A "graftless" approach to treatment planning for dental implant treatment

Many older concepts in implant dentistry still persist to this day. In the past, perspectives were centred on biomechanics and suggested that longer, wider and axially positioned implants, greater numbers of implants and routine splinting of multiple implants should be used. This treatment philosophy often resulted in a greater need for bone augmentation procedures to provide adequate bone volume to fulfil these requirements.

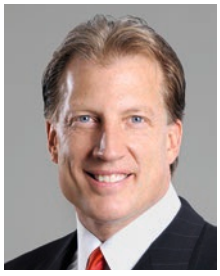
The volume of bone in the site planned for implant placement is measured three-dimensionally in terms of width and height. The minimum ridge width is dependent on the preferred implant diameter and location. A minimum facial bone thickness of 2.0 mm was recommended around implants in the aesthetic zone to avoid crest resorption and gingival recession[1,2]; however, this recommendation was based on 1.4 mm horizontal bone loss observed around implants with external hex connections.[3] Tissue-level, conical connection and platform-switched implants are associated with less marginal bone resorption.[4] A clinical study found that the horizontal bone loss around platform-switched implants was just 0.6 mm.[5] Thus, using implant designs with a conical seal or medialised connection or without a microgap, such as tissue-level implants, may reduce the ridge width requirement to 1.0 to 1.5 mm facial and palatal/lingual bone.

An alternative to performing bone augmentation of the atrophic ridge with insufficient width is to use narrow-diameter implants (NDIs). A systematic review and meta-analysis found that use of implants with a diameter of 3.0 to 3.5 mm resulted in no difference in implant survival compared to standard diameter implants (> 3.5 mm).[6] Other systematic reviews and meta-analyses have also found NDIs are an effective alternative to standard diameter implants due to their similar survival/success rates, marginal bone loss, and mechanical and biological complication rates.[7] Stronger metals, such as titanium-zirconium or titanium alloy, may reduce the risk of implant fracture when NDIs are utilised. A systematic review on narrow-diameter titanium-zirconium implants observed implant success and survival rates similar to those achieved with standard diameter titanium implants, with no increase in fractures.[8] Using NDIs would reduce the threshold for bone width required for implant placement. For example, an implant with a diameter of 3.3 mm and with a conical seal or tissue-level design would require a ridge width of approximately 5.5 to 6.0 mm. If the width was below this threshold, the amount of bone augmentation needed would be less than that for older implant designs.

The minimum bone height for implant placement is dependent on several factors. One of these is the anatomical region. In the posterior maxilla, the sinus floor can limit the available bone height; however, this is an anatomical boundary that can be encroached upon or manipulated via an internal or lateral sinus lift. Many studies have shown that the survival rate of short implants (< 8 mm) is the same as that of longer implants placed in grafted sinuses.[9] Although there is no definitive bone dimension needed before sinus bone grafting is considered, 6.0 to 8.0 mm below the sinus floor appears to be sufficient. In the posterior mandible, the mandibular canal and lingual cortex can limit implant length, and a common rule is to allow for a distance of at least 2.0 mm from the mandibular canal for implant placement to account for potential inaccuracies in radiographic measurements, drilling depth and implant insertion. As mandibular bone is usually better quality, extra-short implants (6.0 mm) have been shown to be effective.[10] Thus, only 8.0 mm available bone height above the canal would be needed to place extra-short implants in the posterior mandible. Insertion of short implants may represent an alternative to vertical bone augmentation. If inadequate bone height is available to

place short implants, the amount of vertical bone augmentation required may be reduced by using even shorter implants.

Improvements in implant design and materials have made it possible for reduced implant diameters and lengths to be employed in many cases. There is growing evidence that these are effective alternatives that lead to equivocal outcomes. If bone volume is insufficient for implant placement, the amount of horizontal or vertical bone augmentation required may be decreased. When the amount of available bone is inadequate, bone augmentation procedures may be performed for the purpose of placing short or narrow implants. This "graftless" approach allows clinicians to select augmentation methods that are more predictable and less invasive.[11]



Craig M Misch, DDS, MDS
Editor-in-Chief

References

1. Spray JR, Black CG, Morris HF, Ochi S. The influence of bone thickness on facial marginal bone response: Stage 1 placement through stage 2 uncovering. Ann Periodontol 2000;5:119–128.
2. Grunder U, Gracis S, Capelli M. Influence of the 3-D bone-to-implant relationship on esthetics. Int J Periodontics Restorative Dent 2005;25:113–119.
3. Tarnow DP, Cho SC, Wallace SS. The effect of inter-implant distance on the height of inter-implant bone crest. J Periodontol 2000;71:546–549.
4. Saleh MHA, Ravidà A, Suárez-López Del Amo F, Lin GH, Asa'ad F, Wang HL. The effect of implant-abutment junction position on crestal bone loss: A systematic review and meta-analysis. Clin Implant Dent Relat Res 2018;20:617–633.
5. Rodríguez-Ciurana X, Vela-Nebot X, Segalà-Torres M, et al. The effect of interimplant distance on the height of the interimplant bone crest when using platform-switched implants. Int J Periodontics Restorative Dent 2009;29:141–151.
6. Schiegnitz E, Al-Nawas B. Narrow-diameter implants: A systematic review and meta-analysis. Clin Oral Implants Res 2018;29(suppl 16):21–40.
7. Cruz RS, Lemos CAA, de Batista VES, Yogui FC, Oliveira HFF, Verri FR. Narrow-diameter implants versus regular-diameter implants for rehabilitation of the anterior region: A systematic review and meta-analysis. Int J Oral Maxillofac Surg 2021;50:674–682.
8. Legami CM, Uehara PN, Sesma N, Pannuti CM, Tortamano Neto P, Mukai MK. Survival rate of titanium-zirconium narrow diameter dental implants versus commercially pure titanium narrow diameter dental implants: A systematic review. Clin Implant Dent Relat Res 2017;19:1015–1022.
9. Thoma DS, Zeltner M, Hüsler J, Hämmerle CHF, Jung RE. EAO Supplement Working Group 4 - EAO CC 2015 Short implants versus sinus lifting with longer implants to restore the posterior maxilla: A systematic review. Clin Oral Implants Res 2015;26(suppl 11):154–169.
10. Ravidà A, Wang IC, Barootchi S, et al. Meta-analysis of randomized clinical trials comparing clinical and patient-reported outcomes between extra-short (≤6 mm) and longer (≥10 mm) implants. J Clin Periodontol 2019;46:118–142.
11. Misch CM, Polido WD. A "graft less" approach for dental implant placement in posterior edentulous sites. Int J Periodontics Restorative Dent 2019;39:771–779.