

Case Report: Maintenance of Gingival Form Following Immediate Implant Placement—The Custom-Healing Abutment

Abstract:

The anatomical changes that occur with the alveolar ridge after the loss of a single anterior tooth can be a challenge to redevelop during the restorative process. The preservation of the soft tissue level from the time of extraction may optimize the final prosthetic outcome. One technique that can be used to achieve ideal tissue form is immediate dental implant placement with a custom-healing abutment.

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Immediate dental implants placed in a transmucosal technique have proven to be a predictable treatment modality.^{1,2} This one-stage protocol negates the need for complete socket closure, thus improving soft tissue esthetics by maintaining the position of the mucogingival junction and amount of keratinized tissue.³ Although this helps to maintain the soft tissue appearance on the facial of the ridge, we are still faced with a flattening of the soft tissue scallop. A review of previous studies examining the dento-gingival relationship will help in understanding why these changes occur and how a strategy aimed at preservation of the existing gingival anatomy may be beneficial.

The presence of a papilla and its relationship to embrasure space has been evaluated. In a study examining the soft tissue dimensions between teeth, researchers found that in sites where the linear measurement was 5 mm between the contact point and the level of the interproximal bone, the papillae filled the embrasure almost 100% of the time.⁴ A similar value was measured in an evaluation of the total dento-gingival complex on maxillary incisors.⁵ The interproximal average values were up to 4.5 mm and the facial measurements were 3 mm. Although biologic width (connective tissue and junctional epithelium) on different surfaces of the tooth may vary slightly, it may not be enough to explain the difference in tissue heights between the facial and interproximal surfaces.⁶ Sulcus depth seems to be responsible for these

differences and may vary depending on periodontal biotype, tooth form, and embrasure volume. Sites with greater sulcus depth are prone to greater recession after the extraction of a tooth. The absence of interproximal support allows for a flattening of the papillae to the same level above bone that exists on the facial. Considering these sequelae, the clinician may be challenged to restore the missing tooth with the desired gingival profile.⁷

When replacing a tooth with an implant-supported restoration, several protocols have evolved to achieve a reasonable outcome. The traditional approach of a two-stage delayed implant placement followed by a period of osseointegration has proven successful.⁸ The re-creation of soft tissue form may occur by re-establishment of a gingival embrasure with the final restoration. Researchers have determined that the level of bone and periodontal attachment on the adjacent teeth appear to determine the height of the papillae.^{9,10} Although the interproximal tissue level may be restored close to the presurgical level, it appears to be dependent on the peri-implant tissue biotype. In addition, there may be a period of time after insertion of the restoration that is needed to achieve fill of the embrasure.^{11,12}

Immediate implant placement followed by immediate provisional restoration of single sites is another protocol used to replace a failing tooth.¹³ Along with the advantages of a fixed esthetic restoration, the soft tissue profile can be maintained from the time of extraction.

This technique may benefit patients with a thin periodontal biotype. Another benefit is the simplification of the final restorative procedure. Pre-fabricated healing abutments are circular in shape. Attempts at molding the tissue from a small opening above the implant to a contour similar to the missing tooth can take time.

The preserved tissue profile can be easily duplicated in the impression process and allow for an accurate fabrication of a restoration in harmony with ideal tissue architecture at the day of insertion. This form of maintenance of the supporting gingival tissue has been demonstrated to be beneficial using immediate pontics for tooth replacement.¹⁴ Preservation of form, rather than re-creation, is achieved with the extension of the pontic into the subgingival zone with a contour replicating that of the extracted tooth. Concepts from immediate pontics have been applied to immediate dental implants with a similar goal. This is achieved with either a custom healing abutment or a complete provisional crown. The subgingival portion is essentially the same. The clinician can select either option dependent on the risk with respect to the patient's occlusion. The use of a custom-healing abutment is recommended in patients who have a deep anterior bite, who present with signs of bruxism, or who have a malocclusion that is not conducive to the protection of an immediate restoration. This article will illustrate the use of a custom-healing abutment after immediate post-extraction implant placement.

