Clinical and Laboratory Procedures for Fixed Margin Implant Abutments

Abstract
Standard, cylindrical abutments were initially used in the treatment of edentulous and partially edentulous patients. These abutments were not designed to simulate the natural emergence profiles of individual teeth. Custom abutments were often the treatment of choice for partially edentulous patients and were successful in replicating the emergence profiles of missing natural teeth. One of the limitations associated with custom abutments is the expense of producing them. Stock, pre-machined abutments with varying emergence profiles were designed to be used in partially edentulous situations, for significantly less cost. These abutments could be modified by restorative dentists and dental laboratory technicians when indicated in terms of margin placement and location, inter-occlusal distance, and retention/resistance form of the abutment preparation. An additional line of abutments with fixed margins that do not need to be modified has also been introduced. This paper presents a clinical and laboratory protocol for using fixed margin, stock abutments.

Introduction
Since the concept of osseointegration was introduced approximately 40 years ago, the use of osseointegrated endosseous implants has become increasingly more common. The initial protocol, called for the treatment of edentulous patients with maxillary complete dentures and fixed hybrid screw-retained mandibular tissue integrated prostheses. Single tooth replacements using osseointegrated implants were initially discussed in the late 1980's. These initial implant restorations were primarily concerned with masticatory function and not aesthetics (Fig. 1).

Clinicians and patients were initially satisfied with the return to normal masticatory function and fixed implant restorations. However, clinicians and patients soon expressed interest in the aesthetic replacement of individual missing teeth with implant restorations. Standard abutments with cylindrical, non-anatomic emergence profiles were never aesthetically acceptable; they were indeed quite functional. Anatomic, emergence profiles were considered essential for optimal, peri-implant soft tissue contours. Lazzara, designed three sizes of anatomic-like healing abutments that guided peri-implant soft tissue healing after implants were placed or uncovered. These healing abutments were available in three diameters and multiple heights. The healing abutments replicated the approximate sizes of the teeth being replaced and generated reasonable peri-implant soft tissue contours for restorations in the aesthetic zone. (Figs. 2 & 3)

During the transition from treating edentulous patients to treating partially edentulous patients, custom abutments were the only realistic alternative to develop aesthetic, anatomic-like implant restorations. Custom abutments were expensive for both clinicians and dental laboratory technicians to use in terms of technique sensitivity, expense and labor. Custom abutments were ideal in following soft tissue contours and also for correcting angulations associated with malposed implants.
The purpose of this article is to describe the clinical indications and laboratory benefits involved with the use of fixed margin titanium abutments (Provide® Abutment Restorative System, BIOMET 3i™, Palm Beach Gardens, FL). The clinical and laboratory steps involved in the construction of a three unit fixed partial denture supported by two Osseotite® Certain® implants and Provide® Abutments will also be illustrated.

Surgical Benefits of Fixed Margin Titanium Abutments

Surgeons may place implants at, below or above the level of crestal bone in either single or two stage protocols. If an implant is placed at the level of the bone crest and not trans-gingival, the contours of the definitive crown will be part of the abutment and not part of the implant. If the gingival margins are stable, surgeons will not need to “guess” what abutment collar height to use at the time of abutment placement. Even if gingival recession occurs after the abutment has been placed but prior to the definitive impression, the abutment collar heights of Provide® Abutments can easily be changed by either the surgeon who placed the abutment or by the restorative dentist. If, prior to making the definitive impression, there has been soft tissue recession that exposes an abutment margin, an abutment with a smaller collar height may be substituted for the pre-existing abutment by simply unscrewing the original abutment and replacing it with an abutment with the appropriate collar height.

With fixed margin abutments, surgeons do not need to determine the final abutment/crown margin at the time of implant placement because the abutments are available with 4 collar heights (1-4 mm). At the appropriate time (after soft tissue healing and osseointegration have occurred), a specific Provide® Abutment can be chosen with a collar height consistent with the restorative dentist’s philosophy of margin placement- above, below or at the gingival margin. In either case, restorative dentists will not need to prepare the abutments or implants themselves for optimal aesthetics.

Provide® Abutments are also available in 2 post heights: 4 and 5.5 mm. This allows surgeons to place abutments without having to prepare the occlusal surfaces for the 2mm interocclusal clearance required for implant crown restorations. They can simply place the requisite abutment with the 2 mm inter-occlusal clearance prior to discharging patients to restorative dentists for provisional restorations (Fig. 6).
Restorative Benefits of Fixed Margin Titanium Abutments

The Provide® Abutment Restorative System provides restorative dentists and dental laboratory technicians easily identifiable color-coded compatible components (Fig. 7). In addition, the system also has the QuickSeat® Connection specific for the internal implant/abutment connection with both audible and tactile clicks for verification of abutment seating. It is important to note that this system is only available for the internal connection of Certain® implants. This system also features impression copings that snap on to the abutments and eliminates the need for implant level impressions. Custom provisional restorations may be fabricated directly in patients’ mouths or indirectly on casts in the laboratory. Provisional prostheses made with these components can be used with any protocol including traditional and immediate occlusal loading.

