On Continuing Synergies in Surgery • Prosthodontics • Biomaterials

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Per-Ingvar Brånemark introduced the concept of osseointegrated dental implants and raised the bar for management of dental and orofacial deficits. As a result, long-term clinical outcomes from the technique’s scrupulously applied surgical and prosthodontic protocols ushered in a new and exciting dental treatment era, particularly for partially and completely edentulous patients.

The method’s ensuing clinical virtuosity evolved from rigorous scientific documentation and critical appreciation of two very compelling considerations: first, the realization that a particular metal, commercially pure titanium, designed in different macroscopic and microscopic forms, offers the potential to become strongly rooted in bone under controlled conditions; and second, the development of specified surgical tissue management and prosthodontic loading protocols to induce and maintain the desired interfacial osteogenesis.

Subsequent routine dental use of osseointegration resulted from a long research voyage in a vessel made seaworthy by the synergistic efforts of numerous clinical scientists. The scholarly journey was a long and fruitful one since its Gothenburg inception and subsequent launch via the Toronto Conference of 1982. A number of this book’s writers were crew members on that first journey, while others joined at a later time. Together we have weathered both fair and heavy conditions as we tended to—and sometimes even replaced—the vessel’s planks while staying afloat.

The clinical journey continues to be an exciting one, and this monograph seeks to be a log of the important ports visited and revisited. We hope that a synthesis of these fascinating venues provides a useful guide for those readers who plan their treatment voyages to similar destinations.
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The health and esthetic appearance of peri-implant soft tissues are mutually dependent. Favorable long-term outcomes of both are influenced by the required synergy of several factors, namely a better understanding of wound-healing predictability, newer biomaterials, and refinement of surgical techniques. The routine clinical objective is to replicate and maintain normative esthetic parameters that reflect optimal tissue health and morphology around natural teeth. This objective is particularly relevant in the anterior or esthetic zone of the mouth and should be reconciled with each patient’s circumoral activity (Fig 8-1).

This chapter discusses treatment protocols that are most likely to yield efficacious and effective long-term outcomes in the management of peri-implant morphologic tissue compromise. The ultimate objectives are an esthetically acceptable result and predictable achievement of two key determinants in treatment planning: the host bone site with its overlying soft tissue and its relationship to the interdental papilla.

### Management of the Host Bone Site

Surgical implant placement must be guided by the overall esthetic requirements of the definitive restoration. This strategy demands a routine three-dimensional analysis of the proposed implant site that reconciles these features in the context of an individual’s circumoral activity:

- Clinical assessment and diagnostic cast analysis to provide information on mesiodistal, faciolingual, and apicocoronal dimensions
- Imaging evaluation (see chapter 6)

All too frequently, the cause of the dental absence—congenital condition, trauma, periodontal disease, failed endodontic treatment—results in different degrees of time-dependent morphologic distortion and reduction of the planned host site for the implant (Fig 8-2). Consequently, the site often needs improvement to ensure both predictable osseous support for the implant and esthetic soft tissue surroundings.

### Mesiodistal dimensions

The width of the space may have an impact on the surgical management decision. A narrow space (usually one missing tooth) is unlikely to be accompanied by a challenging reduction in vertical bone height unless the tooth was lost because of a traumatic incident with accompanying avulsion of bone or an advanced localized infective process. This stability occurs because the proximity of two healthy periodontal ligament areas adjacent to the edentulous space appears to preclude much of a ridge reduction process. The challenge in such cases is far more likely to be in the faciolingual dimension, and a narrow implant, which will have somewhat reduced optimal physical properties, usually meets the challenge in patients with a low smile line (Fig 8-3a). Otherwise, buccal grafting will be needed either before or during implant placement. The resultant interproximal papilla tends to readily assume normal proportions (Fig 8-3b).

A wide space (two or more missing teeth), on the other hand, is frequently accompanied by a time-dependent and variable vertical reduction in residual ridge height. Irrespective of the number of implants placed to support a planned fixed prosthesis, bony support for the interproximal papillae is frequently insufficient. In these situations, a mix of gingival and bony surgical strategies have to be applied to provide respect-
able esthetic results. Alternatively, a single implant and an adjacent pontic (Fig 8-4) may be the answer rather than two adjacent implants, except when two central incisors are missing.

**Faciolingual dimensions**

Without question, the worst place to position an implant is too far facially. The implant should not be angled anywhere toward the labial surface. Whenever this happens, there will be great difficulty in keeping the labial tissue from migrating coronally when the new restoration is placed. The ideal placement is either at the incisal edge, if the definitive restoration will be cement retained, or slightly lingual to that (toward the cingulum area) for screw-retained restorations (Fig 8-5). If a screw-retained crown is used and the implant is placed more palatally, then the facial eminence can be created by using the crown to contour the crevice and support the buccal free gingiva.
Ideally, the implant should be placed 3.0 mm apical to the gingival margins of the proximal teeth to facilitate esthetic integration (Fig 8-6). This positioning will allow adequate space for a smooth emergence profile of the crown. If the implant placement is too shallow, and particularly if the implant is placed toward the palate, there will not be enough room to make a smooth transition in the contour of the restoration. Wherever possible, ridge lap restorations should be avoided. This design may lead to soft tissue management problems for the patient and, without impeccable home care, to unsatisfactory long-term outcomes.

A residual ridge area with a minimal deformity that possesses a sufficient quantity of bone to allow proper implant positioning can be corrected either prior to or at the time of stage 1 surgery with a connective tissue graft. Soft tissue management at stage 2 surgery will aid in creating the appropriate tissue shape or volume in interimplant and intertooth situations. Repositioning of the tissue may be necessary to create...