Preservation of soft tissue contours with immediate screw-retained provisional implant crown

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When a patient with a missing or failing maxillary anterior tooth desires immediate tooth replacement, fabrication of a provisional restoration can be challenging. Due to individual anatomical variations in tooth shape, size, and supporting soft and hard tissue structures, there are no premanufactured components with an anatomical emergence profile that universally suits all individual situations. This article describes the fabrication of a screw-retained immediate provisional restoration that fulfills anatomic, biologic, and esthetic requirements. (J Prosthet Dent 2007;98:329-332)

Currently, implant-supported restorations are considered the first choice for replacing missing or failed maxillary anterior teeth, with predictable and documented results.[1-5] There is no doubt that the primary requirement for implant success is osseointegration[6]; however, from an esthetic perspective, implant-supported restorations are successful if they mimic adjacent natural teeth in a well balanced and harmonized soft tissue frame.[7] Tooth loss results in soft tissue collapse and bone resorption, with the end result of flat anatomical contours.[8] Therefore, preservation of the existing soft and hard tissue contours should be the goal of esthetic patient management. One method of preserving soft and hard tissue is through immediate implant placement and placement of a provisional restoration.[9] The application of controlled functional loads to the implant at the time of surgical placement has proven successful in the prosthetic restoration of both partially edentulous and edentulous patients.[10-16] Improved implant design and surface characteristics have resulted in increased initial implant stability upon placement, decreased micromotion, and enhanced bone apposition along the implant surface during the healing process.[17-19] From an esthetic perspective, immediate implant restoration benefits the esthetic outcome in 2 ways: by providing immediate replacement of the missing tooth and preservation of the soft and hard tissue contours at the fresh extraction site.

When an implant is placed with proper 3-dimensional orientation in relation to the adjacent teeth, the gingival tissue from the gingival margin to the implant platform can be altered using a customized abutment to create a natural emergence profile and provide the necessary support to the surrounding soft and hard tissue. This can be performed with a provisional restoration at the time of implant placement or second stage surgery.[20,21]

There are no premanufactured components with an anatomical emergence profile that suits each situation, due to individual anatomical variations in tooth shape, size, and supporting soft and hard tissue structures. Different approaches have been suggested to fabricate implant-supported provisional restorations. Reiser et al[21] described an approach in which the provisional crown is created in the laboratory following stage I indexing and can be inserted at the time of stage II surgery. Daoudi[22] used a customized interim abutment to provide a matrix for a vacuum-formed matrix-created provisional restoration. Chaimattayompol[23] described the use of an impression coping when fabricating the provisional implant-supported prosthesis. Kan et al[9] used a direct approach in which a temporary abutment is customized using autopolymerized acrylic resin to capture the cervical gingival emergence of the extracted tooth. The customized abutment is then prepared extraorally to receive a cemented crown shell. Regardless of the method used to fabricate a provisional crown, the key objective is development and maintenance of soft tissue contours before fabrication of the definitive prosthesis, while providing the patient with a stable esthetic restoration during the healing phase. This article describes the fabrication of a screw-retained immediate provisional restoration using a crown shell indirectly fabricated in the laboratory and attached directly to the provisional plastic abutment at the time of implant placement.

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TECHNIQUE

1. Make preliminary impressions of both arches with an irreversible hydrocolloid impression material (Jeltrate Plus; Dentsply Intl, York, Pa) and fabricate diagnostic casts (Microstone; Whip Mix Corp, Louisville, Ky). Make a facebow transfer and maxillomandibular records, and mount the diagnostic casts in a semi-adjustable articulator (Model 2240; Whip Mix Corp).

2. Wax the definitive missing crown form and fabricate a provisional methyl methacrylate resin (Jet Acrylic; Lang Dental Mfg Co, Wheeling, Ill) crown shell that matches the shade of the adjacent teeth. Also, fabricate a surgical template using clear autopolymerized acrylic resin (Orthodontic Resin; Dentsply Caulk, Milford, Del).[24]

3. Place the implant (Nobel Replace; Nobel Biocare, Yorba Linda, Calif) at the desired position with the aid of the surgical template.

4. Select the appropriate provisional plastic abutment (Nobel Biocare), mark the abutment, and trim it to the required height extraorally.

5. Mount the plastic abutment to the implant using a guide pin (Nobel Biocare) (Fig. 1). Estimate the exit point of the guide pin on the provisional crown shell and create an opening to accommodate the guide pin.

