Is zero bone loss a possibility when placing implants?

Tomas Linkevičius

Crestal bone stability around dental implants remains one of the most important and foremost factors of successful implant treatment. Besides major clinical advantages to the patient, a positive long-term outcome due to stable marginal bone provides the clinician with psychological comfort and satisfaction (Fig 1). Therefore it is necessary to be aware of possible causes which can lead to loss of crestal bone stability and to use every method to prevent bone resorption.

For almost a decade, platform switching was considered to be the most effective way to achieve this. It was so effective that almost all implant companies implemented platform switching as an essential feature of implant manufacturing. Everyone came to the conclusion that implant design was more important that the biology itself. However, recent clinical research conducted by our group has shown that soft tissue thickness is an important factor in preserving crestal bone stability around implants. It was determined that if vertical soft tissue thickness is 2mm or less, there will be crestal bone resorption of 1.5mm extent during formation of biological seal between soft tissues and implant/abutment/restoration surfaces (Fig 2).

Furthermore, it was clearly shown that even implants with platform switching modification could not maintain bone if vertical soft tissues were thin at the time of implant placement (Fig 3). This leads to the discussion of what is more important: biology or implant design? Vertical soft tissue thickness, the prerequisite of the biological width around implants starts to form at the time of healing abutment connection and is completely finished after 8 weeks. This biological seal is the only and most important protection barrier of the osseonintegrated implant from a contaminated intraoral environment. Thus there is a direct connection between pre-implant mucosa of edentulous alveolar ridge and peri-implant soft tissues.

Soft tissue thickness required to protect underlying bone around implants is approximately 4mm, which is wider than the biological width around teeth. There are 2 ways how biological width around implants can be formed: with crestal bone loss or without bone resorption. All clinicians should carefully consider the best option.

There are no current guidelines to follow should thin vertical tissues at the time of implant placement be diagnosed. However steps need to be taken to prevent because crestal bone resorption. This is especially important for short implants, the use of which are becoming common practice. Today, implants of

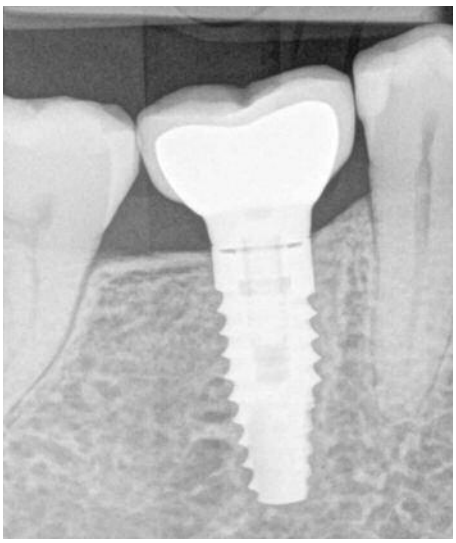

Figure 1: Crestal bone stability around implant/ abutment matching implant. (Biohorizons Tapered, Biohorizons, USA)

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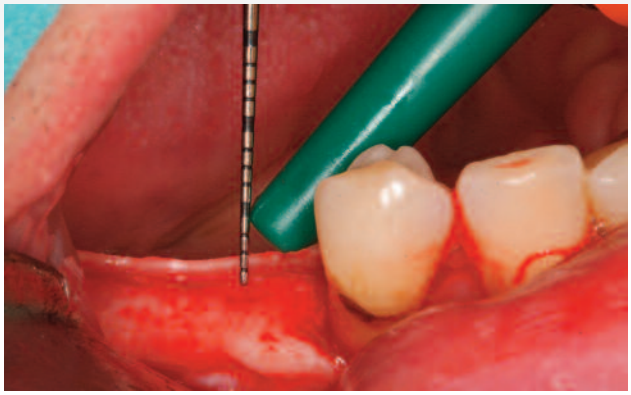

Figure 2: Thin, vertical soft tissues measured at the crest (≤ 2mm)

8mm length are no longer considered short. There is sufficient data that shows that 6mm length implants are as effective as longer ones in the posterior areas of both jaws. However, in a situation where a 6mm implant is placed in the mandibular posterior jaw region, where thin vertical soft tissues are frequently present, there would be approximately 2mm of bone resorption, due to biological width formation. It would leave only 4mm of implant surface osseonintegrated. That is a risk of implant failure, keeping in mind the prosthetic suprastructure and implant/crown ratio. With the launch of 4mm length implants by some implant manufacturers, soft tissue thickness is even more important for the users of these products.

What strategy should therefore be implemented? There are several options - some already researched clinically; some based on clinical expertise without any serious evidence. The initial thought is to simply place the implant deeper sub-crestally (Fig 4). The surgeon should however bear in mind that a safety margin be maintained between the implant site and vital anatomical structures such as the inferior alveolar nerve and maxillary sinus. Placing the implant sub-crestal may damage such structures if care is not taken.

Extensive sub-crestal positioning of the implant does not prevent crestal bone loss, Extensive sub-crestal positioning of the implant, without platform switching or without stable conical connection will not prevent the formation of an inflammatory infiltrate, which will resorb the bone anyway. However it is likely that the implant will not have soft tissue recession nor rough surface exposure, which usually follow bone resorption. It is well known that the exposure of the rough implant surface enhances plaque accumulation and development of peri-implantitis.

