Abutment Emergence Modification for Immediate Implant Provisional Restorations

TODD R. SCHOENBAUM, DDS*, **YI-YUAN CHANG,** BS, MDC†, **PERRY R. KLOKKEVOLD,** DDS, MS‡, **JOHN S. SNOWDEN,** DDS§

ABSTRACT

In their stock form, some titanium provisional implant abutments are not ideally designed for use in immediate placement/immediate provisional restoration treatment. This is largely due to the apical flare design that applies excessive pressure to the peri-implant soft tissue complex and crestal bone. This appears to have the undesirable effect of increasing peri-implant bone resorption and severely impeding the potential for increases in gingival volume. This type of stock titanium abutment will therefore benefit significantly from recontouring. The subgingival portion of the abutment is recontoured from the flared stock shape to a straight or parallel design. This modification minimizes pressure on the surgical site and provides additional space around the subgingival portion of the provisional restoration, within which the gingiva has the potential to remodel and fill. This allows the potential formation of additional peri-implant gingival volume and a coronal maintenance or migration of the soft tissue complex. In order to minimize the "graying effect" of titanium abutments, the retentive portion is opaqued by the technician or clinician. These modifications will improve the potential outcomes for both the peri-implant gingiva and the provisional restoration.

CLINICAL SIGNIFICANCE

Narrowing the emergence profile of implant abutments for use in immediate implant provisional restorations appears to allow for creation of greater peri-implant volume. Thus resulting in increased esthetic potential and predictability of the peri-implant gingiva.

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INTRODUCTION

The use of implant-supported provisional restorations has been shown to be a viable and important component of successful implant treatment, particularly in treatments that involve preservation and/or manipulation of the peri-implant gingiva in the esthetic zone.[1–5] The immediate provisional restoration replaces natural tooth contours and helps to support the gingival architecture during the immediate and subsequent healing period, thus improving overall predictability of the treatment.[6–10] In its initial form, the immediate implant provisional restoration must protect the surgical site and stabilize peri-implant graft materials without exerting excessive pressure to the gingiva.

For immediate implants in the esthetic zone, the provisional abutment must perform three functions well: preserve bone and soft tissue, provide adequate strength to the provisional restoration, and support the

*Assistant Clinical Professor, Division of Restorative Dentistry, University of California-Los Angeles School of Dentistry, Los Angeles, CA, USA
†Staff Research Associate, Division of Restorative Dentistry, University of California-Los Angeles School of Dentistry, Los Angeles, CA, USA
‡Associate Professor, Section of Periodontics, University of California-Los Angeles School of Dentistry, Los Angeles, CA, USA
§Lecturer, Division of Restorative Dentistry, University of California-Los Angeles School of Dentistry, Los Angeles, CA, USA

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shade of the provisional. Although "plastic" (generally polymethyl methacrylate [PMMA] or polyetheretherketone [PEEK]) provisional abutments are available, it has been the author's experience that they are significantly more prone to breakage and unreliable for provisionals that frequently need to function for the 6 to 12 months necessary to achieve an ideal and stable gingival result. Titanium (and zirconia) abutments have been shown to minimize bone and soft tissue loss around the implant,[11,12] are less prone to breakage, are approved for use beyond 6 months, and can be torqued to higher loads. For these reasons, the authors prefer the use of titanium provisional abutments that allow the creation of a screw-retained provisional restoration. However, with some implant systems, the provisional abutment will require some modification to better achieve the goals stated earlier. This technique is of particular use for implants not designed with a narrow diameter abutment (or "platform switched" interface).[13]

Provisional titanium implant abutments from some implant manufacturers significantly benefit from two primary modifications that maximize their effectiveness in the esthetic zone: recontouring and opaquing. These abutments have a flare that starts at the abutment/implant interface (Figure 1A). The flare present on the abutment where it interfaces with the implant creates unnecessary pressure on the soft tissue complex and crestal bone, which may lead to an increase in resorption and recession of the peri-implant tissues.[14–16] Such changes are most significant at the facial gingival margin and the interdental papillae.

In order to minimize apical migration of the crestal bone and accompanying gingival recession, such abutments can be recontoured to a more ideal form. The flare on the abutment can be carefully removed in the laboratory prior to the surgery to create a significant improvement in the subgingival contour of the abutment. This will allow for a straight, smooth transition from the implant to the abutment without changes in contour, thus minimizing unnecessary intrusion of bulk restorative/abutment material into the peri-implant space, which should ideally be occupied by gingival tissues.

