Clinical Indications
For Immediate Restoration Of Implants Using PreFormance® Provisional Components

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Implant dentistry has undergone dramatic changes since the concept of osseointegration was first introduced in the 1970's. There have been multiple advancements associated with implant therapy including altering the surfaces of titanium implants from machined surfaces to biologically active roughened surfaces, thread pitch and design, implant loading protocols, enhanced retaining screw surfaces and more versatile abutment designs. Patients have increasingly come to expect more natural looking, aesthetic implant restorations in shorter timeframes.

Dental implant clinicians and researchers have rediscovered that it is more important to preserve that which remains than it is to replace what is missing, as Devan wrote in 1966.1 This has become especially apparent relative to the anterior aesthetic zone, interdental papillae and the biologic width. New technologies in abutment design and materials, changes in implant loading protocols, and modifications in surgical technique have allowed clinicians to treat patients in ways that are significantly different when compared to the original four to six month unloaded healing protocols first proposed by Branemark et al.2

Throughout the past two decades, standards of care in implant dentistry have dramatically changed. Early loading (occlusal loading of implants in Type I, II or III Bone, two months post implant placement) of dental implants with acid etched surfaces is now routinely accomplished.3 Dental implants are often placed into the sockets of extracted teeth immediately post extraction. Single-stage surgical protocols, where implants are not covered at the time of surgical placement, are also routinely accomplished.4 All of the above changes in protocols would not be accepted by the profession if the five year survival rates of dental implants were not at least as high as the original survival rates of 90+% in edentulous mandibles and 85% in edentulous maxillae.4

Single-unit implants may also be restored at the time of implant placement with a protocol called immediate non-occlusal loading (INOL).6 This protocol calls for single-unit implant restorations without centric and eccentric contacts to be placed immediately after implant placement if certain criteria are met. These criteria include implant insertional torque values of at least 35Ncm, favorable occlusal relationships with the opposing jaw and patient compliance. This protocol, coupled with placement of Certain® PREVAIL® Implants, may allow for improved prognosis relative to the maintenance of interdental papillae and crestal bone heights.

For the last several years, BIOMET 3i has been working on a next generation implant surface to build on the success of the OSSEOTITE® Surface. The new NanoTite™ Surface starts with OSSEOTITE as its foundation (Figure 1). New formulation techniques allow the deposition of individual nanometer-sized crystals of calcium phosphate onto the OSSEOTITE Surface. This technique is referred to as Discrete Crystalline Deposition™ (DCD™). The crystals are so small that advanced high resolution scanning electron microscopy is necessary to visualize the details of the CaP nano-scale topography (Figure 2).

The NanoTite Crystals fuse to the OSSEOTITE Substrate and occupy about 50% of the surface area. The total amount of CaP material on a NanoTite Implant is so small that it measures less than 20 micrograms. These characteristics substantially distinguish NanoTite from traditional plasma-sprayed CaP coatings, which have approximately 20,000 micrograms of CaP. Such a small amount of material, however, creates a complex surface texture and has a profound effect when combined with the OSSEOTITE Architecture.
**NANOTITE™ CLINICAL TRIALS IN PROGRESS**

The NanoTite Surface should have clinical relevance for enhancing outcomes when used for challenging indications such as immediate and accelerated loading, immediate placement in extraction sockets, simultaneous grafted sites and sinus lifts, in locations requiring short lengths or wide diameters and in aesthetic cases where bone preservation is critical. Randomized-controlled, prospective, multicenter clinical studies are in progress to formally evaluate the performance of NanoTite Implants when placed according to protocols designed to compare outcomes for these indications. Animal and human histological studies evaluating the NanoTite Surface are ongoing at renowned university centers in North America and Europe.