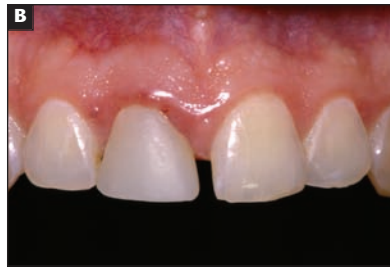


Figure 1A through Figure 1C At initial presentation, this patient had a large composite restoration for tooth No. 8, gingival inflammation, and incisal attrition (**A and B**). A tapering root form, angled post-placement, and short endodontic fill was noted on the radiograph (**C**).

CASE REPORT

A 36-year-old patient presented with a structurally compromised tooth No. 8. This tooth had a failing composite resin restoration and lacked sufficient ferrule for adequate retention of a restoration (Figure 1A and Figure 1B). Repair had been attempted several times and the patient was informed about the poor restorative prognosis. Radiographic analysis noted the presence of an angled post placement, a narrow tapering root form and short endodontic fill (Figure 1C). The soft tissue form around this tooth was ideal, with the facial gingival margin slightly coronal to that on tooth No. 9. Periodontal probing indicated normal attachment levels on tooth No. 8 as well as the adjacent teeth. After a complete review of the examination findings, a treatment plan was proposed to replace this tooth with an implant-supported restoration. In an effort to maximize the esthetic result, the surgical procedure was planned as an immediate post-extraction implant placement with a custom-healing abutment.

Surgical Technique

Extraction of tooth No. 8 (Figure 2A) was accomplished without flap elevation using a periosteal elevator to sever the periodontal

ligament fibers, and forceps to gently rotate the tooth out of the socket. A bone curette was used to remove any soft tissue and examine the integrity of the labial bone plate. No dehiscence was noted and the facial bone crest was measured to be 4 mm below the gingival margin.

Osteotomy preparation in immediate implant sites is usually started on the palatal wall. This helps to avoid perforation to the facial and positions the implant with good bone contact on the mesial, distal, palatal, and apical area. The implant (3i Osseotite, BIOMET 3i, Palm Beach Gardens, FL) was placed with the platform positioned at the level of the labial bone crest, 4 mm from the facial gingival margin (Figure 2B). Some resultant recession would be acceptable given the favorable coronal position of the gingival margin as compared to tooth No. 9.

Custom-Healing Abutment

Prefabricated healing abutments are circular in shape and fail to provide support for the supracrestal soft tissue in immediate implant sites. Dental implant companies have attempted to fabricate healing abutments with the cross-section of natural teeth or ones that can be customized. The problem with these versions is the difficulty in adding and subtracting material to customize the shape. The author has found it easier to use temporary abutments with the addition of composite resin. The supragingival extension of the metal cylinder allows for easy handling during the fabrication process. Composite resin is used with controlled application to customize the emergence profile specific to the site.

A temporary abutment (BIOMET 3i) is prepared extraorally with a light addition of flowable composite resin before it is inserted onto the dental implant. Additional composite resin is added to the abutment to fill the space

between it and the soft tissue margin. Incremental addition and curing is recommended and should be executed with great care to prevent resin from flowing onto the implant surface. The abutment is then taken out of the mouth and connected to an implant analog. Composite resin is added to fill in and create the proper emergence profile from the top of the implant to the level of the free gingival margin (Figure 3A and Figure 3B). It is important to note that the soft tissue margin will begin to collapse immediately after tooth extraction. The clinician will need to compensate for this by adding to the perimeter of the healing abutment during the final shaping and contouring. The custom-healing abutment is tried in several times to check the profile. Radiographs are helpful to examine the angle of emergence from the top of the implant. After a final polish with discs, the supragingival extension of the temporary abutment cylinder is cut to the level of the gingival margin (Figure 3C and Figure 3D). The custom-healing abutment is then inserted and torqued onto the implant. Tooth replacement is accomplished with a removable prosthesis (Figure 4A through Figure 4C). Either an Essix appliance or an interim removable partial denture can be adjusted to fit over the healing abutment. Adjustment of the appliance is necessary to avoid contact with the healing abutment and pressure on the implant.

