ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 11, pp. 21856-21860, November, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EVALUATION AND COMPARISON OF CRESTAL BONE CHANGES IN PATIENTS WITH IMPLANT SUPPORTED PROSTHESES FITTED WITH CONVENTIONAL ABUTMENTS AND PLATFORM SWITCHED ABUTMENTS

Xerxes Khambatta., Rizwan M Sanadi., *Meenu .V. Pillai and Medha Sawarkar

Department of Periodontics, Y.M.T Dental College and Hospital, Sector-4, Kharghar, NaviMumbai-410210

DOI: http://dx.doi.org/10.24327/ijrsr.2017.0811.1155

ARTICLE INFO

Article History:

Received 16th August, 2017
Received in revised form 25th September, 2017
Accepted 23rd October, 2017
Published online 28th November, 2017

Key Words:

Platform switching, radiovisiography, crestal bone loss, abutment-fixture interface.

ABSTRACT

Aim: To evaluate and compare crestal bone loss in conventional abutments and platform switched abutments in implants placed in the oral cavityat 3, 6, and 9 months in 20 sites.
Materials and methods: 20 sites requiring implant supported prosthesis were selected. For each implant, radiographs, (using radiovisiography);were evaluated for interproximal bone level changes from the abutment-fixture interface, arbitrarily taken as baseline level. The proximal distance between the interface and the most coronal aspect of the alveolar crest was measured at the mesial and distal aspects, at baseline and at intervals of 3, 6 and 9months. The difference between the bone loss from the initial and final radiographs for each implant was calculated for the total bone loss of that implant and was subjected to statistical analysis.
Results: There was statistically significant difference in the bone loss between the two groups at 6 and 9 months. The platform switching group showing less bone loss as compared to the platform matched group (control group).
Conclusion: This study concluded that platform switching resulted in lesser bone loss as compared to the platform matched group (control group) and can help preserve peri-implant bone peak better than the conventional implant restoration.

INTRODUCTION

Osseointegrated dental implants have become a predictable treatment optionfor single partially edentulous spans in patients. Implant therapy offers increased longevity, improved function, bone preservation and quality of life. Success rates for endosseous implants have been shown to be greater than 90% (GardnerDM, 2005). The longevity of the implants relies primarily on their stability at placement. The peri-implant bone level is one of the criteria to assess the success of dental implants. It is an important prerequisite for preserving the integrity of gingival margins and interdental papillae, which is most challenging for the placement and subsequent restoration in the esthetic zone. A comprehensive understanding of crestalbone changes around endosseous implants and subsequent soft tissue reaction to these osseous changes hence becomes imperative (AteihMA *et al*, 2010).

There is an association between bone and soft tissue preservation around implants with direct influence on aesthetics. Some authors have proposed different methods to maintain supporting bone such as improved implant micro-geometry and implant surface treatment, improved implant abutment connection (elimination of bacterial reservoir, absence of movements under bending forces) as well as the use of wide implants with smaller sized abutments (platform switching concept).

The concept of "platform switching" explains the use of a smaller-diameter abutment on a larger-diameter implant collar. This connection shifts the perimeter of the implant– abutment junction (IAJ) inward toward the central axis (i.e., the middle) of the implant. Lazzara and Porter introduced 5mm and 6mm diameter implants with seating surfaces (i.e. restorative platforms) of the same dimensions. After a 5-yearperiod, the typical pattern of crestal bone resorption was not observed radiographically in cases where platform switching was utilized. They theorized that this occurred because shifting the IAJ inward also repositioned the inflammatory cell infiltrate and confined it within a 90° area that was not directly adjacent to the crestal bone.

The mechanism by which this stepped effect produced by platform switching may contribute in maintaining the crestal

Corresponding author:* **Meenu .V. Pillai
Department of Periodontics, Y.M.T Dental College and Hospital, Sector-4, Kharghar, NaviMumbai-410210

bone height can be because of following main reasons:-

- Shifting of the inflammatory cell infiltrate inward and away from the adjacent crestal bone.
- Maintenance of biological width and increased distance of IAJ from the crestal bonelevel in the horizontal way.
- The possible influence of microgap on the crestal bone is reduced.
- Decreased stress levels in the peri-implant bone.

This study was therefore designed to evaluate and compare bone loss inplat form matched abutments and platform switched abutments in implants placed in 20 sites at3,6 and 9 months.