One of the initial drawbacks to the INOL protocol was the cost of the implant restorative components involved in fabricating the provisional restorations. Pre-machined, stock abutments were relatively expensive for this application and depending on the restorative protocol, were not going to be used for the definitive restorations. BIOMET 3i recently introduced PreFormance® Provisional Components as interim abutments that provide cost effective options for developing soft-tissue contours during the provisional phase of implant therapy. These components could also be used effectively for restorations fabricated with the INOL protocol. PreFormance Posts (for cement-retained provisional restorations) and PreFormance Temporary Cylinders (for screw-retained provisional restorations) are fabricated from a biocompatible, tooth-colored polymer called PEEK (Polyetheretherketone). These interim abutments are also manufactured with titanium inserts for strength and precision fit in the implant/abutment connection (Figure 3).

These provisional components are easily customized for specific contours and anatomic profiles. Intraoral interim abutment preparation is much faster and easier than with the more traditional titanium alloy temporary cylinders and abutments. With the elimination of metallic components, the white hue (shades A1 and A2) of PreFormance Provisional Components eliminates the gray shadow typically seen with metallic abutments with resin provisional crowns. This provides clinicians and patients with much more aesthetically pleasing provisional restorations in terms of tooth chroma, value and hue, as well as eliminating any gray discoloration of the metal components through thin, translucent gingival tissues.

PreFormance Posts are available for the internally interfaced Certain® Implant System with 4 and 6mm transgingival collar heights and a 5mm Emergence Profile. The multiple collar heights enable clinicians to choose abutments that can be customized (prepared) as needed based on individual clinical situations. For example, in the case of a missing maxillary central incisor with scalloped gingival margins, a clinician may encounter a situation where the interproximal tissue depth is 5 or 6mm, and the midfacial free gingival margin is typically 2–3mm more apical than the height of the interdental papillae on either side of the implant site (Figure 4).

The appropriate interim abutment selection would be a PreFormance Post with a 5mm EP® flare (Emergence Profile) and a 6mm collar height. The clinician would then prepare the abutment following the gingival contour so the facial and interproximal margins would support and follow the pre-existing gingival architecture (Figure 5).
The interim abutment’s emergence profile would support the perimplant soft tissues, which have proven to be so critical relative to maintaining/establishing optimal gingival contours during the healing process. Another benefit of multiple collar heights for these interim abutments is that clinicians can prepare the abutments at gingival level or with 1mm subgingival margins throughout the entire circumference of the abutment. This margin design ensures easy, predictable and complete cement removal from the perimplant sulcus after crown cementation.

Alternatively, a 4mm transgingival collar height may not adequately support the interdental papillae or teeth in the aesthetic zone (Figure 6). In addition, the cement line between the abutment and crown may be too deep to facilitate complete cement removal and may negatively impact the developing biologic width. This would be implicated in the potential for increased crestal bone loss.

**DISCUSSION**

During the last 40 years, prosthetic rehabilitation of edentulous patients with implant-supported prostheses has proven to be a viable and predictable treatment option. Long-term studies have reported high clinical success rates with the original protocols. Implants may now be used in more challenging situations, with wider indications. It is now predictable to replace a single tooth with an implant-retained restoration that restores both optimal aesthetics and function. There have also been changes in implant loading protocols. A submerged, non-loaded healing period of three to six months was originally considered a prerequisite for achieving osseointegration of titanium implants. However, during the last 10 to 15 years this traditional protocol has been modified. There are numerous clinical studies that have reported on the outcome of early and immediate loading in various clinical situations. There has also been a change of focus from the original implant protocols where implants were used to improve masticatory function of edentulous patients, to implant treatment modalities with great attention on natural, optimal aesthetics. Implant treatment according to the traditional protocols generally took the better part of a year to provide patients with functional implant-retained prostheses. Surgical and restorative implant components have undergone dramatic changes and enhancements from the original, machined, external hex titanium implants. Dental implants are now available in multiple lengths and diameters, with various implant/abutment connection designs. Additive and subtractive processes have also dramatically altered the biologic activity associated with osseointegration including significant decreases in treatment times prior to definitive implant restoration. Patient care has improved not only in terms of rates and predictability of osseointegration, but also in terms of predictable delivery of aesthetic, natural looking and long-term implant supported/retained restorations/prostheses.