Clinical and Laboratory Case Report

A 62 year old female patient presented to the first author with a chief complaint that included the desire to replace the missing mandibular right posterior teeth with a fixed implant-retained prosthesis. She did not want any type of removable prosthesis. The patient presented with enough surgical and restorative volumes to have implants placed. Two OSSEOTITE Certain (Biomet 3i, Palm Beach Gardens, FL) implants (5 mm diameter in the molar region; 4.1 mm diameter in the premolar region) were placed in a single stage surgical protocol and osseointegration occurred uneventfully. Approximately eight weeks later, the patient returned to the surgical office for evaluation of osseointegration, soft tissue healing and abutment placement.

The location of the implants and planned restoration was in a non-aesthetic zone. Minimal gingival recession occurred during osseointegration and the decision was made by the surgeon and the prosthodontist to use fixed margin abutments (Provide® Abutments). After the healing abutments were removed from the osseointegrated implants, the surgeon placed two abutments: for the implant in the #28 tooth site, the abutment post was 5.5 in height, 4.8 mm emergence profile, 2 mm collar height; for the implant in the #30 tooth site, the abutment post was 4 mm in height, 6.5 mm emergence profile; 2 mm collar height (Fig. 8). The abutments went to place and seating was confirmed via the QuickSeat Connection tactically, audibly and with a verification radiograph. No occlusal adjustment of the posts was required. The abutments were attached to the implants with abutment screws tightened to 20 Ncm with a torque driver. If the patient was not going to be seen immediately after abutment placement, surgeons may elect to place protection caps onto the abutments (Fig. 9). The protection caps snap onto the abutments and will protect patients’ tissues from the sharp line angles of the abutments.

(Figure 5) Provide® abutments with 4 mm post heights and 1, 2, 3 and 4 mm collar heights (left to right).

(Figure 6) Provide® Abutments with 4 and 5.5 mm post heights (left, right respectively).

(Figure 7) Provide® Impression copings that correspond to 4 and 5.5 mm post heights.

(Figure 8) Clinical buccal image of 2 abutments with fixed margins in place in the right posterior mandible. The anterior abutment’s facial margin is slightly sub gingival; the posterior abutment’s facial margin is supra gingival.

(Figure 9) Laboratory image of snap cap for a Provide® Abutment.
The patient was discharged to the first author for fabrication of a three unit fixed provisional prosthesis and the definitive impression of the abutments and soft tissue contours. The patient wished to have input into the design of the definitive prosthesis relative to the extent of porcelain coverage for the prosthesis. Therefore, during the time between implant placement and osseointegration, a processed shell for a provisional prosthesis was made in the laboratory. Clinically after the abutments were placed, plastic temporary cylinders were placed onto the intraoral abutments and the prosthesis was relined with a Bis-GMA resin (Figs. 10 & 11).

This prosthesis was designed for full occlusal function in centric, lateral and balancing side occlusions. In other clinical situations (immediate loading after implant placement), the temporary cylinders could have been used in conjunction with a laboratory processed provisional restoration for immediate restoration of the implants.

Plastic impression copings, consistent with the implant restorative platform diameters, and collar and post heights were snapped onto the abutments and a definitive impression was made in a stock impression tray (Figs. 12 and 13). Laboratory analogs consistent with the size of the clinical abutments were placed into the impression copings in the impression and the master cast was poured in conventional fashion (Fig. 14). Prefabricated waxing sleeves (Fig. 15), were placed onto the lab analogs and the wax pattern was developed, cut back, finished and cast in noble alloy (Fig. 16). Porcelain was applied to the framework, per patient request, and the prosthesis was finished, polished and returned to the prosthodontic office (Fig. 17).

The provisional prosthesis was removed and the definitive prosthesis was tried in, adjusted and cemented with permanent cement (Figs. 18 and 19). The patient was discharged after oral hygiene procedures were reviewed.

**Summary**

A clinical and laboratory case report has been presented illustrating the benefits of using pre-machined, fixed margin titanium abutments (Provide® Abutments). The versatility of this implant system has also been explained including the decision making process involved in clinical abutment selection, laboratory procedures including construction of provisional and definitive prostheses and the clinical procedures associated with this abutment system. The primary advantage of this system is that there is...
There is no need for the restorative dentists to prepare implants or abutments because the abutments are available with multiple collar and post heights. All of the restorative components are color coded and the laboratory procedures have been simplified with the use of pre machined metal and plastic components. This system provides the entire dental implant team (surgeon, restorative dentists and dental laboratory technicians) with improved efficiency in implant restorations, without compromising aesthetics or function.

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References