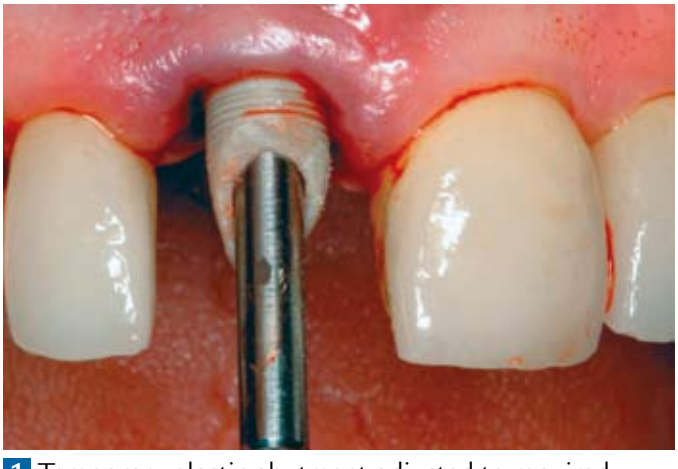
6. Evaluate the provisional crown shell intraorally and adjust if needed. Fill the crown shell with a light-polymerized composite resin (Filtek Supreme; 3M ESPE, St. Paul, Minn), and insert it over the temporary abutment to an ideal position (Fig. 2).

7. Light polymerize (Litex 680A; Dentamerica, City of Industry, Calif) for 40 seconds (400-500 nm) on both the facial and palatal surfaces.

8. Unscrew the guide pin and remove the provisional crown together with the attached abutment (Fig. 3, A). Add light-polymerized composite resin (Filtek Supreme; 3M ESPE) to create an appropriate emergence profile (Fig. 3, B). Finish and polish to a high luster using an aluminum-oxide rubber cup (HiLuster Plus; Kerr Corp, Orange, Calif) to allow undisturbed soft tissue healing (Fig. 4).

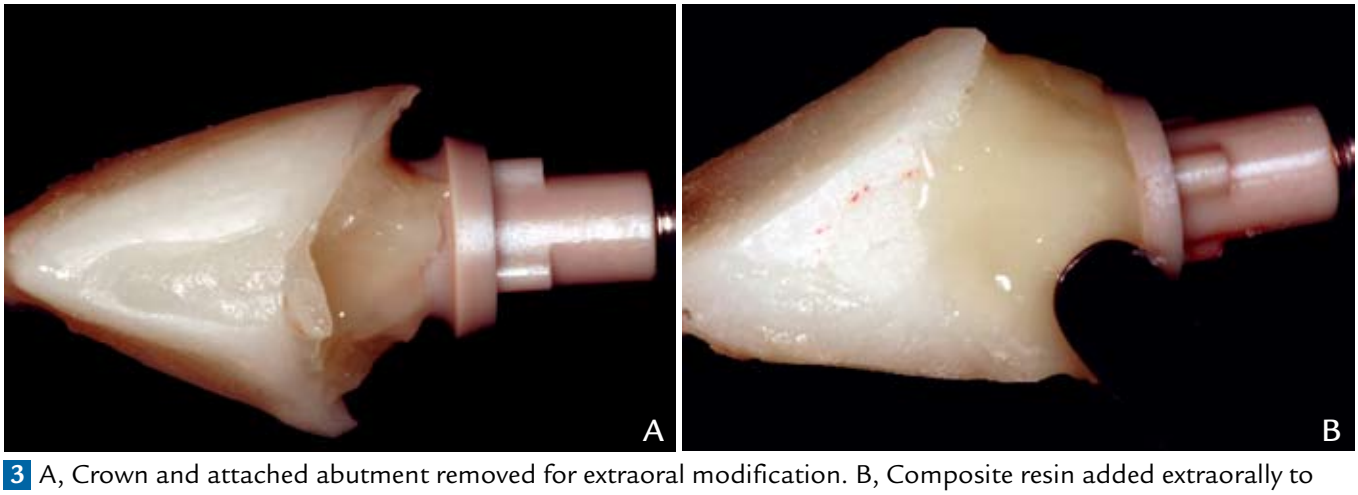
9. Place the provisional crown into position and hand tighten or torque the screw to approximately 10-15 Ncm.

10.Obturate the screw access opening with a cotton pellet and light-polymerized composite resin (Filtek Supreme; 3M ESPE) or autopolymerized acrylic resin (Jet Acrylic; Lang Dental Mfg Co). Evaluate and



