Platform switching in dental implants

Prof. Liviu Steier and Gabriela Steier look at the benefits of this concept, how best to carry it out and which manufacturers offer the equipment

Introduction

The crestal area is the region to suffer initial breakdown when it comes to the implant tissue interface. Adell et all. (1981) first communicated 1.2mm of marginal bone loss from the first thread during healing time, with a continuation of 0.1 mm annually.

As a consequence, Smith and Zarb (1989) established the following as criteria for implant success: vertical bone loss of <0.2mm annually following the first year.

This of course is a major issue in the anterior esthetic zone. Since then, clinicians and manufacturers have worked hard to try to improve this condition.

Factors affecting loss

The following factors are among the most discussed to cause crestal bone loss:
1. Surgical trauma
2. Biologic width/seal
3. Microgap
4. Occlusal overload
5. Crest module.

Causes of trauma

Overheating the bone during the drill procedure; extended full-flap raise, Screw-in forces higher than 35 N/cm2 are optional causes for crestal breakdown. As such, these factors may only be responsible for bone loss prior to prosthetic load.

Pic. 1 – still missing

Illustrates the components of the biologic width.

Biologic width/seal

This seal starts the day the abutment is mounted and continues for the next six weeks into treatment. Today's surgical protocols control this fact by adequate three-dimensional implant positioning.

Microgap development

Two-stage implants seem to be prone to microgap development. Even with implant engineering work, it's hard to control via different improved connections, glue, etc.

Occlusal overload

Crestal bone is mostly cortical bone. Forces occurring at the crestal level are described as shear forces. Cortical bone is highly susceptible to shear forces. Occlusal concepts have been developed specially for implant-supported restorations to address this issue.

Crest module

Implant professionals as well as implant manufacturers have introduced different remedies to address this issue: polished collar, Connective Contour (Astra), Laser-Lok Technology (Biohorizons), for example.

The peri-implant histology

Ericsson et al (1995) reported the following findings:

a. Plaque associated inflammatory cell infiltrate;
b. Implant associated inflammatory cell infiltrate.

As such implantologists addressed more attention to the area.

Serendipity

- In the late 1980s, NobelPharma introduced a Branemark 5mm-diameter implant. The prosthetic components used a "standard" diameter.
- In 1991, Implant Innovations introduced wide diameter implants. Of course not all prosthetic abutments were available. As a result, prosthetic parts from a regular platform have been used.

Long-term observations of this demonstrated a reduced loss vertical change in crestal bone height compared to the available standards.

The platform switching treatment concept

The platform is the crestal area of an implant. Let us say as an example that the crestal diameter of the implant is 3.8mm and the abutment used measures 3.2mm. The difference of the diameter between the implant and the abutment is the so called "platform switching".

Manufacturers offering the concept

The concept of platform switching is only offered exclusively by a restricted number of implant manufacturers.

1. Wieland
2. BTI
3. 3I
4. Astra
5. Dentsply ¬– Ankylos
6. Zimmer
7. NobelBiocare.

Scientific evidence

1. A random prospective multicentre trial evaluating the platform-switching technique for the prevention of postrestorative crestal bone loss. Int J Oral Maxillofac Implants. 2009 Mar-Apr; 24(2): 299-308.

Conclusion: The findings of the current trial indicate that the use of implants with an enlarged platform can result in better preservation of crestal bone as compared with conventional cylindric implants when a reduced abutment is mounted.

2. Double-blind randomised controlled trial study on post-extraction immediately restored implants using the switching platform concept: soft tissue response. Preliminary report., Canullo L, Iurlaro G, Iannello G., Clin Oral Implants Res. 2009 Apr;20(4): 414-20.

Conclusion: This study suggests that, in a limited time period of two years, immediately placed implants with subsequent platform switching can provide peri-implant tissue stability.

3. Effect of microthreads and platform switching on crestal bone stress levels: a finite element analysis. Schrotenboer J., Tsao YP., Kinariwala V., Wang HL. J Periodontol. 2008 Nov; 79(11): 2166-72.

Conclusion: Results from this study showed the reduction of abutment diameter (for example, platform switching) resulted in a measurable, but minimal effect on Von-Mises stress in the crestal region of cortical bone.

4. Peri-implant bone level around implants with platform-switched abutments: preliminary data from a prospective study.,Hürzeler M, Fickl S, Zuhr O, Wachtel HC. Department of Operative Dentistry and Periodontology, J Oral Maxillofac Surg. 2007 Jul; 65(7 Suppl 1): 33-9

Conclusion: The concept of platform switching appears to limit crestal resorption and seems to preserve peri-implant bone levels. A certain amount of bone remodelling, one year after final reconstruction occurs, but significant differences concerning the peri-implant bone height compared with the nonplatform-switched abutments are still evident 1 year after final restoration. The reduction of the abutment of 0.45mm on each side (5mm implant/4.1mm abutment) seems sufficient to avoid peri-implant bone loss.

5. Evaluation of peri-implant bone loss around platform-switched implants. Cappiello M, Luongo R, Di Iorio D, Bugea C, Cocchetto R, Celletti R., Int J Periodontics Restorative Dent. 2008 Aug; 28(4): 347-55.

