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Research Article

ORAL PERIIMPLANT BONE LOSS: PLATFORM SWITCHING OR SHIFTING? – A REVIEW

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ABSTRACT

Background: Prevention of crestal bone loss by inward shifting of the implant abutment junction has gained popularity among implant manufactures over the last few years. However, effect of stepping down the size of implant platform on crestal bone loss is not known. Objective of this review article is to discuss the concept of platform switching and shifting.
Purpose: The purpose of this article is to discuss the literature dealing with the platform switching and platform shifting concept.
Materials and Methods: Thorough literature search using PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Web of Sciences, AMED (Ovid) was done.
Results: Literature search revealed studies involving concepts of platform switching and platform shifting.
Conclusion: Effect of platform switching on crestal bone loss is very well documented as compared to platform shifting.

INTRODUCTION

In implantology, understanding of biology and immunology of bone is of utmost importance. Bone homeostasis is regulated by coupled interplay between the osteoblast and osteoclast. Osteoclast-osteoblast interplay involves bone growth, bone healing and bone remodeling. Bone metabolism is challenged in patients with dental infection which is different from the bone metabolism around the tooth[1].

Albrektsson *et al* hypothesize that the key trigger of bone turnover in implants is the trauma applied[2]. Minor trauma may result in successful osseointegration whereas more trauma can result in marginal bone loss and major trauma can lead to implant failure[1].

One of the pertinent success criteria for assessing dental implant therapy is by detecting periimplant bone level after prosthetic loading[3]. After placement, bone remodeling is usually seen around dental implants which results in diminution of bone volume. It can occur due to two reasons: stress concentration at the coronal region of dental implant and localized inflammation of the soft tissue at the implant abutment interface. Although after the first year of implant function, bone loss is usually exempted from pathological diagnosis as it is due to normal bone remodeling[1].

Marginal bone loss after the first year may occur around dental implants due to periimplant infections. Implants act like our natural teeth and are therefore susceptible to similar type of diseases. The only exception being the term periodontitis (biofilm mediated infection) earmarked for the teeth and periimplantitis earmarked for implant[4]. Marginal bone loss may also occur for reasons other than infections likely periodontal biotype, bone density and the formation of biological width, implant placement depth, interimplant distance, implant macrodesign and microdesign, occlusal overloading and surgical trauma[4].

Accepted Crestal bone loss in two-piece implantis 1.5mm during the first year, followed by a loss of 0.2mm in the subsequent years[5]. Nowadays marginal bone levels (MBLs) around implants following prosthetic loading should not exceed 0.5 mm up to 3 years or 5 years of observation[3]. Numerous methods to preserve marginal bone 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 implant and platform switching technique.
In this article the authors reviewed the implant abutment interface and its influence on the dynamics of bone loss around the dental implants.

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DISCUSSION

Implant abutment interface plays a substantial role in providing primary stability and strength to an implant supported restoration. Implant abutment interface ensures optimal load distribution to reduce peak stresses. It also minimizes the infiltration of bacteria and contamination in microgaps.

Implant abutment interface design when located at alveolar bone contributes to recruitment of inflammatory cell infiltrate. These recruited inflammatory cell infiltrate contributes to the marginal bone loss. Regardless of the type of Implant abutment interface marginal bone loss around implants are generally professed. One of the many ways of reducing marginal bone loss around dental implants is platform switching. Platform switching occurs when the diameter of abutment is lesser the diameter of implant platform.

Platform switching can be defined as "act of changing an implant abutment to one with a smaller diameter, so as to place the implant abutment interface medial to the edge of the implant platform"[6]. Implant innovations ascertained the concept of platform switching in the year 1991. Initially they introduced wide diameters implants with matching diameters platforms. However, due to unavailability of wide diameter prosthetic components, early 5 and 6mm wide implants received standard diameter (4.1mm) healing abutments and were restored with standard diameter (4.1mm) prosthetic components. On follow up, this inadvertently introduced platform switched implants exhibited minimization of vertical change in marginal bone height[7].

Rationale behind this reduction in crestal bone loss is the inward placement of outer rim of implant abutment interface which is far away from the outer rim of implant platform[7]. Physiology behind platform switching can be explained as follows:

Authors have suggested that crestal bone loss is due to increase in inflammatory cell infiltrate around implant abutment junction. Therefore, inward repositioning of the implant abutment interface increases the surface area created the horizontal offset which reduces the effect of abutment inflammatory cell infiltrate around the soft tissue[8].In other words in platform switching, shifting of the implant abutment junction inward results in repositioning of the inflammatory cell infiltrate within 90 degree area which is not directly adjacent to crestal bone[8]. Markus Hurzeler *et al* concluded that crestal bone loss with respect to platform switched implants was 0.22mm as compared to nonplatform switched implants (2.02mm)[9]. Cappiello *et al*, found that vertical bone loss for the platform-switched cases varied between 0.6 and 1.2mm (mean: 0.95 ± 0.32 mm), while for the cases without platform switching, the bone loss was between 1.3 and 2.1 mm (mean: 1.67 ± 0.37 mm)[10].

It is understood that certain amount of biologic width is necessary to maintain hard and soft tissue. Platform switching helps in providing additional horizontal biologic width. Hence this tissue prevents microorganism to form a biological seal into the bone, thereby, reducing marginal bone resorption. Platform switching also shifts microgap away from the crestal bone or increases the distance between Implant abutment junction and crestal bone, hence, reducing crestal bone resorption[8].

It has been stated that the platform switching configuration has the biomechanical advantage of shifting the stress concentration area away from the cervical bone–implant interface. However, It also has the disadvantage of increasing stress in the abutment or abutment screw.
(Maeda, Yoshinobu *et al*)[11].

Platform switching provides both horizontal and vertical mismatch therefore providing greater surface area for osseointegration. Platform switching provides stronger neck structure due to convex and concave outerrim[12].

Recently another concept called platform shifting has been introduced by Nobel Biocare. They believe in "stepping down" the size of implant platform to increase the volume of soft tissue around the implant platform during implant treatment which is in contrast to the concept of platform switching[13, 14].

In practice, Platform Shifting adapters convert regular (RP) and wide (WP) platform implants to narrow (NP) and regular (RP) platforms implants, respectively. Benefits of Platform Shifting are that the basic product is comprised of only two, premanufactured adapters. To these adapters, employ the best abutments on the market – Procera® Abutment and Procera® Esthetic Abutments Zirconia. Hence, offering individualized patient solution[13, 14].

Platform shifting is a current method to restore teeth in cases of immediate implant placement. It provides better esthetic results by shifting to a narrower interface which results in increase of space, hence making soft tissue stable[14].

We conducted a thorough literature search using PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Web of Sciences, AMED (Ovid) for more information on platform shifting. However there seems to be not much work done in the field of platform shifting. There is not much documented literature regarding the same.

CONCLUSION

It was found that effect of Platform switching effect on bone loss is very well documented. Platform switched implants reduce marginal bone loss between 0.05 and 1.4mm.

A new concept called "platform shifting" has been introduced by Nobel Biocare. They have stated that platform shifting increases the volume of soft tissue hence giving a better emergence profile. However, effect of platform shifting on bone loss is not well documented in the current literature.

Does the platform shifting help in preserving marginal bone loss?

Further studies need to be done to find an answer to the above question. More clinical trials and evidence based analysis are required for its application on patients.

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