**CONCLUSION**

Immediate provisionalization of dental implants on the day of implant placement, as well as provisional restoration of implants placed with traditional or single-stage protocols, provides multiple clinical and patient benefits. These include reduced chairtime, decreased costs, elimination of second surgical procedures, the ability to use an immediate non-occlusal loading protocol, preservation of crestal bone and interdental papillae, and the psychological benefit to patients as they receive aesthetic restorations on the same day of implant placement. Placement of NanoTite™ PREVAIL® Implants and provisional restorations with PreFormance® Provisional Components should increase the prognosis to fabricate aesthetic, functional implant restorations by preserving facial and interdental soft tissue and bone, while providing an aesthetically pleasing restoration on the same day as implant placement.

**REFERENCES:**

INITIAL PATIENT PRESENTATION
A 50-year-old female presented with a failing maxillary right central incisor. Radiographic examination revealed root resorption of the endodontically treated tooth (Figures 1 and 2). Several metal-ceramic crowns had been placed throughout the previous 10 years. The patient was also unhappy with the aesthetics of her smile and did not want to have a removable provisional restoration during treatment. The recommended treatment plan accepted by the patient included immediate implant placement and an immediate implant-supported, fixed provisional restoration.

DIAGNOSIS
• Failing maxillary right central incisor
• Adequate bone volume for implant placement
• Acceptable restorative volume for implant restoration

TREATMENT PLAN
• Atraumatic extraction of the failing maxillary right central incisor and preparation of the implant osteotomy with osteotomes in a flapless surgical design
• Immediate implant placement of an internally interfaced 4mm diameter x 13mm length OSSEOTITE® Certain® Implant
• Placement of a PreFormance Post and provisional crown per the protocol for immediate non-occlusal loading
• Osseointegration and maturation of soft tissues
• Fabrication of an Encode® Final Abutment and ceramic crown

TREATMENT
The failing maxillary right central incisor was atraumatically extracted using periotes to maintain the cortical and interseptal bone (Figure 3). Instead of conventional implant placement involving a soft-tissue flap, the treating periodontist performed flapless surgery and used an osteotome technique to preserve the hard and soft tissues (Figure 4). A 4mm diameter x 13mm length, internally interfaced OSSEOTITE Certain Implant was placed into the prepared site (Figure 5).
Immediately after implant placement, the restorative dentist seated a PreFormance® Post into the internal interface of the implant for fabrication of a cement-retained provisional crown. The Certain® QuickSeat® Connection provided an audible and tactile click to verify complete seating of the post, which was verified radiographically. The post was marked intraorally, removed, placed onto a laboratory holder and modified using a coarse high-speed diamond bur (Figure 6) and a white stone for refinement.

The post was reseated intraorally. A vacuum-formed matrix was filled with bis-acryl resin, seated over the post and removed before final setting of the resin. The provisional restoration was trimmed and reseated intraorally (Figure 7) and flowable composite resin was then used to fill in the deficient contours. The post and provisional crown were removed and the contours were refined and polished on a laboratory holder (Figure 8). The subgingival contours were developed to optimize soft-tissue support.

Clinical Tip: Immediate implant placement and restoration of single implants may demonstrate a positive effect on periimplant soft tissue. The contours of the PreFormance Post and restoration dramatically influence sulcular form. The provisional crown can be used to prosthetically sculpt the tissue after implant surgery. It aids in development of the gingival tissue from a narrow cylindrical implant to the three-dimensional gingival form of a tooth as it emerges from the sulcus.

A Hexed Titanium Abutment Screw tightened to 20Ncm with a Restorative Torque Indicator secured the PreFormance Post to the implant. Following the protocol for immediate non-occlusal loading, the absence of occlusal contacts in centric and eccentric positions was verified. The provisional crown was then cemented with temporary cement.