To maximize the potential height of the soft tissue complex, the most apical portion of the abutment should be modified to be no wider than the implant body at the neck (Figure 1B). The narrow abutment profile allows for sufficient biologic width around the nonintegrated abutment and therefore minimizes remodeling of the peri-implant crestal bone. This straight emergence profile on the abutment should extend as far coronally as possible (depending on tissue thickness, this is generally 2–3 mm in the maxilla) before transitioning outward to meet the profile of the crown at the cementoenamel junction (CEJ). The transition from the straight apical area of the abutment to the wider crown area should be smooth and polished with a gentle "S" curve design to promote hygiene and gingival health (Figure 2). This narrow contour is especially useful in preserving the interproximal crestal bone adjacent to the implant (Figure 3).

Because of their color, titanium abutments can cause a "graying effect" of the provisional restoration. This problem is resolved through the use of a low-viscosity opaque composite resin applied to the abutment to

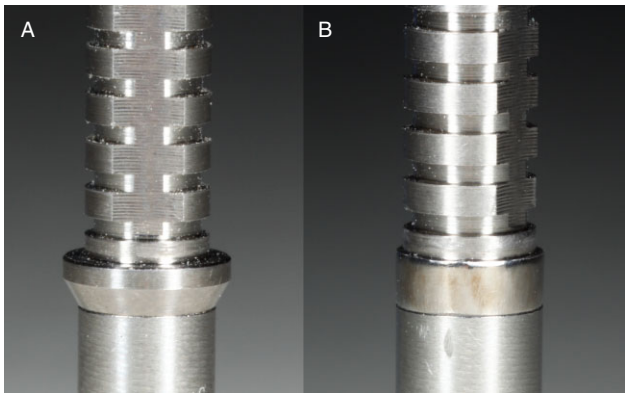

FIGURE 1. A, Stock provisional abutments from some implant manufacturers have a flared emergence profile on the subgingival portion. This design occupies valuable peri-implant space and may cause apical repositioning of the gingiva, particularly in immediate placement/immediate provisional implant treatment. B, The flared emergence profile of the provisional abutment has been removed with a heatless stone and polished with rubber polishing wheels to create a subgingival surface of 2 to 3 mm that is smooth and parallel with the terminal portion of the implant body.

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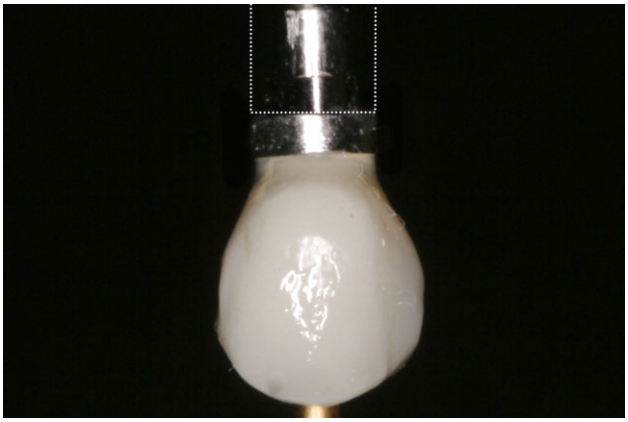

FIGURE 2. Buccal view of the completed provisional restoration. Note the straight profile from the implant body to the narrowed abutment collar, and the continuous "S" curve from the abutment to the full contour of the crown. The implant body is represented by the dotted line.

FIGURE 3. Radiograph of the provisional restoration in position on the day of extraction and immediate implant placement. The narrowed emergence profile of the provisional restoration is evident and will minimize the apical migration of the gingiva because of encroachment of the biologic width.

neutralize the graying effect commonly associated with titanium.

TECHNIQUE

1. Attach stock titanium provisional abutment to a protection analog (titanium engaging temporary abutment NobelReplace; Nobel Biocare AB, Goteborg, Sweden) (Figure 1A).
2. Remove the flared portion of the abutment using a heatless stone (no. 6 white stone wheel; Shofu, Inc., Kyoto, Japan). Do not adjust the portion of the abutment that will interface with the head of the implant body. Ensure that the contour is parallel to the terminal portion of the implant body (Figure 1B).
3. Polish the adjusted area using coarse Dialite wheel (Dialite polishing wheels; Brasseler, Savannah, GA, USA), then with soft-cut grade wheel (Shofu, Inc.), finished with the extra-fine Dialite wheel.
4. Apply sticky wax to polished collar area (Kerr Lab sticky wax; Sybron Dental Specialties, Orange, CA, USA).
5. Abrade retentive zone of the abutment with 50-μm aluminum oxide at 2 bar of pressure.
6. Remove the sticky wax, steam clean, and dry the abutment.
7. Apply low-viscosity composite resin opaquing wash to the retentive zone of the abutment (tooth-colored ultraviolet opaquer; XPdent, Miami, FL, USA) (Figure 4).
8. Polymerize the composite opaquing resin using a dental curing light for 60 seconds.
9. Fabricate and deliver provisional restoration and torque to manufacturer's recommended specification (Figures 5 and 6).
10. Avoid removing or modifying provisional restoration during osseointegration and gingival maturation. Evaluate at 3 months postoperative (Figure 7).