Aim of the Study

This study is designed to evaluate and compare crestal bone loss in conventional abutments (platform matched) and platform switched abutments in implants placed in the oral cavityat 3, 6, and 9 months in 20 sites.

MATERIALS AND METHODS

This clinical study was conducted in Department of Periodontics, in 20 sites requiring implant supported prosthesis. Each selected subject was given a detailed statement about the type, duration and benefits of the proposed treatment. An informed, written and signed consent was taken from all the selected subjects.

Method of Collection of Data

Systemically healthy and willing subjects, male or female, who are ready to give consent for the study were included in the study.

Subjects with poor oral hygiene or with bruxism or systemic debilitating diseases which contraindicates the person for surgical approach and smokers were excluded.

Study Design

A total of 20 implants were placed in subjects with missing teeth. Final prosthesis was given after 3 months of healing period after the implant placement. The subjects were followed up at 3, 6 and 9 months post implant insertion.

Pre Implant Surgical Preparation

1. Oral prophylaxis and correction of other pathologies in the subjects was done prior tosurgery
2. Antibiotics were administered 1 hour prior to surgery and every 8 hours for the next 5 days

Surgical Procedure

The surgical site was anaesthetized with local anaesthetic (2%lignocaine hydrochloride with 1:80,000 adrenaline) by giving block and infiltration anaesthesia. A mid crestal incision was given at the implant site, using B.P. handle (blade no.15). The incision was extended to the mesial and distal teeth giving crevicular incisions with B.P. handle and blade. Vertical incisions were given only if required.

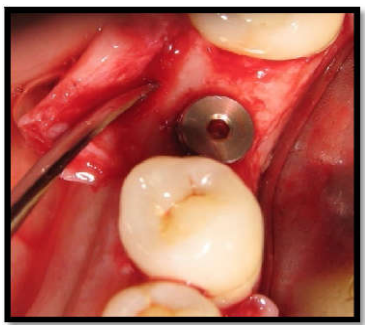
Full thickness mucoperiosteal flaps were reflected with the help of periostealelevator and the implant site was exposed. Surgical stent was used to make the punch drill. The sequence of drills used was as suggested by the manufacturer. A copious amount of refrigerated sterile irrigant (Saline) was used in osseous drilling procedure. Finally the implant (Brand: Uniti, Manufacturer: Equinox Pvt Ltd.) was advanced into the prepared site until the platform was flush with the crestal bone. Sutures were placed to approximate the flap around the implant which were removed after a week.

Radiographic Parameters

Digital radiographs i.e. intraoral periapical (IOPA) were taken using radiovisiography. The digitalized radiographic images were analyzed using image analysis software (KODAK software) with an accuracy of 0.1 mm. For each implant, radiographs were evaluated for interproximal bone level changes from the abutment-fixture interface, arbitrarily taken as baseline level. The proximaldistance between the interface and the most coronal aspect of the alveolar crest was measured at the mesial and distal aspects, at baseline and at intervals of 3, 6 and9months. The difference between the bone loss from the initial and final radiographs for each implant was calculated for the total bone loss of that implant.

All the clinical and radiographic parameters assessed at different time intervals were subjected to statistical analysis.

Mandibular occlusal view



Implant and coverscrew seated

Final Restoration

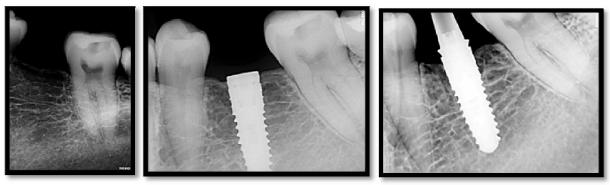
Fig 1 Case No. 1-Platform Switching

Fabrication of Permanent Prosthesis

At three months after implant placement the second stage surgery was performed. The gingival former was placed. Two weeks following this, a final impression was made with a rubber base impression material. The final prosthesis was made in the laboratory. Metal try-in and shade selection were done. Once the ceramometal prosthesis was ready, it was cemented.

