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PLATFORM SWITCHING - A REVIEW

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ABSTRACT

Platform switching is a concept to improve long-term bone maintenance around implants. Platform switching aims at reduction of the crestal bone loss around the implants and involves the restoration of implants with smaller diameter abutments. This is a review article that describes the importance and significance of Platform switching.

INTRODUCTION

Osseo-integrated implants have become a treatment option for partially edentulous, and completely edentulous patients. However, the goal of modern implant therapy is focused on more than just the successful osseo-integration of the implant. A successful result must also provide an esthetic and functional restoration surrounded by sound peri-implant tissues that are in harmony with the existing dentition. Stable level of peri-implant bone is one set parameter of implant success.

Observations has shown that bone preservation is possible when the narrower diameter of abutment is connected to the implant, so called "platform switching".

An important factor in avoiding crestal bone loss related to platform switching may be that of the inflammatory connective tissue around the Implant abutment junction.

Lazzara and Porter theorize 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.

Enkling et al did another study to evaluate the effect of healing mode (open or submerged) on marginal bone levels in platform switched implants and they found that the healing mode does not affect the marginal bone.

Platform switching can aid in preserving the bone around the implant and retain the inter implant bone peaks. This can be explained on the basis of the concept that platform switching shifts the IAJ towards the center of the implant and therefore provide biologic width modification so less resorption occurs. The placement of platform switched implant in proximity of natural tooth does not have any adverse effect on the natural tooth or the implant itself.

In an another study done by tabata et al, pellizer et al, cimen et al, stress distribution in peri- implant bone tissue, implants, and prosthetic components of single implants in platform switching technique was measured, and they found that there was better stress distribution in peri- implant bone tissue.

This can be explained by the fact that platform switching decreases the stress concentration on peri- implant bone and tissues by shifting the implant abutment junction which leads to less micro damage in the bone, resulting in minimized crestal bone loss but higher stresses were evident for the retention of screw and prosthesis, concentration of stresses at the screw are mechanically harmful because it could clinically transfer into increased frequency of complications in implant supported prosthesis such as screw loosening and fracture or screw deformation of the abutment if the stresses overcome the elastic limit.

Khurana et al, studied influence of fine threads and platform switching on crestal bone stress around implant and found that crestal bone stress is increased by the fine threads upon loading, fine threads increase the bone resistance to load by changing shear load to tensile or compressive load.

Ana paula et al evaluated stress in peri-implant bone with straight and angulated abutments. They concluded that angulated abutments produce more stress on peri implant bone when compared to straight abutments.

Chou et al undertook a clinical trial where over 1500 implants were placed on the platform switching concept. A bone loss of 0.2 mm per year was observed in a period of 3 years. The authors concluded that bone loss was influenced by platform switching. The findings had a robust base given the large sample size and multicentric nature of the study.

Cappiello et al also showed reduction in bone loss in platform-switched group against the standard platform. In short, almost all studies have shown platform switching to be beneficial except 1 study that reported less bone loss in test samples although the difference was found not statistically significant.

Degidi et al studied the effect of platform switching on peri-implant tissues. They showed that there was good connective tissue growth after 28 days of implantation with fast mineralization, which provided strength to the implant.

Luongo et al undertook histologic and histomorphometric analyses of a platform-switched implant 2 months after placement. The authors suggested that lesser bone resorption in platform switched implants may be because of alignment of the connective tissue zone from vertical to horizontal in the space provided by the narrow abutment.

Baggi et al evaluated the stress distribution associated with 5 major commercially available implant types. The authors reported that maximum stress was located at the neck of implant and that platform-switched implants demonstrated better stress performance.

Deshpande et al undertook a study on 3D finite element model of mandible with a missing premolar. Stress value with a standard implant was higher (785 Mpa) in comparison with the platform-switched implant (465.71 Mpa). In another finite element model analyses.

Maeda et al reported that narrow abutments offered reduced stress at the crestal bone compared with wide-diameter abutments.

Canullo et al used abutments of same size (3.8 mm) with different diameters of implants (3.8 mm for control group, 4.3 mm for test group 1, 4.8 mm for test group 2, and 5.5 mm for test group 3). Histology and immunohistochemistry were

done to analyze the bone structure and the cases followed up to 20 months. Bone loss in all test groups (0.896 for group 1, 0.770 mm for group 2, and 0.388 mm for group 3) was less in comparison with control group (1.548 mm). This showed inverse correlation between switching extent and the bone loss.

Canullo et al undertook a prospective, controlled randomized immediate implant study on 22 patients, in which the participants were randomly distributed to 2 equal groups. After extraction, an implant of 5.5 mm was inserted at the fresh site with a titanium abutment of 3.8 mm diameter in the test group and similar abutment diameter (5.5 mm) in the control group. All implants in both groups were osseointegrated, clinically stable, and infection free with similar periodontal indices. The test group showed a deceased buccal periimplant mucosal level loss of 0.63 mm between baseline and 1-year follow-up compared with the control group.

Hurzeler et al also conducted a clinical trial to evaluate the performance of switched platforms against standard ones, such that 14 implants were based on the concept of platform switching, whereas 8 used implants and abutment of same diameter. Radiographs taken at the base time and 1 year after installation showed mean value of crestal bone height after 1 year to be significantly higher in the platform-switched cases.

Luongo et al removed a mandibular platform-switched implant after a period of 2 months because of rehabilitation difficulties. Histological analyses of the implant revealed the presence of inflammatory connective tissue infiltrate around the implant surface up to 0.35 mm coronal to the implant abutment junction. The authors suggested that lesser bone resorption in platform-switched implants may be because of alignment of the connective tissue zone from vertical to horizontal direction in the space provided by the narrow abutment. They felt that availability of the horizontal surface for connective tissue growth resulted in establishment of the connective tissue layer without the need for crestal bone to provide the required space. The study had limitations of sample size and no control group.

In a systematic review by Maram et al there can be presence of some confounding factors which can mask the real effect of platform switching which are

1. Apico coronal position of implants in relation to crestal bone. This review concluded that the more deeper the implant is placed the more bone loss will occur.
2. Presence of various implant microtextures. The closer the micro threads were to the top of the implant the less is the marginal bone loss.
3. The degree of platform switch. The effect of degree of platform switching on marginal bone loss is inversely related i.e the greater the degree of platform switch, the least is the maginal bone loss.
4. Reliability of examination methods. A three dimensional examination method is more reliable as compared to a two dimensional periapical radiograph.

CONCLUSION

The use of Platform switching implants minimizes the peri-implant bone loss and consequently alters the adjacent soft tissue, associated with correct prosthetic planning ensuring esthetics and function.

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