

The Platform Switching - A Novel Concept of Preserving Crestal Bone: A Literature Review

Dr. Naveen Raveendran Nair¹, Dr. Shamla Latheef².

(Senior Lecturer, PMS College of Dental Sciences and Research)

(Senior Lecturer, PMS College of Dental Sciences and Research)

Corresponding Author: Dr. Shamla Latheef

Abstract: The peri-implant level of bone around a dental implant is regarded as an important criterion for assessing the success of an implant. Platform switching is a concept that aims at the reduction of crestal bone loss around implants by restoring implants with a smaller diameter abutments so that the implant abutment junction (IAJ) is horizontally repositioned inwards and away from the outer edge of the implant platform. This positioning is regarded as an important prerequisite for preserving the integrity of gingival margins and interdental papillae. This review aims at summarizing the importance of platform switching.

Keywords: Platform switching, Crestal bone levels, smaller diameter abutments.

Date of Submission: 28-02-2019

Date of acceptance: 18-03-2019

I. Introduction

The concept of Platform switching for maintaining the peri-implant bone levels has gained its popularity over the last few years. Studies have identified presence of a microgap between implant and abutment facilitating a bacterial colonization of the implant sulcus and a release of endotoxins which can cause an infectious reaction at the implant-abutment tissue interface level and lead to a resorption of bone below the implant-abutment connection (IAJ). It is also noted that chewing loads cause a relative movement between the components therefore only a bacteria-proof connection prevents resorption of bone and stabilizes the soft tissue.

Platform switching increases the width of the epithelial collar around the abutment resulting in a thicker and tighter seal around the abutment and also minimizes the pocketing around the abutment. It promotes the health of the gingiva by increasing the volume of soft tissue and by preserving the crestal bone levels. The implant abutment junction is displaced horizontally inwards from the perimeter of the implant platform, and further away from the bone creating an angle or step between the abutment and the implant and therefore the inflamed connective tissue does not extend laterally to the same extent as it does with a traditional matched implant-abutment junction.

HISTORY AND ORIGIN OF THE CONCEPT OF PLATFORM SWITCHING

The concept of platform switching was initially discovered by accident in 1991. The 3i Implant Innovations Inc. (Palm Beach Gardens, FL) designed wide diameter 5.0 and 6.0 mm implants that are mainly used for poor quality bones to achieve improved primary stability. However, when introduced, there was a lack of commercial availability of abutment components to match these wide-diameter implants which ultimately resulted in placement of a standard 4.1 mm diameter abutment, which created a 0.45 mm or 0.95 mm circumferential horizontal difference in dimension. Thus the discovery of the concept was a coincidence. Later the platform switching concept was analyzed and studied by Lazzara and Porter and Gardner¹.

THEORIES OF PLATFORM SWITCHING

Several theories have been suggested to explain the potentiality of platform switching to preserve peri-implant marginal bone by Annibali et al in 2012.

1. BIOLOGIC RATIONALE

This rationale suggests that there is an inward positioning of the implant- abutment junction (IAJ) that influences the bone remodelling process in two ways¹.

a. **Biologic width hypothesis**

The inward positioning of the implant-abutment interface exposes the implant seating surface consequently creating an additional horizontal surface area. This allows the biologic width to be formed horizontally, reduces the amount of crestal bone resorption necessary to expose a minimum amount of implant surface to which the soft tissue can attach¹.

b. Inflammatory cell infiltrate (ICT) hypothesis

There is a repositioning of the IAJ inwards and away from the outer edge of the implant and adjacent bone, the overall effect of the abutment inflammatory cell infiltrate (ICT) on the surrounding tissue may be reduced, thus decreasing the resorptive effect of the abutment ICT on the surrounding crestal bone ¹.

It is also suggested that platform switching locates the inflammatory infiltrate within an approximate 90-degree confined area of exposure instead of a 180-degree area of direct exposure to the surrounding hard and soft tissues. The reduced exposure and confinement of the platform-switched abutment ICT may also contribute in reducing its inflammatory effect ¹.

2. BIOMECHANICAL RATIONALE

Another theory supported by finite element analysis explains the biomechanical advantages of the platform switching configuration in terms of distribution of stress in and around the implant. Theory put forwards that the platform switching design reduces the stress at implant interface and in the crestal region of cortical bone by shifting stress away from the bone-implant interface toward the center of the implant.

TYPES OF PLATFORM SWITCHING :

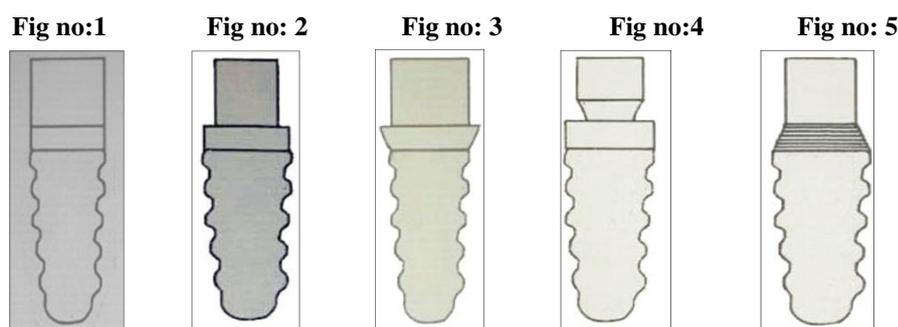


Fig no:1 - Platform matched implant

Fig no:2 - Platform-switched implant, with an abutment diameter less than the implant platform diameter

