

Crestal Bone Loss Around Dental Implants; A Short Communication

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Abstract

Many studies described several parameters which are supposed to determine success or failure in longterm evaluations of dental implants. However, the relationship between crestal bone loss around implants and the location of implant-abutment connection in the bone still needs further investigations. The subgingival microgap between the implant and the abutment, which creates higher bone level resorption as a result of plaque accumulation, the polished surface of the implant, and the re-establishing of a biologic width are all possible factors which may increase the bone loss around dental implants which are inserted with a distance between the implant shoulder and the bone crest (DIB) <1mm. It is recommended that at least 1mm of DIB should be present when implants are to be inserted.

The longevity of dental implants is highly dependent on integration between implant components and oral tissues, including hard and soft tissues. Initial breakdown of the implant-tissue interface generally begins at the crestal region in successfully osseointegrated endosteal implants (1). In particular, after the first year of function, crestal bone loss to or beyond the first thread of titanium screw implants, characterized by "saucerization," is often observed radiographically around certain implant types.

Many possible etiologies of early crestal bone loss around implants (from implant placement to 1-year post-loading) including surgical trauma, occlusal overload, peri-implantitis, the presence of microgap, reformation of biologic width, implant crest module, and others have been proposed. However, the location of dental implants, whether subcrestal or supracrestal, is still becoming increasing importance for researchers.

Non-submerged implants also have demonstrated early crestal bone loss, with greater bone loss in the maxilla than in the mandible, ranging 0.6 mm to 1.1 mm, at the first year of function (2). In another study that analyzed wide neck ITI® implants placed in a private practice, it has been shown that the mean crestal bone loss around those implants at the mesial and distal sides was 0.71 mm and 0.60 mm, respectively; bone losses >1 and >2 mm were recorded for 29.7% and 2.5% of the sides, respectively (3).

To attain patients' esthetic expectations regarding implant-supported restorations, it has been recommended that the rough/smooth implant border of non submerged implants be moved to slightly below the crest of the alveolar bone, resulting in a microgap/interface being located 1 to 2 mm below the gingival margin. To accomplish such a subgingival located implant shoulder, the apical part of the relatively smooth machined titanium surface is placed subcrestally. However, there is evidence both from experimental as well as from clinical studies that relatively smooth machined titanium surfaces are associated with additional crestal bone loss in such scenarios. It has therefore been recommended that the placement of the rough/smooth implant border into a subcrestal location is not favorable from a biological standpoint especially in esthetic regions or in areas of limited vertical bone height.

In a study by Becker and his colleagues (4), it has been shown that cumulative survival rates for machined, screw-shaped titanium fixtures placed in one and two stages as well as one-stage titanium plasma-sprayed screws up to the 2- to 3-year follow-up examination were similar, indicating excellent clinical results. Radiographic measurements for changes in crestal bone loss were clinically insignificant for fixtures placed in one stage. For two-stage fixtures, maxillary changes were insignificant, whereas mandibular bone loss was statistically significant but clinically insignificant.

Haemmerle et al. (1996) studied different amounts of bone loss which occurs when ITI® implants are placed 1 mm subcrestal to the border of the rough to the polished surface (5). In this study it was found that a higher amount of bone loss is present when implants are placed with their polished surface in contact to the bone.

Nowadays, it is believed that increased bone loss around implants with implant shoulder-to-bone crest distance (DIB) < 1 mm might be due to 1) the subgingival microgap between the implant and the abutment, which creates higher bone-level-resorption as a result of plaque-accumulation, 2) the polished surface or 3) the biologic width.

According to the findings of Hermann et al. (6), the idea of a biologic width formation, previously described around natural teeth, has been strengthened. It could be believed that implants which are placed with a DIB < 1 mm have an insufficient biologic width, which results in a significant increase in bone loss.

It seems to be evident in the literature that there is a constant soft tissue formation with only small variations of measurements in different studies around the neck of dental implants (2, 5). This constant soft tissue formation might be the reason for increased bone loss when implants are placed with a DIB \geq 1 mm.

It has been suggested that the implant surface is an important factor in determining the amount of bone loss that occurs around dental implants. A study that compared the bone-to-implant contact in rabbits demonstrated a significantly higher percentage of bone-to-implant contact when plasma-sprayed (56.8%) and acid-etched surfaces (72.4%) implants were used instead of machined surfaces implants (48.6%) (7).

Cochran et al. (2009) (8) evaluated radiographic marginal bone levels around non-submerged hollow cylindrical and solid-screw implants for 5 years after loading. It has been demonstrated that clinically significant marginal bone remodeling occurred between the time of implant placement and final prosthesis placement around one-stage non-submerged titanium implants with a titanium plasma-sprayed surface. Subsequent to that, bone loss observed around implants up to 5 years post-loading was minimal. These results suggested that the factors that influence early healing around implants are significantly different from those that affect later marginal bone remodeling.

More recently, Cecchinato et al. (2012) (9) conducted a

cross-sectional retrospective study to determine bone loss in a sample of subjects restored with implant-supported prostheses and the prevalence and severity of peri-implantitis in a sub-sample. In this study, a total of 139 patients who had attended a follow-up visit in 2007 were considered for inclusion. The final study population comprised 133 subjects with a total of 407 implants. Radiographic measurements identified subjects who had \geq 1 implant site exhibiting marginal bone loss of >0.5 mm. It has been shown that marginal bone loss (>0.5 mm) at implants was observed in 30% of subjects and 16% of implant sites. More advanced loss of marginal bone occurred in much fewer subjects and sites. Sites with marginal bone loss were in the sub-sample characterized by bleeding on probing, but only occasionally with deep (\geq 6 mm) pockets.

No matter whether bone loss around dental implants is the result of increased plaque accumulation, or an insufficient biologic width, probably also affected by the polished surface, it can be stated, that at least 1 mm of DIB should be present when dental implants are inserted.

The location of implant-abutment connection regarding DIB may be an important factor that affects the success rates of dental implants.

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