Measurement of Crestal Bone Loss (Yoorh 2006)

Corrected crestal bone loss = measured bone level × (actual implant length /measured implant length), e.g. corrected crestal bone loss = 2 × 10/11= 2 × 0.9 = 1.8mm

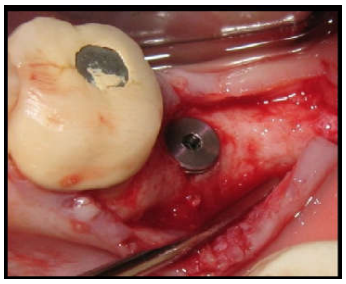


Preoperative **Immediate postoperative** **At 3 months**

Final Prosthesis **At 6months** **At 9 months**

Fig 2 RVG Images

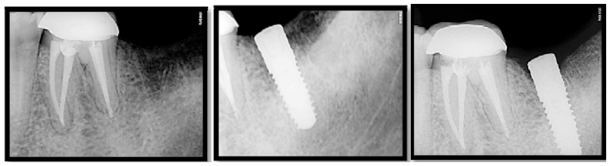
Mandibular occlusal view



Implant placed and cover screw seated

Final Restoration

Fig 3 Case No. 2 - Control



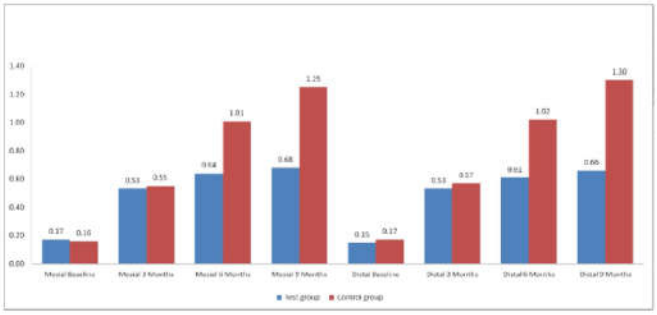
Preoperative **Immediate Postoperative** **At 3 months**

Placement of abutment (Non-Platform Switched) **At 6 months** **At 9 months**

Fig 4 RVG Images

OBSERVATIONS AND RESULTS

In the present study, when the mesial and distal bone loss were compared between platform switching and control group at different time intervals, the p-values were obtained by Mann-Whitney U test (Table 1).The analysis was performed with a statistical software package (IBM SPSS, Version 20, India)Significant difference in bone loss was seen after 6 and 9months. The mean bone loss at 6 and 9 months was 0.64 ± 0.09mm and 0.68 ± 0.09mm for mesial bone loss and 0.61 ± 0.09 and 0.66 ± 0.09 for distal bone loss respectively in platform switching group & 1.01 ± 0.16mm and 1.25 ± 0.17mm for mesial bone loss & 1.02 ± 0.13mmand 1.30 ± 0.11mm for distal bone loss respectively in control group. There was statistically significant difference in the bone loss between the two groups at 6 months and 9 months. The platform switching group showing less bone loss as compared of the two. Tabular and graphical representations of the values are given ahead (Table 1)



Graph 1 The mean wise comparison of bone loss in millimeters (mm), mesially& distally, at different stages of both Test(Platform Switched) and Control(Non-Platform Switched)

DISCUSSION

Early crestal bone loss has been observed around the permucosal portion of dental implants for decades, such loss has been described in the crestal region of successfully osseo integrated implants regardless of surgical approaches, and can range from loss of marginal bone to complete failure of the implant. It varies in degree and dramatically decreases after the first year. It is reported that crestal bone levels are typically located 1.5 mm to 2 mm below the implant –abutment junction (IAJ) at 1yearfollowing implant restoration, but are dependent upon the location of the IAJ relative to the bony crest.

Table 1 Comparison of control and platform switching group with respect to mesial bone loss at different intervals by Mann-Whitney U test

Time	Group	Means		Std.Dev.		Sum of ranks		P-Value	
		Mesial	Distal	Mesial	Distal	Mesial	Distal	Mesial	Distal
Baseline	Control	0.16	0.17	0.08	0.06	110.00	103.00	100.00	0.671
	Platform Switching	0.17	0.15	0.06	0.07	107.00	100.00		
3 months	Control	0.55	0.57	0.11	0.10	108.50	114.00	0.777	0.460
	Platform Switching	0.53	0.53	0.06	0.09	101.50	96.00		
6 months	Control	1.01	1.02	0.16	0.13	154.00	155.00	0.008	0.007
	Platform Switching	0.64	0.61	0.09	0.09	56.00	55.00		
9 months	Control	1.25	1.30	0.17	0.11	155.00	155.00	0.007	0.006
	Platform Switching	0.68	0.66	0.09	0.09	55.00	55.00		

The various etiological factors leading to crestal bone loss are: Surgical trauma, Abnormal occlusal loading, Implant-abutment junction variations, Bacterial colonization in the peri-implant surface. Violation of biologic width, Host response to changes in bacterial flora.

