

Replacing a Single Anterior Tooth Immediately After Extraction With a Single Implant to Preserve Interproximal Papilla and Alveolar Bone



by Khalil Saghezchi, D.D.S.

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INTRODUCTION

Preservation of the interproximal papilla and prevention of alveolar bone collapse, especially in the smile zone, has never been more desirable than it is in today's dentistry. The replacement of single and multiple anterior teeth has always been a challenging task for the clinician.¹

To better understand the dentition's role in the creation of the interdental papilla, it is essential to review the normal anatomy of the surrounding bone socket and the relationship of the gingival contour to the underlying osseous scallop. In a healthy individual, the contour of the alveolar bone follows the outline of the cemento-enamel junction (CEJ). Clinical research has shown that on the facial bone, the crest of the alveolar ridge is, on average, 2 mm apical to the CEJ. The average distance from the facial bone to the interproximal bone is 3 to 3.5 mm in height.²

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The presence of the osseous scallop (positive bone architecture) creates a degree of papillary form. Research has shown an average distance from the crest of the alveolar bone to the free gingival margin facially to be 3 mm in height.³ However, the average distance from the free gingival margin on the facial bone to the interproximal gingival tissue is 4.5 to 5.5 mm. This means that there is



Figure 1: Intraoral lateral view of maxilla, displaying the healing cap.



Figure 2: Postoperative natural smile, six months after placement of the definitive restoration.

1.5 to 2.5 mm of increased gingival tissue height interproximally. Therefore, there exists some other factor besides the underlying osseous contour that accounts for this increased tissue height. The biological width consists of the connective tissue attachment and epithelial attachment, which on average is approximately 2 mm. It appears that the presence of the adjacent tooth attachment and the size of the gingival embrasure formed by these teeth are responsible for the presence and height of the papilla. After extraction of an anterior tooth, bone and tissue collapse over the underlying bone, creating flat papilla or no papilla at all.⁴ If there is no periodontally compromised condition and bone is intact, one of the critical factors in preserving the tissue height and preventing alveolar bone collapse after the extraction of an unsalvageable tooth is to preserve the socket size and shape, and the space of the gingival tissue by replacing the extraction site immediately after the extraction.⁵

There are several treatment modalities to preserve the osseous scallop and interdental tissue. One of the options is the temporization of the extracted site in preparation for a conventional fixed bridge. A second option is the immediate restoration of the extracted site with an implant and immediate loading with a temporary.

Regardless of the choice of treatment, the temporization of the extracted site is the major factor in preserving the interdental tissue and osseous contour.⁶

Using immediate implant restorations with immediate temporization under no occlusal forces to replace an extracted single anterior tooth reduces the likelihood for further surgical procedures.

Despite the excellent outcome that is typically obtained with an implant restoration, many patients are hesitant to accept treatment with implants (Figs 1 & 2). One of the main reasons for this resistance is the amount of time required to replace one missing tooth with an implant restoration, as compared to fabricating a three-unit fixed bridge. The commonly accepted treatment protocol includes a three to four month waiting period after implant placement in the mandible and six months after placement in the maxilla prior to exposure and restoration placement.^{7,8} Although this lengthy waiting period for osseointegration results in a highly predictable outcome, patients may object to the prolonged treatment time.

Using immediate implant restorations with immediate temporization under no occlusal forces to replace an extracted single anterior tooth reduces the likelihood for further surgical procedures—such as bone or tissue grafts to create interdental tissue and improve bone contour—to improve the esthetics of the implant.⁹ This technique clearly will increase case acceptance and patient satisfaction, especially in the smile zone, due to the following factors:

- simplification of treatment and reduction of sequence
- improved patient comfort and esthetics
- improved psychological advantage.

CASE SELECTION

Immediate placement of the implant into the extraction site can be performed in selected cases. Immediate implant placement is contraindicated in patients who present with periapical infection, periodontal disease and severe bone loss, or a root configuration that does not allow primary stabilization of the implant. Occlusion can be one of the major factors in the success or failure of the immediate implant with immediate temporization. Patients with severe bruxism and extensive occlusal wear



Figure 3: Preoperative intraoral frontal view of discolored tooth #9.



