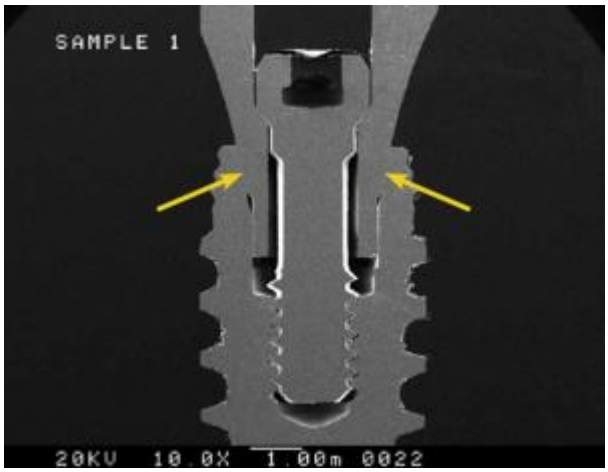
Managing Soft Tissues by Design

Longevity has many aspects.

By Hans Geiselhöringer



Implant treatment has proven to be a highly predictable and extremely reliable option for today's patients.

With sixty years of continuous research, innovation and clinical follow-up behind its implants and related components, Nobel Biocare continues today to provide optimal solutions for the patient, both in terms of functional and esthetically pleasing outcomes.

Nobel Biocare designs products for solutions in harmony with the adjacent dentition—and ideally invisible to the human eye.

Never complacent

Despite the extremely high success rates that have resulted from treatment optimization over the years, Nobel Biocare continues to actively pursue scientific research with probable clinical consequences.

The maintenance and stability of the peri-implant tissue architecture is currently a key area of enquiry. While pathways and cellular responses during the osseointegration of an implant have been described in detail, questions related to soft tissue stability and ideal treatment protocols are also being explored [Cairoet al, 2008].

Clinicians naturally want to create an effective barrier protecting the underlying bone from intraoral microorganisms and their by-products [Rompen*et al*, 2006]. In this context, it is generally accepted that the tight and stable soft tissue integration of an implant-based restoration means a great deal for long-term success.

Although clinical protocols have been developed to maintain or improve soft tissue quality and quantity at implant recipient sites [Thoma*et* al., 2009], it is important to understand that the interaction and interdependencies of the tissue surrounding restorative components play as vital a role as the general anatomic situation at the implant site.

Nobel Biocare has been among the first manufacturers to take this critical interface between the oral cavity and the body seriously in every aspect of product development. To ensure safe, reliable and long-lasting implant outcomes, Nobel Biocare emphasizes four product characteristics that complement patient-related factors and the selection of appropriate treatment protocols in the quest for such outcomes. These are:

• The design and contour of the implant-abutment interface

• The fit of mating components and quality of the screw joint

• The abutment morphology and choice of materials and

• Easy adaptation to any given clinical situation (e.g. via tactile feedback).

Meeting clinical needs and personal preferences

Every patient is unique, as is every clinical situation. In terms of personal confidence and professional preferences for protocols and components, every dentist is also unique.

Recognizing diverse needs and preferences, Nobel Biocare provides a wide variety of implant platform configurations. With recent Nobel- Replace line extensions featuring conical connection and platform shifting interfaces, Nobel Biocare has once again proven its commitment to meeting every clinician's needs.

Nobel Biocare incorporated new connections into the world's most versatile and widely used implant system in order to facilitate the use of a variety of established and highly predictable treatment protocols.

To put it another way, Nobel Biocare developed and launched implants with conical connection and platform shifting in order to provide new tools for soft tissue management and the preservation of the crestal bone.

Platform shifting provides a narrower diameter prosthetic component on a wider diameter implant platform (see figure 1 on the next page and the accompanying case study by Dr. David Lustbader). This creates an exposed ridge on the implant platform where the soft tissue can develop.

Implants with platform shifting increase the interface between biological width and retention and may act as a "stop" preventing tissue recession. Literature shows that utilizing platform shifting results in both significantly less radiographically detectable bone loss in humans and better soft

tissue support and maintenance in the esthetic zone [Atieh MA et al, 2010; Canullo et al, 2007; López-Mari et al, 2009].

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Decisive design features

The back-tapered collar of the NobelActive regular platform implant has been designed to maximize the volume of bone at the alveolar crest and to improve soft tissue support. Tissue management is further supported by the built-in platform shift and the internal conical connection.