1 Temporary plastic abutment adjusted to required height and screwed in place using guide pin.

2 Provisional crown shell loaded with composite resin and placed intraorally.

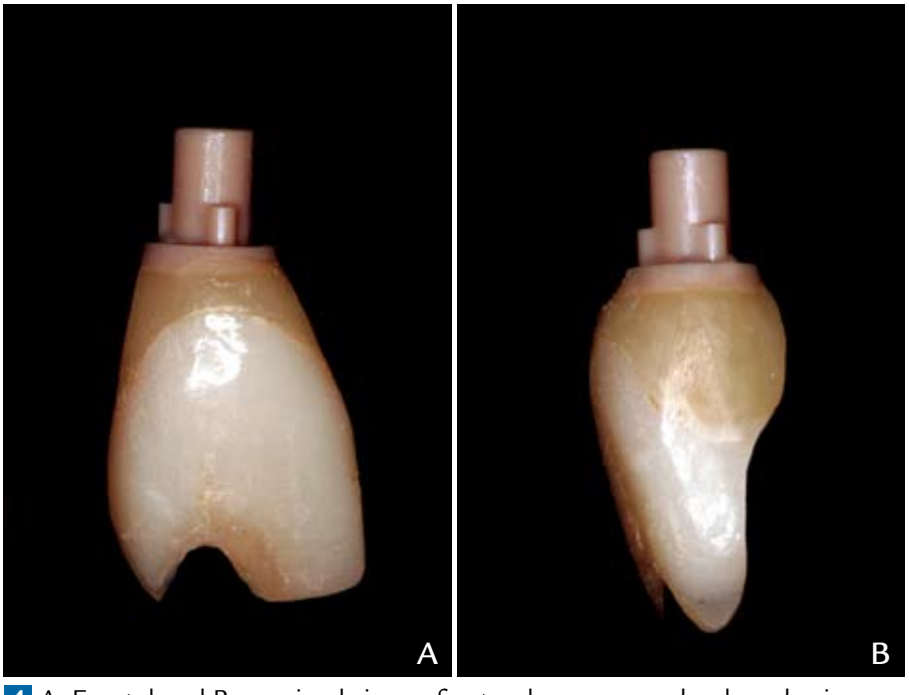


3 A, Crown and attached abutment removed for extraoral modification. B, Composite resin added extraorally to create appropriate emergence profile.

adjust the occlusion to eliminate occlusal contact on the provisional crown in maximum intercuspation and all excursive movements. Finish and polish using an aluminum oxide and a rubber cup (HiLuster Plus; Kerr Corp) (Fig. 5).

DISCUSSION

Immediate implant placement and placement of a provisional restoration provides the patient with immediate comfort and a stable esthetic restoration during the healing phase, reduces the number of surgical visits, eliminates the need for a second-stage surgery, and increases patient acceptance for implant treatment. Moreover, immediate replacement maintains the missing tooth space and provides the required dental support to the supporting soft and hard tissue structures at the recent extraction site. Using the described technique, the crown shell is fabricated in the laboratory and, prior to implant placement, fit to the missing or failed tooth space created in the stone cast. The crown shell is attached directly to the provisional plastic abutment at the time of implant placement. Little adjustment is typically needed at the surgical visit, and, therefore, clinical time may be saved. Despite its inferior strength, the plastic abutment is recommended in this situation, as it is more esthetic when compared with a metal abutment. It is also easier to trim extraorally after being marked intraorally to the required height, thus minimizing surgical site contamination. Screw retention allows easy retrievability and eliminates the need for cementation and possible soft tissue irritation, especially in subgingival sites. Another advantage of using screw retention is elimination of the rough surface created at the crown abutment junction by providing a highly polished surface which facilitates tissue healing. Since the screw is only hand-tightened to prevent applying extra torque to the implant during provisional crown removal, screw loosening is a possible complication that could occur during the healing period which might require retightening and additional visits to the dental office. Finally, with the use of microhybrid composite resin rather than acrylic resin to secure the crown shell to the plastic abutment, soft tissue irritation is less likely, due to elimination of autopolymerized acrylic resin monomer. Futhermore, polymerization can be achieved in 40 seconds compared to 7-10 minutes when using acrylic resin. The shade matching of the composite resin to the acrylic resin can be difficult; however, it is of little concern since the composite resin is used primarily to form the subgingival portion of the crown.



4 A, Frontal and B, proximal views of natural emergence developed using light-polymerized composite resin.

5 Immediate provisional crown in place 1 week postoperatively.

As with any immediate-load protocol, this technique should be limited to situations with acceptable initial implant stability and absence of soft and hard tissue defects. Occlusion should be carefully adjusted to minimize micromotion, as it has been implicated in fibrous encapsulation, rather than osseointegration, and overall treatment failure.[25, 26]

SUMMARY

A key objective after maxillary anterior tooth extraction is preservation

of the existing soft and hard tissue contours. The described technique permits development and maintenance of soft tissue contours before fabrication of the definitive prosthesis, while providing the patient with a stable esthetic restoration during the healing phase.