Conclusion: Platform switching seems to reduce peri-implant crestal bone resorption and in-

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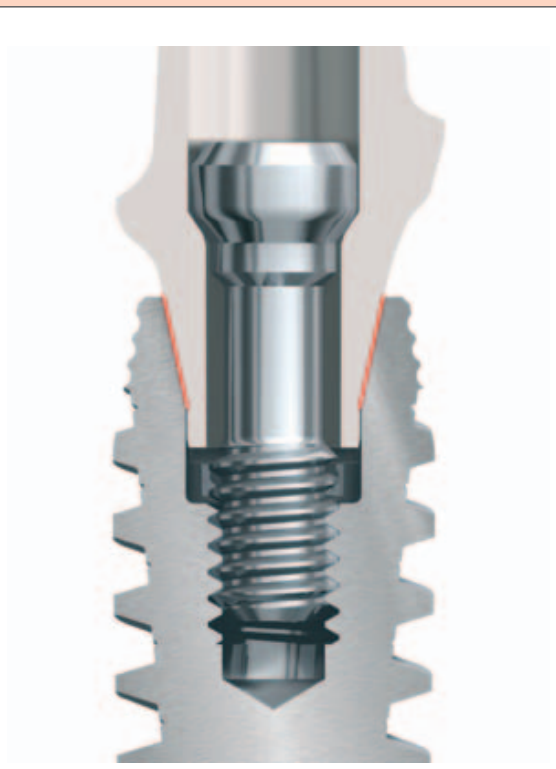
A Nobel Speedy Replace Implant with adapter and abutment. (Picture by NobelBiocare)

The abutment screwed in demonstrating platform switching. (Picture by NobelBiocare)



NobelActive implant with abutment screwed in place demonstrating platform switching. (Picture by NobelBiocare)

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crease the long-term predictability of implant therapy.

6. 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., Canullo L, Rasperini G., Int J Oral Maxillofac Implants. 2007 Nov-Dec; 22(6): 995-1000.

Conclusion: This proof-of-concept study suggests that immediate loading with platform switching can provide peri-implant hard tissue stability with soft tissue and papilla preservation.

7. Biomechanical analysis on platform switching: is there any biomechanical rationale? Maeda Y, Miura J, Taki I, Sogo M., Clin Oral Implants Res. 2007 Oct;18(5):581-4. Epub 2007 Jun 30.

Conclusion: Within the limits of the present study, it was concluded that both CAM and CPS implants revealed crestal bone-level changes after 28 days of healing.

The ITI Consensus Statements and recommended clinical procedures regarding esthetics in implant dentistry (ITI Treatment Guide Volume 1 – Quintessence) have to be mentioned here as the authors wish to avoid raising false expectations that only platform switching (a group of prosthodontic and restorative procedures) can lead to predictable results. The author's statements in the articles are based on:

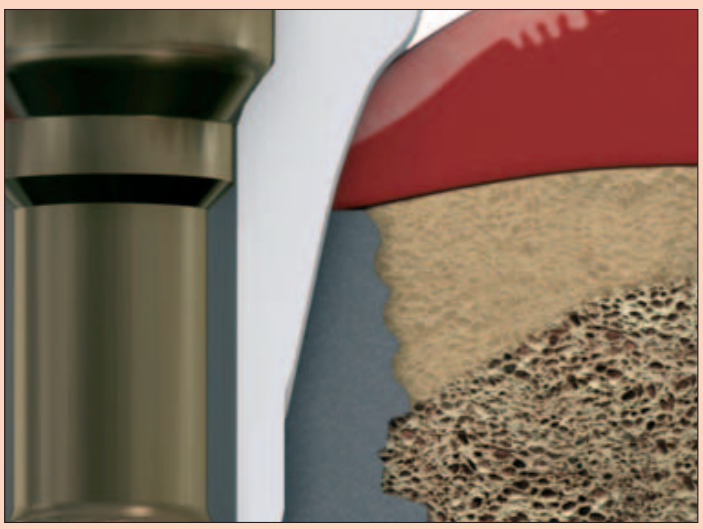
1. Long-term results (from evidence to newer surgical approaches)
2. Surgical considerations (from extraction planning to soft tissue stability)
3. Prosthodontic and restorative procedures (from standards for esthetic fixed-implant restorations to location of the implant shoulder)
4. Well-executed esthetic risk analysis performed prior to any treatment planning.

Conclusion

The authors would like to end with questions raised by DM Gardner in an article in NYSDJ, from APRIL 2005:

- Can implants be placed closer than 3mm from an adjacent implant, while still maintaining interproximal height of bone?
- Can implants be placed less than 1.5mm from an adjacent tooth and still maintain interproximal bone?
- Can implants be placed at or below the osseous crest and avoid bone loss to the first thread after abutment connection?
- Can implant esthetics be improved through "platform switching?"

The authors' personal experience is of course limited to one manufacturer, but over time the results are encouraging and many more long-term multicentre studies are needed to obtain evidence. IT



Crestal level animation showing the hard/soft tissue Relations. (Picture by NobelBiocare)

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