The patient initially requested a diastema between the central incisors to match her original natural dentition (Figure 9). However, after wearing the provisional crown for three months, she preferred to have the diastema closed for the definitive restoration. Four months after immediate implant placement, the provisional restoration was removed revealing healthy soft tissue with an aesthetically pleasing emergence profile (Figure 10). An Encode® Healing Abutment, chosen to match the soft-tissue contours created by the provisional restoration, was placed into the internal interface of the implant. Impressions were made and the provisional
The provisional crown was removed and complete seating of the Encode Final Abutment was verified with a periapical radiograph. A provisional implant cement was used to secure the all-ceramic crown to the Encode Final Abutment (Figures 11 and 12). Optimal occlusion was developed with centric contacts and protrusive disclusion with the contralateral maxillary central incisor.

**CLINICAL OVERVIEW**

Today the demand for optimal aesthetics is coupled with the desire for faster, easier techniques that minimize chairtime. Seating a provisional restoration at the time of surgical implant placement benefits both the clinician and the patient by eliminating a second surgical procedure and immediately providing a secure and aesthetic restoration. PreFormance Provisional Components provide an easy and efficient way to fabricate cement- or screw-retained provisional restorations on the same day as implant placement. These components can be easily customized for optimal sulcular form and anatomic profiles. In this case, an immediate provisional restoration allowed the patient to assess her smile and clarify her expectations for the design of the definitive restoration. Technological advancements such as PreFormance Provisional Components provide clinicians with the ability to offer patients aesthetically pleasing, immediate fixed restorations supported by dental implants. Intraoral preparation is faster and easier than with titanium components. The EP (Emergence Profile) contours of the posts provide for soft-tissue support and more natural toothlike contours, which may improve treatment outcomes. PreFormance Provisional Components offer dentists an additional tool to enhance implant results and meet the aesthetic demands of their patients.

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Adapted with permission from Priest G. Optimizing Anterior Aesthetics with Immediate Implant Placement and a Fixed Provisional Restoration: A Patient Presentation. *Inside Dentistry* 2006; Vol 2: Num 8:94–95. © 2006 Aegis Communications, LLC.
INITIAL PATIENT PRESENTATION

A 36-year-old non-smoking female presented with a missing mandibular right first molar (Figure 1). She exhibited a healthy periodontium and was in good health. The patient desired a fixed restoration for the missing tooth, which had been lost several years previously due to dental caries. The patient was leaving the area for an extended period of time and requested a fixed tooth-like replacement at the time of implant surgery.

DIAGNOSIS

• Partially edentulous mandible (mandibular right first molar)
• Adequate bone volume for implant placement
• Adequate restorative volume for implant restoration

TREATMENT PLAN

• Diagnostic work up including pre-operative radiographs, diagnostic casts, diagnostic wax pattern and surgical guide
• Fabrication of a screw-retained laboratory processed provisional restoration from the diagnostic cast, on a PreFormance Temporary Cylinder
• Placement of an internally interfaced NanoTite PREVAIL Implant
• Placement of the prefabricated provisional restoration in the same surgical appointment, if the insertional torque of the implant is 35Ncm or greater
• Osseointegration and maturation of soft tissues
• Definitive impression and fabrication of an implant-supported PFM crown

TREATMENT

At the pre-surgical appointment, an alginate impression was made and a diagnostic cast was poured in dental stone. A diagnostic wax pattern was made by setting a denture tooth into the edentulous area corresponding to the missing right first molar. Subsequently, a surgical guide was fabricated to facilitate optimal implant placement. The denture tooth was
removed from the diagnostic cast and a hole was drilled into the edentulous space corresponding to the missing molar. This hole had to be large enough to accept an implant lab analog. A mountless implant driver tip for the Certain® Implant System was placed into the internal interface of a Certain Implant Laboratory Analog. A surgical guide tube was placed over the shaft of the implant driver tip and the assembly was inserted into the hole in the cast (Figure 2). Wax was placed on the lingual aspect of the components to stabilize these relative to the adjacent teeth (Figure 3). Flowable, light-cured composite resin was placed around the facial and occlusal aspects of the laboratory components to lute the complex to the cast (Figure 4). It was critical that the composite resin did not engage any undercuts. Resilient soft-tissue material was applied to the coronal aspect of the cast around the driver tip shaft, thus creating a seal of the complex to the stone cast (Figure 5). The implant laboratory analog was subsequently secured to the diagnostic cast by injecting dental stone into the space between the analog and the cast (Figure 6).