REFERENCES

1. Andersson B, Odman P, Lindvall AM, Lithner B. Single-tooth restorations supported by osseointegrated implants: results and experiences from a prospective study after 2 to 3 years. Int J Oral Maxillofac Implants 1995;10:702-11.
2. Avivi-Arber L, Zarb GA. Clinical effectiveness of implant-supported single-tooth replacement: the Toronto study. Int J Oral Maxillofac Implants 1996;11:311-21.
3. Cordioli G, Castagna S, Consolati E. Single tooth implant rehabilitation: a retrospective study of 67 implants. Int J Prosthodont 1994;7:525–31.
4. Jemt T, Pettersson P. A 3-year follow-up study on single implant treatment. J Dent 1993;21:203-8.
5. Laney WR, Jemt T, Harris D, Henry PJ, Krogh PH, Polizzi G, et al. Osseointegrated implants for single-tooth replacement: progress report from a multicenter prospective study after 3 years. Int J Oral Maxillofac Implants 1994;9:49-54.
6. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. Int J Oral Maxillofac Implants 1986;1:11-25.
7. Al-Harbi SA. Nonsurgical management of interdental papilla associated with multiple maxillary anterior implants: a clinical report. J Prosthet Dent 2005;93:212-6.
8. Lam RV. Contour changes of the alveolar process following extractions. J Prosthet Dent 1960;10:25-32.
9. Kan JY, Rungcharassaeng K, Lozada J. Immediate placement and provisionalization of maxillary anterior single implants: 1-year prospective study. Int J Oral Maxillofac Implants 2003;18:31-9.
10. Weinlaender M, Kenney EB, Lekovic V, Beumer J 3rd, Moy PK, Lewis S. Histomoerphometry of bone apposition around three types of endosseous dental implants. Int J Oral Maxillofac Implants 1992;7:491-6.
11. Gottlander M, Albrektsson T, Carlsson LV. A histomorphometric study of unthreaded hydroxyapatite-coated and titanium-coated implants in rabbit bone. Int J Oral Maxillofac Implants 1992;7:485-90.
12. Babbush CA . Titanium plasma spray screw implant system for reconstruction of the edentulous mandible. Dent Clin North America 1986;30:117-31.
13. Lefkove MD, Beals RP. Immediate loading of cylinder implants with overdentures in the mandibular symphysis: the titanium plasma-sprayed technique. J Oral Implantol 1990;16,4:265-71.
14. Babbush CA, Kent JN, Misiek DJ. Titanium plasma-sprayed (TPS) screw implants for the reconstruction of the edentulous mandible. J Oral Maxillofac Surg 1986;44:274-82.
15. Piattelli A, Paolantonio M, Corigliano M, Scarano A. Immediate loading of titanium plasma-sprayed screw-shaped implants in man: a clinical and histological report of two cases. J Periodontol 1997;68:591-7.
16. Sanz A, Oyarzun A, Farias D, Diaz I. Experimental study of bone response to a new surface treatment of endosseous titanium implants. Implant Dent 2001;10:126-31.
17. Orenstein IH, Tarnow DP, Morris HF, Ochi S. Factors affecting implant mobility at placement and integration of mobile implants at uncovering. J Periodontol 1998;69:1404-12.
18. Corso M, Sirota C, Fiorellini J, Rasool F, Szmukler-Moncler S, Weber HP. Clinical and radiographic evaluation of early loaded free-standing dental implants with various coatings in beagle dogs. J Prosthet Dent 1999;82:428-35.
19. Pierrisnard L, Hure G, Barquins M, Chappard D. Two dental implants designed for immediate loading: a finite element analysis. Int J Oral Maxillofac Implants 2002;17:353-62.
20. Biggs WF. Placement of a custom implant provisional restoration at the second-stage surgery for improved gingival management: a clinical report. J Prosthet Dent 1996;75:231-3.
21. Reiser GM, Dornbush JR, Cohen R. Initiating restorative procedures at the first-stage implant surgery with a positional index: a case report. Int J Periodontics Restorative Dent 1992;12:278-93.
22. Daoudi MF. Case report: temporary restoration for a single tooth implant prosthesis with adverse axial inclination of the fixture. Eur J Prosthodont Restor Dent 1999;7:95-7.
23. Chaimattayompol N. Chairside fabrication of provisional implant-supported prosthesis using impression copings. J Prosthet Dent 2000;83:374-5.
24. Al-Harbi SA, Verrett RG. Fabrication of a stable surgical template using staged tooth extraction for immediate implant placement. J Prosthet Dent 2005;94:394-7.
25. Brunski J. Biomechanical factors affecting the bone-dental implant interface. Clin Mater 1992;10:153-201.
26. Szmukler-Moncler S, Salama H, Reingewirtz Y, Dubruille JH. Timing of loading and effect of micromotion on bone-dental implant interface: review of experimental literature. J Biomed Mater Res 1998;43:192-203.

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