The expanding tapered Nobel- Active implant body with doublelead thread is designed to condense bone gradually to provide high initial stability and support for immediate loading.

The results of a multi-center study—encompassing 64 partially or fully edentulous patients receiving 117 NobelActive implants in 12 centers— show that the marginal bone level as well as the soft tissue level is
stable two years after implant insertion. The study demonstrates that NobelActive can be placed under demanding immediate loading conditions as it provides stable bone and soft tissue levels after two years of function [Martineze Fuentes et al, 2010].

The perfect balance

While the implant platform-abutment interface design plays a significant role in a stable and lasting connection, other design considerations have also been taken to reduce detrimental effects on the peri-implant tissues. Bona fide precision fit and the ingenious design of the Nobel Biocare abutment screw minimize micromotion, for example.

The achievement of proper fit between mating components is governed by an apparent paradox: On the one hand, precision is paramount, on the other, acceptable tolerances make the seating of prosthetic components possible. In defining acceptable tolerances, Nobel Biocare has specified figures that facilitate passive fit yet remain well below the critical threshold limits that would lead to micromotion and ultimately to loosening of the implant- butment joint. (Read more about micromotion in Professor John Brunski's article on page 14.)

An inconspicuous hero: the TorqTite™ screw

In the early days of implant dentistry, one of the most commonly reported maintenance needs for implant restorations was retightening or changing the abutment screws [Goodacre et al, 2003]. Nobel Biocare's engineers
solved the problem by developing a screw with features outclassing any other retaining screw.

Other implant systems have tried to introduce similar screws, but the features of Nobel Biocare's TorqTite screws remain unique. To keep the implant and abutment interface connected and to prevent any rotational movement upon load application, special features have been integrated into its design.

For one thing, the screw is manufactured from a specific titanium alloy and coated with a carbon layer that reduces friction between the internal screw-threads of the implant and the threads of the retaining screw.

A reduction of friction is namely needed to reach the pre-torque values required to create pre-tension in the screw shank. (See the Tips and Techniques article by Dr. Chandur Wadhwani on page 11.) Nobel Biocare's TorqTite screws have been designed and tested to occupy the center of the proper torque zone.

If screw threads ran all the way up to the head of the screw—as they do in many other implant systems—the shaft could not act as the pre-load spring necessary to ensure the longevity of the screw-joint.

Ideally suited materials and dedication to quality – optimum tissue adaptation to restorative components

Abutment design and material choices must meet and exceed some basic requirements. They must be strong and stable enough to withstand continuous loading forces and bending moments in the oral environment. They must demonstrate biocompatibility, forestall any corrosive phenomena and serve to support and maintain tissue health. At the same time, these choices should facilitate the patient's hygiene regimen, and they should also be customizable in order to meet any given clinical situation without requiring complicated handling and adjustment procedures.

NobelProcera CAD/CAM products fulfill all these design and material requirements. The comprehensive product portfolio makes it possible for clinicians and dental technicians to choose from a broad range of options. Well-proven materials such as titanium and zirconia are available,

and products range from single to multi-unit restorations that can be scanned and designed in the laboratory without the need to send casts to manufacturing facilities.

The reaction of cells and tissues to implanted foreign bodies depends on the material's properties and its behavior upon contact with body fluids. Various studies have demonstrated successful application for zirconia ceramic and titanium abutments in terms of acceptable soft tissue and marginal bone stability, as well as a reduction in bacterial and plaque accumulation, making these materials the primary choice not only for non-compromised clinical situations, but also for pre-existing periodontal conditions.

Recent clinical comparative trials prove that both titanium and zirconia abutments provide for a reliable and long-lasting restoration on implants with a slight advantage to zirconia when it comes to esthetically relevant anterior restoration.

NobelProcera's CAD/CAM manufactured parts provide homogeneity, fit and strength through controlled industrial production processes. They also offer the free virtual design options necessary to adapt to any given clinical situation. In this way soft tissue can be ideally supported without the need for manual adjustments or the addition of less biocompatible materials. Problems such as incorrect abutment selection, and concerns about dissimilar metals and interfaces between cast and machined components can be significantly reduced.

A single factor does not lead to the success or failure of an implant restoration. Many interactions and variables must be addressed with each patient.

Alhough Nobel Biocare products and components have proven to be of excellent quality for many years, there is still room for further innovation and greater understanding of the complex interactions in the oral milieu. At Nobel Biocare, we provide clinicians with high-precision, quality components that are easy to use, and reliable as well, for the sake of their reputation and the benefit of the patient.

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