After the stone set, the surgical guide was removed and a hexed (single unit) Certain PreFormance® Temporary Cylinder for a 5mm restorative platform was placed into the internal interface of the laboratory analog and secured with a lab try-in screw (IUNITS) (Figure 7). The cast was sent to the dental laboratory for fabrication of a screw-retained provisional crown (Figure 8).

At the surgical appointment, the patient was anesthetized and the surgical template was placed into its proper position. It was noted that there was an inadequate amount of fixed keratinized attached gingiva at the implant site and the implant surgeon elected to reflect a full thickness mucoperiosteal flap rather than simply using a soft-tissue punch technique. After the flap was reflected, the surgical index was placed back onto the adjacent teeth and a round drill was aligned into the surgical drill guide tube (Figure 9). The round drill was used, with copious irrigation, to mark the location of the osteotomy on the osseous crest. A 2mm ACT™ Twist Drill was used to penetrate the bone to the desired depth of 11.5mm. The surgical guide was removed and a surgical guide pin was placed to confirm implant position and angulation. Preparation of the osteotomy continued with the 2/3 Pilot Drill, 3mm Twist Drill to 11.5mm depth and 4.1 Countersink Drill. For greater primary implant stability, the osteotomy was intentionally undersized. The final drill size was the 4.25mm x 8.5mm Twist Drill followed by the 5/6 Countersink Drill.
An internally interfaced 5/6/5 x 11.5mm NanoTite™ PREVAIL® Implant (5mm diameter x 6mm collar x 5mm restorative seating surface x 11.5mm length) was delivered to the implant site via the mountless driver tip and inserted at 15 to 20rpm without irrigation. The final insertion torque was 45Ncm. The implant driver tip was inserted into a hand-ratchet and used for final implant seating to the predetermined internal hex rotational position.

The prefabricated provisional restoration was tried in, adjusted and secured with a Hexed Titanium Abutment Screw tightened to 20Ncm with a Torque Driver (Figure 10). The screw access opening was partially blocked out with a cotton pellet and restored with composite resin. The soft-tissue flap was closed with intermittent sutures and the occlusion was verified to ensure that the restoration did not have any centric and eccentric contacts. This protocol follows the principles for immediate non-occlusal loading (Figure 11). Radiographs were taken (Figure 12), and postoperative medications were prescribed. The patient was cautioned that this restoration would not be ready for chewing (occlusal loading) for at least three months. Three months later, the patient will be seen for impressions and fabrication of the definitive restoration.

**CLINICAL OVERVIEW**

Previously, clinicians sometimes elected to fabricate a surgical index at the time of implant placement and had the patient return within 24 hours for placement of a laboratory-processed provisional restoration. In the clinical case presented above, the clinician opted to have a laboratory processed provisional restoration fabricated prior to implant surgery and delivered at the time of implant placement. In this procedure, the provisional restoration was taken out of occlusion consistent with the principles of immediate non-occlusal loading (INOL) of partially edentulous patients. Preoperative treatment planning included implant selection and positioning within the edentulous site of the missing mandibular first molar. An internally interfaced NanoTite PREVAIL Implant was chosen in this case for its ability to help maintain crestal bone levels. In addition, the implant type was chosen for the ability of the system’s implant driver tip to be used as a guide to fabricate a surgical index and laboratory-processed provisional restoration.

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Adapted with permission from del Castillo RA. Immediate provisionalization of a single-tooth implant with a temporary cylinder in one surgical appointment. Pract Proced Aesthet Dent 2006;18(5Suppl):3-5. © 2006 Montage Media Corporation.
## PreFormance® Provisional Components Ordering Information

### PreFormance Provisional Components Ordering Information

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### PreFormance Temporary Cylinder

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