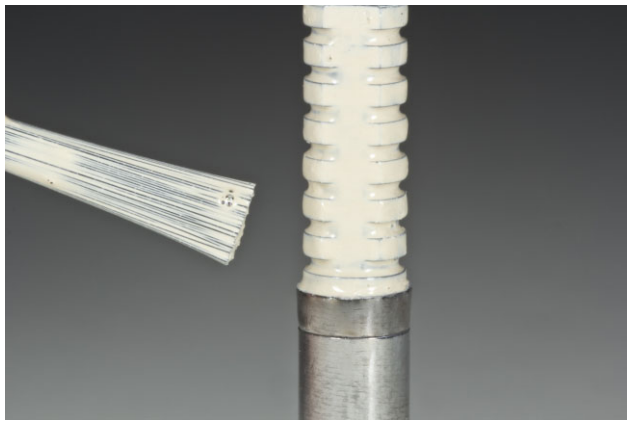

FIGURE 4. A low-viscosity opaquing composite resin has been applied to the retentive zone to minimize the "graying effect" of the titanium in the coronal portion of the provisional restoration.

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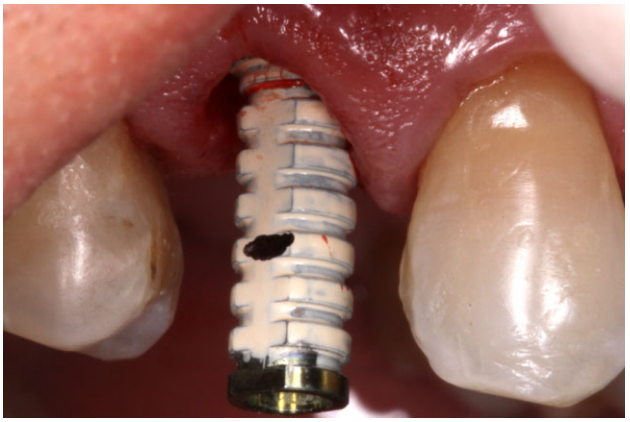

FIGURE 5. The modified, narrow emergence titanium abutment is in position approximately 1 hour after extraction and implant placement. Note the absence of pressure on the gingiva. The abutment has been marked and will be trimmed (extraorally) prior to combining it with the provisional shell.

FIGURE 6. The provisional restoration in position on the day of extraction and implant placement. Note the open gingival space at the midfacial, provided by the narrowed neck form of the provisional restoration. It is expected that this space will allow for coronal migration of the gingiva.

SUMMARY

Immediate implant placement with the fabrication and delivery of a properly designed provisional restoration significantly improves the potential esthetic and functional outcome of implant treatment. The most significant improvements are gained in the resulting gingival architecture. Although highly durable and biocompatible, some stock titanium provisional implant abutments decrease the esthetic potential of treatment because they are improperly flared and put undesirable pressure on the surgical site. By recontouring the subgingival portion of the abutment to a parallel design, the pressure on the peri-implant gingiva is minimized, and the potential for ideal papillae height and gingival contour is significantly increased. Opaquing the retentive portion of the abutment significantly improves the potential for shade matching the provisional restoration to the adjacent dentition.

The primary advantage of fabricating a screw-retained implant provisional with this modified abutment is the preservation of the soft tissue complex at its most coronal position. Additionally, the provisional restoration stabilizes the contours of the soft tissue and serves as a guide for the fabrication of the definitive prosthesis/abutment. Following a period of osseointegration and periodontal maturation, the contours of the definitive restoration should replicate those created by the provisional restoration, thus minimizing the potential loss of gingival height.

FIGURE 7. Three-month evaluation reveals coronal migration of the peri-implant gingiva of approximately 1 mm at the midfacial. The provisional restoration was left in place and unmodified for the initial 3 months to minimize damage to the maturing gingiva.

DISCLOSURE

The authors do not have any financial interest in the companies whose materials are included in this article.

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Reprint requests: Todd R. Schoenbaum, DDS, UCLA School of Dentistry, Continuing Dental Education, Box 951668, Room A0-121 CHS, Los Angeles, CA 90095-1668, USA; Tel.: 310-267-3380; email: tschoenbaum@dentistry.ucla.edu

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