly assign patients to the case and control groups. Only patients having the proper conditions to undergo implant placement surgery were included in the study, in relation to systemic and local conditions and oral habits. The sample size was calculated to be 25 implants in each group for statistically significant difference of approximately 0.2 mm with the two implant types at a 95% confidence interval and a test power of 90% and by considering an integrated standard deviation of approximately 0.21. All the implants were placed at bone level, confirmed by a panoramic radiograph after surgery. After the healing period (eight weeks after the surgical operation), the patients were referred for the initiation of prosthetic treatment procedures and implant-supported crowns were fabricated and placed. During the follow-up period, every six months (up to one year after implant placement) each patient underwent a standardized digital periapical radiography and the amounts of crestal bone loss around the implants at six and 12-month intervals were compared to determine which implants resulted in less bone resorption. To decrease the confounding factors, all the implants were of the same brand, with similar surface characteristics. Attempts were made to use implants of the same type in both groups. To standardize radiographs after placement of prostheses, an alginate impression was taken from each patient and a radiographic stent was fabricated for the reproducibility of

radiographs for each patient. The radiographs, taken exactly in the same manner and position, were compared using the relevant software Romexis® (Planmeca, IL, USA) version 2.6 and the amount of bone loss was determined.

Independent sample t-test was used for comparing bone loss between the two groups. Since more than one implant was placed in some patients, marginal modeling and generalized estimating equations (GEE) were used to consider the created correlation and the time elapsed after placement of the implant in order to compare the amount of bone loss between the two groups.

RESULTS

Of all the 46 implants evaluated in the present study, 25 implants were of the bone platform shift type (group A) and 21 implants were of the non-bone platform shift type (group B).

Table 1 presents the mean bone loss values in the two groups without considering the time elapsed after implant placement. Independent t-test did not reveal any significant differences in the mean bone loss between the two groups ($P=0.802$). Table 2 presents the results of GEE modeling and shows that the implant types had no significant effect on the amount of bone loss in the subjects by considering the effect of time elapsed after implant placement ($P=0.707$).

In fact, the amount of bone loss in type A implants was 0.07 mm more than that in type B, but this difference was not statistically significant.

DISCUSSION

The results did not show any statistically significant difference in bone stability at gingival margin between these two implant types. The amounts of bone loss in Nobel Replace Groovy and Nobel Active implants were 0.645 and 0.682 mm, respectively, which were not different from each other from statistical and clinical viewpoints. Therefore, it can be concluded that both techniques were effective in bone stability during implant placement, without any superiority to each other. In a study by Kielbassa et al. [8] comparison of Nobel Replace Groovy and Nobel Active implants did not reveal any significant differences in bone loss after one year, which is similar to our findings. But Hürzeler et al. found a different result. They carried out a case-control study to evaluate the effect of platform switching technique on the amount of bone loss around implants [9]. In their study, 14 implants with large platforms and smaller abutments and eight implants with matching abutments and platforms with normal dimensions were included as the case and control groups, respectively.

Table 1. Comparison of the mean bone loss between the two groups

Implant type	Number	Mean	SD	P
A	25	0.682	0.468	0.802
B	21	0.645	0.519	

Table 2. The results of GEE analysis for the comparison of bone loss between the two groups by considering the time elapsed after implant placement

Variable	Class	Estimate	Standard error	P
Implant placement duration	-	0.049	0.46	0.281
Implant type	A	0.069	0.184	0.707
	B	Reference class	-	-

The results showed that platform switching technique decreased bone loss around implants [9]. Pieri et al. carried out a similar study in 2011 in maxillary premolar area immediately after extraction and found that although the mean bone loss was lower in platform switched implants, it was not clinically and statistically significant [10]. Carinci et al. compared the efficacy of implants with reverse conical neck (RCN) with that of conventional implants [5]. They also found that there were no significant differences in survival and success rates between the two implant types and platform switching did not result in any change in the amount of bone loss in implants with RCN, despite its advantages. A retrospective study by Danza et al. also showed a similar result [6]. Crespi et al. compared bone levels at 24-month interval after using platform-switched and non-platform-switched implants using radiographic techniques [11]. It was concluded that immediate placement of implants in the socket of extracted teeth and immediate loading is a predictable protocol during a 24-month period, with no significant differences in bone loss between the two platform-switched and non-platform-switched techniques.

CONCLUSION

Platform switching in the neck area of implants did not result in significant differences in bone loss in this area. Also, it can be concluded that the Nobel Biocare implants may be successfully used. However further studies are recommended in this regard.

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