The amount of bone loss is also observed to be different for differentbone densities and different implant designs.

Several theories exist as to the reason for the observed changes increstal bone height following implant restoration namely: (Misch CE 1993)

1. Periosteal reflection hypothesis
2. Implant osteotomy hypothesis
3. Autoimmune response of host hypothesis
4. Biological width hypothesis
5. Stress factors hypothesis.

Another theory assumed that shifting the implant-abutment connection may medialize the location of the biologic width and minimize the marginal bone resorption, now this theory was based on previous studies, that showed that placing the implant-abutment junction at or below the crestal bone level, may cause vertical bone resorption to re-establish the biologic width. Another theory concerned the role of the inflammatory cell infiltrate at the implant-abutment junction (IAJ). Ericsson *et al* showed that the bone resorption at the IAJ was caused by an inflammatory cell infiltrate that formed in a 1.5mm semispherical zone around the IAJ.

Lazzara and Porter have also theorized that the inward movement of the IAJ in this manner also shifts the inflammatory cell infiltrate inward and away from the adjacent crestal bone, which limits the bone change that occurs around the coronal aspect.

Stress Distribution in an Implant with platform switch design

Force dissipation in the platform switching restoration is slightly more favorable in an internal than in an external junction, since it improves distribution of the loads applied to the occlusal surface of the prosthesis along the axis of the implant. On the other hand, this concentration of forces along the axis of the implant, transmitted through the retention screw, increases the possibility of abutment fracture, and thus may lead to failure of the global restoration.

The technique has few clinical implication such as in cases of short implants, anterior aesthetic zone, implants adjacent to natural teeth.

The clinical advantages of this concept are as follows.

1. To obtain a good long-term prognosis through increasing the degree of bond between implant and bone by minimizing the bone loss of crestal area.
2. To make it possible to produce an aesthetic prosthesis with the production of papilla through minimizing the bone loss between implants and protecting the recession of papilla.
3. To protect the concentration of force on the crestal area.
4. Preservation of esthetics

Also there are few disadvantage of using platform switched implants

1. Platform switching involves using abutments with a smaller diameter than that of the implant platform. This limits the advantages of wide-diameter implants that have matching-diameter abutments.
2. Increasing stresses in the abutment or abutment screw.
3. The procedure shows the need for components that have similar designs (the screw access hole must be uniform) and the need for enough space to develop a proper emergence profile. However, it results in better preservation of periimplant bone.

Long term preservation of crestal bone height around osseointegrated implants is often used as a primary success criteria for different implant systems. Originally a mean crestal bone loss ≥ 1.5mm during the first year after loading and ≥0.2mm/year thereafter had been proposed as one of the major success criteria by Albrektsson. The results obtained in the study are very much in accordance with the studies done previously on platform switching. A significantly less bone loss was found in platform switching group at the end of 6 and 9months.

CONCLUSION

Under the limitations of above preliminary study it can be concluded that platform switching can help preserve peri-implant bone peak better than the conventional implant restoration. This bone preservation can lead to better support for soft tissues and a good crown to implant ratio. Although the technique of platform switching definitely requires additional studies to establish the biological process(es) responsible for the observed positive radiological findings.