Figure 4: Intraoral occlusal view of fractured maxillary central.

can pose major challenges to the success of the immediate implant. One major factor in the success of the immediate implant with immediate temporization is the elimination of all occlusal forces during maximum intercuspation and excursive movements, so as to prevent harm to the underlying healing implant.

PRIMARY STABILITY OF THE IMPLANT

The stability of the immediate implant is controlled almost exclusively by the mechanical interlocking of the implant surface to the mineralized bone. Microscopic study of the bone/implant interface reveals that this co-adaptation does not result from a “chemical bond,” but more from the actual mechanical binding of the implant onto the bone.¹⁰

CASE STUDY #1

The patient was a 30-year-old healthy female who was examined in our office for a fractured anterior tooth #9. Clinical exam revealed that she had an existing porcelain veneer on teeth ##7 and 8 and that tooth #9 was fractured above the gum line. The patient explained that she had had root canal treatment on her broken tooth a few years ago; it eventually became discolored and suddenly frac-

tured while she was eating (Figs 3 & 4). Occlusal examination revealed no occlusal contact between maxillary and mandible anterior teeth. Periodontal examination revealed no pockets exceeding 4 mm, with relatively healthy gingival tissue. The patient was very unhappy with her appearance as a result of the fractured tooth and wanted an immediate solution.

TREATMENT OPTIONS

The patient was presented with a number of treatment options, the first of which was surgical crown lengthening, followed by a post build-up and porcelain fused to metal (PFM) crown. The second option was orthodontic forced eruption followed by a post build-up and PFM crown. The third choice was extraction of the fractured tooth, followed by replacement of the missing tooth with a conventional three-unit fixed bridge. The fourth alternative was extraction and immediate replacement of the extracted tooth with an immediate implant, followed by immediate loading with a temporary crown. Advantages and disadvantages of all the options were explained to the patient. She decided to continue her treatment with an immediate implant restoration, and the fractured tooth was temporized

with a temporary post and a prefabricated polycarboxylate crown. She was then referred to a periodontist for further evaluation and implant consultation.

PERIODONTAL EVALUATION

The patient presented at the periodontist with a loose temporary crown. After its removal, it was determined that tooth #9 had sufficient bone height but inadequate tooth structure remaining to restore with a conventional crown. The periodontist recommended extraction of the fractured tooth and replacement with an immediate implant restoration.

SURGICAL PROTOCOL

A sulcular incision was performed around tooth #9 and a periotome was engaged into the periodontal ligament space (Fig 5). It is crucial during extraction to minimize trauma to the alveolar bone or surrounding tissue. After circumferential application of the periotome, the tooth was lifted out of its socket with extraction forceps; care was taken not to fracture the buccal plate or enlarge the socket (Fig 6). The exposed socket was degranulated and soft tissue remnants were removed using a curette and a large round bur on a slow-speed rotary instrument

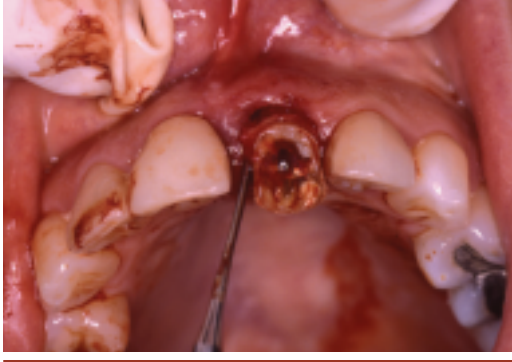


Figure 5: Intraoral view, displaying the periotome separating the periodontal ligament to facilitate extraction without damaging soft and hard tissue.

