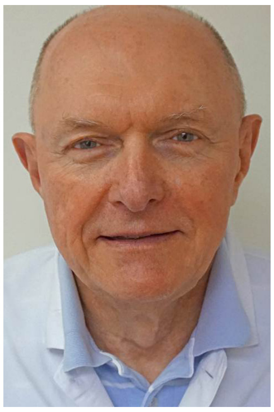
Guest Editorial

CASE FOR SMALL DIAMETER IMPLANTS



Previous work in the dental literature has discussed occlusal over load of dental implants in function.[1] Thus larger diameter implants have been advocated. However, there are other considerations that may come into play that affect the longevity of an implant. The major parameters are: Displacement of the implant, overload and percutaneous circumference. It may be that large implant displacement interferes with bone remodeling.[2,3] Percutaneous circumference may put larger diameter implants at risk for peri-implantitis.[2,4]

Dental implants are capable of resisting an axial load beyond human capability. Off-axial loads may not be resisted by the facial or lingual cortices depending on bone quality and volume. A large diameter implant spreads any off-axial loads over a larger area than small diameter thus lowering the per square millimeter load on the supporting bone (spray). It may be that the actual displacement of large diameter implants impedes bone remodeling, especially at the crest where the bone may be thinner at the facial and lingual as compared to the deep medullary bone. Even if the crestal bone is greater than 1.8 mm, the lager implant may prevent adequate angiogenesis for bone remodeling.[3,5]

Large diameter implants have a larger percutaneous circumference as compared to small diameter implants. The small diameter/circumference may lessen the risk for late peri-implantitis. At least one study suggested that larger diameter implants may be more prone to peri-implantitis.[5]

Mini-implants, less than or equal to 3.0 mm in diameter may demonstrate little or no bone loss over many years of service.[6]

The percutaneous circumference of a 5.7 mm implant is 15.7 mm while that of a 2.5 mm diameter implant is 7.85 mm. This is a dramatic difference. The smaller circumference presents less of an opportunity for invasive bacteria and less risk for any epithelial attachment infection and detachment.[7,8,9]

Nonetheless, the small surface area puts a larger per square millimeter load on the bone. This necessitates more dense bone or multiple splinted implants to lessen the risk for overload on the supporting bone.[7,8,9]

Assuming for the sake of simplicity, a length of 10 mm and the implant is a cylinder, the volume of a 5.7 mm implant is 255.047 mm^3. The volume of a 2.5 mm × 10 mm implant, again assuming a cylinder, is 49.06 mm^3. This larger volume may physically impede blood supply and thus impede activity of osteoclasts and osteoblasts thereby impeding remodeling which in turn may make the cervical supporting bone and epithelial attachment susceptible to peri-implantitis.

Large diameter implants generally have higher removal torque at initial placement and better stability than smaller diameter implants.[1] However, the large physical displacement of wide diameter implants may impede bone remodeling. There may be resorption but not apposition.[2] There may be a physical barrier for the blood supply that would inhibit apposition but allow resorption to occur.[2,7,8,9]

CONCLUSION

Impeded remodeling and increased percutaneous exposure may increase the risk for peri-implantitis in large diameter implants. There may be less risk for peri-implantitis with small diameter implants. Large diameter implant fixtures could be more prone to late peri-implantitis. Long term randomized controlled studies are needed to elucidate this issue. It may be appropriate to only place implants of a diameter to a maximum of 4.7 mm because larger diameters may impede bone remodeling and present a longer percutaneous exposure. It is not known what thickness, volume or quality of bone is needed to adequately resist a given occlusal load. It may be that small diameter implants surprisingly were able to survive long term occlusal loads. Thus when selecting an implant for a site it may be better to err on the side of thin.

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