References

1. Gardner DM. (2005). Platform switching as a means to achieving implant esthetics. *NY State Dent J.* Apr; 71(3):34-7.
2. Atieh MA, Ibrahim HM, Atieh AH. (2010) Platform switching for marginal bonepreservation around dental implants: a systematic review and meta-analysis. *J Periodontol.* Oct; 81(10):1350-66.
3. Lazzara RJ, Porter SS. (2006). Platform switching: a new concept in implant dentistryfor controlling postrestorativecrestal bone levels. *Int J Periodontics Restorative Dent*. Feb; 26(1):9-17.
4. Baumgarten H, Cocchetto R, Testori T, Meltzer A, Porter S. (2005). A new implantdesign for crestal bone preservation: initial observations and casereport. *Pract Proced Aesthet Dent.* Nov-Dec; 17(10):735-40.
5. López-Marí L, Calvo-Guirado JL, Martín-Castellote B, Gomez-Moreno G, López-Marí M. (2009). Implant platform switching concept: an updated review. *MedOralPatol Oral Cir Bucal*. Sep 1; 14(9):e450-4.
6. CalvoGuirado JL, Ortiz Ruiz AJ, Gómez Moreno G, LópezMarí L, BravoGonzález LA. (2008). Immediate loading and immediate restoration in 105 expanded-platform implants via the Diem System after a 16-month follow-upperiod. *Med Oral Patol Oral Cir Bucal.* Sep 1;13(9):E576-81
7. CalvoGuirado JL, SaezYuguero MR, Pardo Zamora G, Muñoz Barrio E.(2007). Immediate provisionalization on a new implant design for esthetic restoration and preserving crestal bone .*Implant Dent*. Jun; 16(2):155-64.
8. Becker J, Ferrari D, Herten M, Kirsch A, Schaer A, Schwarz F. (2007). Influence of platform switching on crestal bone changes at non-submerged titaniumimplants: a histomorphometrical study in ogs. *J Clin Periodontol.* Dec; 34(12):1089-96.
9. Priest GF.2007, (2008) The esthetic challenge of adjacent implants. *J Oral Maxillofac Surg*. Jul; 65 (7 Suppl 1):2-12. Erratum in: *J Oral Maxillofac Surg*. Oct; 66(10):2195-6.
10. Maeda Y, Miura J, Taki I, Sogo M. (2007) Biomechanical analysis on platform switching: is there any biomechanical rationale. *J Clin Oral Implants Res.* Oct; 18(5):581-4.
11. Hermann F, Lerner H, PaltiA (2007). Factors influencing the preservation of the periimplant marginal bone Implant Dent.xJun; 16(2):165-75.
12. Canullo L, Rasperini G. (2007) Preservation of peri-implant soft and hard tissues using platform switching of implants placed in immediate extraction sockets: a proof-of-concept study with 12- to 36-month follow-up. *Int J Oral Maxillofac Implants*. Nov-Dec; 22(6):995-1000.
13. Hürzeler M, Fickl S, Zuhr O, Wachtel HC. (2007) Peri-implant bone level around implants with platform-switched abutments: preliminary data from aprospective study. *J Oral Maxillofac Surg*. Jul; 65(7 Suppl 1):33-9.Erratum in: *J Oral Maxillofac Surg*. 2008 Oct; 66(10):2195-6.
14. Degidi M, Iezzi G, Scarano A, Piattelli A.(2008) Immediately loaded titanium implant with a tissue-stabilizing/maintaining design ('beyond platform switch') retrieved from man after 4 weeks: a histological and histomorphometrical evaluation. A case report. *Clin Oral Implants Res*. Mar; 19(3):276-82.
15. Cappiello M, Luongo R, Di Iorio D, Bugea C, Cocchetto R, Celletti R.(2008) Evaluation of peri-implant bone loss around platform-switched implants. *IntJPeriodontics Restorative Dent* Aug; 28(4):347-55.
16. Cimen H, Yengin E. (2012) Analyzing the effects of platform switching procedure on stresses in the bone and implant‐abutment complex by 3‐D FEM analysis. *Journal of Oral Implantology*; 38:21‐25.
17. Pessoa R, Bezerra, Sousa R, Vander Sloten, Casati M, Jaecques. (2014) Biomechanical evaluation of platform switching: Different mismatch sizes, connection types and implant protocols. *J Periodontol*;85:1161‐1171
18. Bouazza‐Juanes K, Martinez‐Gonzalez A, Peiro G, Juan‐Jose Rodenas, Maria‐Victoria Lopez‐Molla. (2015) *J Clin Exp Dent*. Oct; 7(4): e483‐e488.

How to cite this article:

Xerxes Khambatta *et al*.2017, Evaluation And Comparison of Crestal Bone Changes In Patients With Implant Supported Prostheses Fitted With Conventional Abutments And Platform Switched Abutments. *Int J Recent Sci Res.* 8(11), pp. 21856-21860. DOI: http://dx.doi.org/10.24327/ijrsr.2017.0811.1155

****