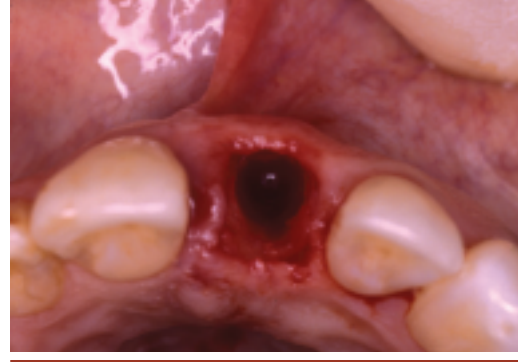


Figure 6: Intraoral view of extracted socket displaying buccal bone and tissue intact.

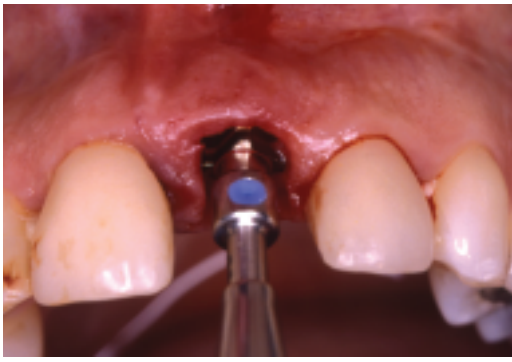


Figure 7: Intraoral view of tooth #9 implant positioning.



Figure 8: Facial view of prefabricated abutment positioned immediately after implant placement.

using copious saline irrigation. The dimensions of the implant used were 5 mm x 13 mm (NobleBiocare; Yorba Linda, CA); this was determined by the size of the defect and restoration diameter. The apical penetration of the extraction socket was initiated with a medium round bur and enlarged to a maximum depth of 5 mm with a sequence of drills. The table of the implant was placed 3 mm apical to the lowest point of the facial gingival margin on the facial aspect, so as to maintain shallow sulcular depth and to ensure adequate soft tissue height for formation of biological width and sulcus. The objective of the osteotomy was to obtain the stability of the implant by engaging the mesial and distal bone, as well as apical extension. The seated implant gains retention by

engaging the extraction socket walls. Once adequate coronal and apical height and implant stability were achieved, a straight esthetic abutment of corresponding size was inserted. After the esthetic abutment was tried on the implant, the necessary adjustments of the margin and the incisal length and occlusion were made outside the oral cavity to prevent any disturbance to the immediately inserted implant, and the abutment was inserted (Figs 7 & 8).

TEMPORIZATION

In a healthy dentulous situation, the gingival tissue coronal to the osseous crest of approximately 3 mm is supported by the natural tooth. Therefore, when this natural tooth is

removed, it is esthetically essential to maintain the gingival tissue with the implant-supported restoration because the osseous crest alone cannot support the height of the gingival tissue. The form of the tissue should be supported by the restoration to prevent gingival tissue collapse after extraction.

After placement of the implant and esthetic abutment, the prefabricated temporary crown was relined with Luxatemp® (DMG; Englewood, NJ). Light-cured composite was placed around the margin to create the form of the socket by supporting the papilla interproximally and the free gingival margin facially. After curing the composite at the desired form, the temporary crown was removed, the margin was polished, and composite sealer was



Figure 9: Facial view of the abutment screw covered with impression material.



Figure 10: Frontal view of the provisional restoration on tooth #9 two months after surgery. Note natural healing tissue around the provisional restoration.



Figure 11: Postoperative natural smile of the patient two months after final restoration.

applied and cured to obtain a smooth, adequately contoured margin to prevent any irritation of the soft tissue around the implant. The abutment screw was covered with a cotton pellet and the temporary crown was cemented with temporary cement, and excess cement was thoroughly cleaned (Figs 9 & 10). The tooth was adjusted completely out of occlusion in both maximum intercuspation and all excursive movements, and the patient was advised not to chew any hard foods during the healing period to prevent harm to the underlying healing implant.