Impression

After the osseointegration phase is complete, a polyvinylsiloxane impression can be taken to register the position of the implant and contour of the soft tissues. The custom-healing abutment has maintained support of the gingival architecture and this should now be transferred to the working laboratory model. The best technique that has been developed is the use of a custom-impression coping (Figure 5A through Figure 5C).¹⁴

The custom-healing abutment is removed from the mouth and connected to an implant analog. Silicone impression material is injected around the analog and abutment to capture the subgingival profile. The custom-healing abutment is returned to the implant to

continue to support the gingival tissues while the impression coping is being fabricated. An implant pick-up impression coping is then attached to the implant replica and composite resin is flowed around it to fill in the void within the impression material and light-cured. The custom impression coping can then be transferred to the mouth and secured to the implant. A standard impression is then made with this custom coping supporting the soft tissue profile. The impression is prepared in the standard manner using a soft tissue replacement material around the custom impression coping before it is poured with die stone.

Restoration

The full-contoured wax-up was used as a guide for the fabrication of the final restoration. A custom abutment was then cast and modified to allow for ceramic application to the subgingival surface (Figure 6A through Figure 6C). For the crown restoration, dentin and enamel porcelain powders were applied on a metal coping with a 360° porcelain margin (Figure 7A and Figure 7B). The abutment was tried in the mouth and the fit was verified with a radiograph (Figure 8). It was torqued to 35 Ncm and the crown



Figure 2A and Figure 2B Tooth No. 8 was extracted with a periosteal elevator and forceps (A). The dental implant was placed with the platform 4 mm below the facial gingival margin (B).



Figure 3A through Figure 3D The custom-healing abutment was fabricated using a temporary provisional abutment and composite resin (A and B). After the desired contour was achieved, the abutment was polished and the supragingival portion of the temporary cylinder was cut to the level of the composite (C and D).



Figure 4A through Figure 4C The custom healing abutment after insertion provides immediate support of the gingival tissue (A and B). An interim RPD is adjusted to avoid contact with the custom-healing abutment (C).



Figure 5A through Figure 5C 6 months after implant placement, 1 mm of gingival recession is noted on the facial (A). The soft tissue form has been maintained during the healing phase. This will simplify the restorative procedure and provide ideal soft tissue esthetics upon insertion of the final restoration (B). A custom impression coping is used to transfer the tissue form to the master cast (C).



Figure 6A through Figure 6C A full-contoured wax-up is used as a guide to fabricate the restoration (A). The custom abutment is modified to allow the addition of porcelain in the subgingival portion (B and C).



Figure 7A and Figure 7B The final restoration was fabricated with a full porcelain margin. A scalloped finish line aids in cement removal and maintains soft tissue health.



Figure 8 Radiograph of the custom-healing abutment at initial insertion.

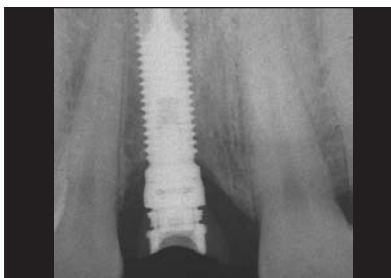


Figure 9A Radiograph at 6 months post-placement of the implant. Normal bone remodeling to the level of the first thread has occurred.



Figure 9B At the 2-year post-insertion follow-up, the soft tissue is healthy and the form mimics that of the adjacent teeth.



Figure 9C Radiograph at 2 years post-insertion of the final restoration. The bone level has remained stable.

was cemented with temporary cement (Temp-Bond, Kerr Corporation, Orange, CA). The final results can be seen in Figure 9A through Figure 9B.

CONCLUSION

This article described a technique for the maintenance of gingival form following immediate implant placement using a custom-healing abutment. Precise

contouring of the subgingival emergence profile allows for the preservation of the original soft tissue levels. The clinician can accurately transfer this information to the dental technician to increase the predictability of the final restorative outcome. Therefore, careful patient selection and execution of this treatment modality provides an effective method to optimize implant esthetics.

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