Consequently, the third option may be used – vertical reconstruction of soft tissue thickness, which in the author's

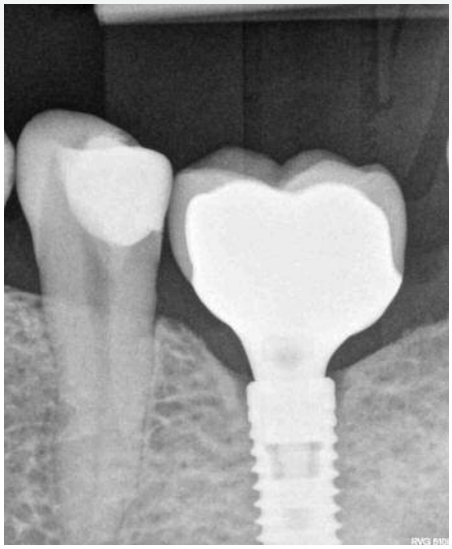

Figure 3: Crestal bone loss around implant with platform switching.

opinion is the most logical approach. Increasing soft tissue thickness vertically compensates the lack of vertical tissue thickness. A JOMI 2009 paper, "The influence of soft tissue thickness on crestal bone changes around implants: a 1-year prospective controlled clinical trial"[1] has suggested that clinicians, "consider the thickening of thin mucosa before implant placement". This concept is therefore not entirely new. The idea is to place some sort of autogenic, allogenic or xenogeneic material over the implant in that way increasing soft tissue thickness after healing.

A connective tissue graft is considered the golden standard for soft tissue augmentation around implants. However this technique has some considerable disadvantages, such as

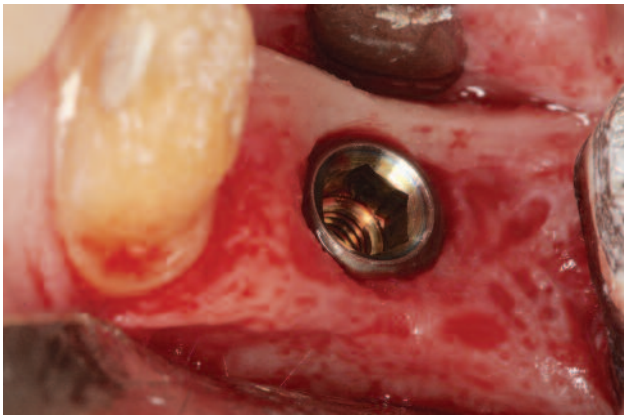

Figure 4: Subcrestal placement of the implant (Biohorizons Tapered Plus, USA)

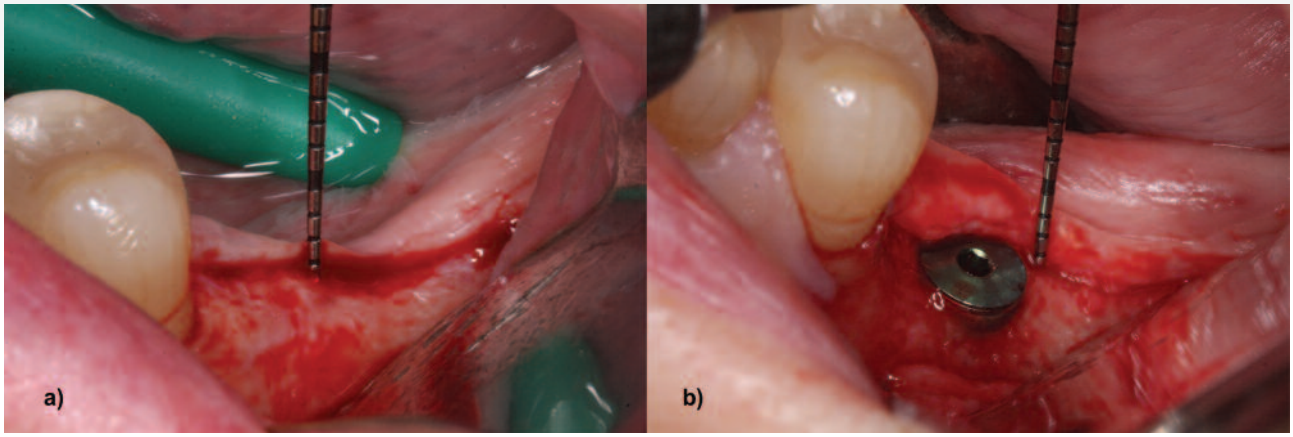

Figure 5a and 5b: a. Original vertical soft tissue thickness. b. Soft tissue thickness after augmentation with acellular dermal matrix (AlloDerm, Biohorizons, USA)

donor site morbidity and, in the case of a general practitioner as opposed to a specialist, the challenges of the harvesting procedure. Allogenic substitutes may therefore be considered as a viable option to replace autogenous grafts in vertical soft tissue reconstruction. The use of accelular dermal matrix so far is the only approach backed by solid clinical research, including a controlled clinical prospective study.[2]

In this study, implants were placed in 3 groups of patients with (1) thin vertical tissues, (2) thick vertical tissues and (3) thin vertical tissues augmented with acellular dermal matrix material. Radiographic assessment showed the reduction of crestal bone loss from 1.74mm in the thin tissue group to 0.32mm in the augmented group. In addition, the soft tissue thickness increased by 2.33mm – from 1.50mm to 3.83mm after augmentation with allograft (Figs 5a,b). This research shows that the lack of vertical soft tissue thickness required for biological width formation without crestal bone loss can be compensated by the use of accelular dermal matrix material at the time of implant placement.

In conclusion it must be emphasized that diagnosis of thin vertical soft tissues is a very important aspect in implant treatment. Only by acknowledging that tissue thickness is a significant factor, can the protocols which allow the reconstruction of vertical peri-implant tissues and reduction of crestal bone loss be used.

References

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2. Puisys A, Vindasiute E, Linkeviciene L, Linkevicius T. The use of acellular dermal matrix membrane for vertical soft tissue augmentation during submerged implant placement: a case series. Clin Oral Implants Res. 2015 26(4) 465-470

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