FINAL RESTORATION

The temporary restoration was observed periodically during the four-month healing process. Four months

after surgery, the patient was scheduled for placement of the final restoration. After removing the temporary crown, the surrounding tissue around the implant was packed with retraction cord, and a final impression was taken with a polyvinylsiloxane putty and wash system. Shade selection was carefully made to match the existing contralateral porcelain veneer and natural teeth (Shade A2). The case was received from the laboratory and cemented with a resin-reinforced glass ionomer luting agent (Fig 11).

CASE STUDY #2

This patient, a female in her mid-40s, was examined in my office for a fractured tooth #7. Clinical examination and radiographs indicated a fractured post still remaining inside the

root. Following thorough occlusal examination, it was determined that the patient exhibited excessive overbite due to loss of vertical dimension and that there was very minimal space for placement of a final restoration. After reviewing the different treatment options, the patient decided on an immediate implant restoration (Fig 12). She was then evaluated by the periodontist for the surgical placement of the immediate implant.

TREATMENT PLAN

After extraction of the fractured root #7, placement of the immediate implant was performed by the periodontist without the use of a surgical stent (the angulation and dimensions of the implant were dictated by the dimensions of the extraction socket,



Figure 12: Intraoral lateral view of tooth #6 with fractured post.



Figure 13: Intraoral view of the custom post abutment.



Figure 14: Lateral view of the provisional restoration on tooth #7, four weeks after surgery. Note the natural tissue adaptation around the provisional restoration.

eliminating the need for the stent). The steps involved in the extraction and placement of the surgical implant were identical to those described in the first case. Due to the minimal space between the upper and lower arches, our options for an abutment were either an angled esthetic abutment or a custom-fabricated abutment for the final restoration. We decided to use the custom-fabricated abutment because the lack of space did not allow for the use of the angled abutment.

PROVISIONALIZATION AND TISSUE STABILITY

Because gingival tissue possesses biological memory, preserving osseous architecture is the key to predicting

the eventual gingival tissue position.¹¹ To maintain the tissue and underlying bony architecture and prevent it from collapsing after the extraction, it is necessary to maintain the socket size and shape with an immediate prosthodontic technique. After extraction and insertion of the immediate implant, temporization can be achieved in several ways. One of the options is a prefabricated temporary crown; another is the fabrication of a temporary from study models and a wax-up. It was decided to use a prefabricated temporary crown because of convenience and to save time. After insertion of the temporary abutment, the prefabricated temporary crown was relined in the exact size and shape of the pre-extract-

ed socket to maintain and support the tissue height. The temporary crown margin was polished and sealer was applied to make a smooth surface to prevent any irritation of surrounding tissue after cementation. Occlusal adjustments were made and the patient was told to eat a soft diet to prevent any damage to the healing implant.

The soft peri-implant tissue recedes approximately 0.6 to 1 mm. This recession generally occurs during the first month after surgery.¹² The patient was evaluated once a week for the first month; after six months she was scheduled for the final restoration. The temporary and esthetic temporary abutments were removed. An impres-



Figure 15: Lateral view of the postoperative definitive restoration after six months.

sion post was inserted into the implant and the final impression was taken with a custom tray. To fabricate the final restoration, the laboratory was instructed to fabricate a labially angled custom abutment with adequate space in the palatal portion for the PFM crown. The shade was selected to match the existing crown and veneers (A2) (Figs 13 & 14).

FINAL RESTORATION

After receiving the final restoration, the custom abutment was inserted into the implant and the PFM crown was tried in the patient's mouth and cemented with glass ionomer cement (Figs 15 & 16).

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CONCLUSION

The use of dental implants to replace missing natural teeth has been a well-accepted treatment option for many years. However, the healing time and sequence of surgical procedures involved in conventional implants, especially in the smile zone,



Figure 16: Full-face view of the patient's natural smile, six months after final restoration.

has long been a major cause of patient resistance. Although further clinical research is needed, with the advances in knowledge and use of immediate implants with immediate temporization, patients have a new and better option for replacing missing teeth, as opposed to wearing removable appliances or waiting for the site to heal before receiving a new tooth. Immediate temporization with immediate implants gives patients immediate satisfaction and a pleasing appearance.

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