Fig no:3 - Expanded implant platform with equal implant and abutment diameter

Fig no:4 - Inherently platform-switched implants using conical emergence abutments

Fig no:5 -Implant with a reverse conical neck

Platform Switching can be achieved by:

1. Using abutment diameter smaller than the implant neck or body width (Fig no:2)
2. Using an implant design with an increased neck diameter with respect to the implant body width. (Fig no:3)
3. Using inherently platform-switched implants and conical emergence abutments, with a variable height of 1.5-2 mm and freeing the extension of implant platform between 0.5-0.75 mm ². However, this mode of Platform Switching is not advisable in mandibular Implant-Mucosal support prosthesis as reduced abutment diameter lessens the abutment resistance in response to occlusal loading.(Fig no:4)
4. Using implants with a reverse conical neck referred to as Bone Platform Switching ³. This forms an inward bone ring in the coronal part of the implant that is in continuity with the alveolar bone crest. However, proximity of implant abutment junction to the alveolar crest in this design does not allow significant reduction in the crestal bone loss. (Fig no:5)

ADVANTAGES OF PLATFORM SWITCHING

1. Facilitates formation of a peri-implant soft tissue cuff : In natural dentition, the junctional epithelium provides a seal at the base of the sulcus against bacterial penetration. The other line of defense present in a natural dentition and absent in implants is the periodontal ligament. As there is no cementum or fibers present on the surface of an implant, the infection has the potential to spread directly into the osseous structures resulting in a bone loss and ultimately lead to implant failure. Platform Switching provides a horizontal shelf for the formation of a leak-proof peri-implant soft tissue cuff that seals the crestal bone from the oral environment and bacterial invasion
2. Effect on soft tissue esthetics around dental implants: Tarnow et al showed the relationship of dental papilla with the distance between the implants ⁴. When two implants are placed close to each other (interimplant distance 3 mm or less) the inter-implant bone height can resorb below the implant-abutment connection reducing the presence of an inter-implant papilla and can affect the clinical result in the esthetic zone. Platform Switching reduces physiological resorption by moving the microgap away from the inter-implant

bone that supports the papilla. Maintenance of the midfacial bone height helps to maintain facial gingival tissues and avoid cosmetic deformities, phonetic problems, and lateral food impaction⁵.

3. Platform-Switched model has a biomechanical benefit of shifting stress concentration away from the crestal bone implant interface. Shear force exerted on the cortical bone in the Platform Switched model is lower than in the Platform Matched model⁶.
4. Anatomic structures such as the sinus cavity or alveolar nerve limit the residual bone height. The Platform-Switching approach minimizes bone resorption and increases the biomechanical support available to the implant⁶.
5. Improved Bone Support for Short Implants: Bone remodeling around platform-switched implant is minimized therefore there is potentially a greater bone/implant contact for short implants, thus opening possibility of treating more patients with less extensive therapy.
6. The amount of restorative volume available for an optimally contoured, physiological implant restoration is a critical factor for the success of an implant. The crestal bone is both horizontally and vertically preserved with the use of platform-switched implants, support is retained for the interdental papillae. Maintenance of the midfacial bone height helps in maintaining facial gingival tissues.
7. Platform expansion in immediate extraction situations makes it possible to minimize the gap between the recently extracted tooth bed and the implant and acts as a physical barrier against the penetration of bacteria into the zone of contact between the bone and implant and also provides improved primary stability and formation of a new biological space.

LIMITATIONS OF PLATFORM SWITCHING

1. For effective Platform Switching undersizing of the components must be carried out during all phases of the implant treatment, from placement of the implant through to the final restoration¹
2. Adequate prosthetic space is needed to develop a proper emergence profile⁷
3. Stress increases in abutment or the abutment screw⁶.
4. Platform Switching has a positive effect on bone preservation in the first year, but after five years the marginal bone change is insignificant around both Platform Switched and Platform Matched implants when compared to that at one year .(Vigolo and Givani).

References

- [1]. Lazzara RJ, Porter SS. Platform switching: A new concept in implant dentistry for controlling postrestorative crestal bone levels. *Int J Periodontics Restorative Dent* 2006;26:9-17.
- [2]. Canay S, Akça K. Biomechanical aspects of bone-level diameter shifting at implant-abutment interface. *Implant Dent* 2009;18:239-48.
- [3]. Carinci F, Brunelli G, Danza M. Platform switching and bone platform switching. *J Oral Implantol* 2009;35:245-50
- [4]. Tarnow DP, Cho SC, Wallace SS. The effect of inter-implant distance on the height of inter-implant bone crest. *J Periodontol* 2000;71:546-9
- [5]. Cappiello M, Luongo R, Di Iorio D, Bugea C, Cocchetto R, Celletti R. Evaluation of peri-implant bone loss around platform-switched implants. *Int J Periodontics Restorative Dent* 2008;28:347-55.
- [6]. Maeda Y, Miura J, Taki I, Sogo M. Biomechanical analysis on platform switching: Is there any biomechanical rationale? *Clin Oral Implants Res* 2007;18:581-4
- [7]. Gardner DM. Platform switching as a means to achieving implant esthetics. *N Y State Dent J* 2005;71:34-7.

Dr. Naveen Raveendran Nair, Dr. Shamla Latheef, "The Platform Switching - A Novel Concept Of Preserving Crestal Bone: A Literature Review." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 3, 2019, pp 01-03.