

SELECTING TREATMENT OPTIONS AND SEQUENCING TREATMENT IN THE REPLACEMENT OF 2 MAXILLARY CENTRAL INCISORS WITH IMPLANTS: A CASE REPORT

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KEY WORDS

Dental implants
 Immediate implant placement
 Soft tissue
 Edentulous ridge expansion

This article describes treatment provided to replace 2 maxillary central incisors with implant-supported restorations. The site of a missing maxillary central incisor was treated utilizing a bone expansion technique to augment the labial hard and soft-tissue profiles at the time of implant placement. The adjacent central incisor tooth, although destined to be extracted, was retained to serve as an abutment for a fixed provisional restoration until the first implant was deemed to have successfully integrated. At the appointment to uncover this implant, the fractured tooth was extracted and an implant was immediately placed into the socket. The first implant was then used to support the provisional restoration during the healing phase of the second implant. The techniques utilized resulted in optimum soft-tissue contours, allowed the patient to have a comfortable and esthetic provisional restoration, and minimized the number of surgical procedures.

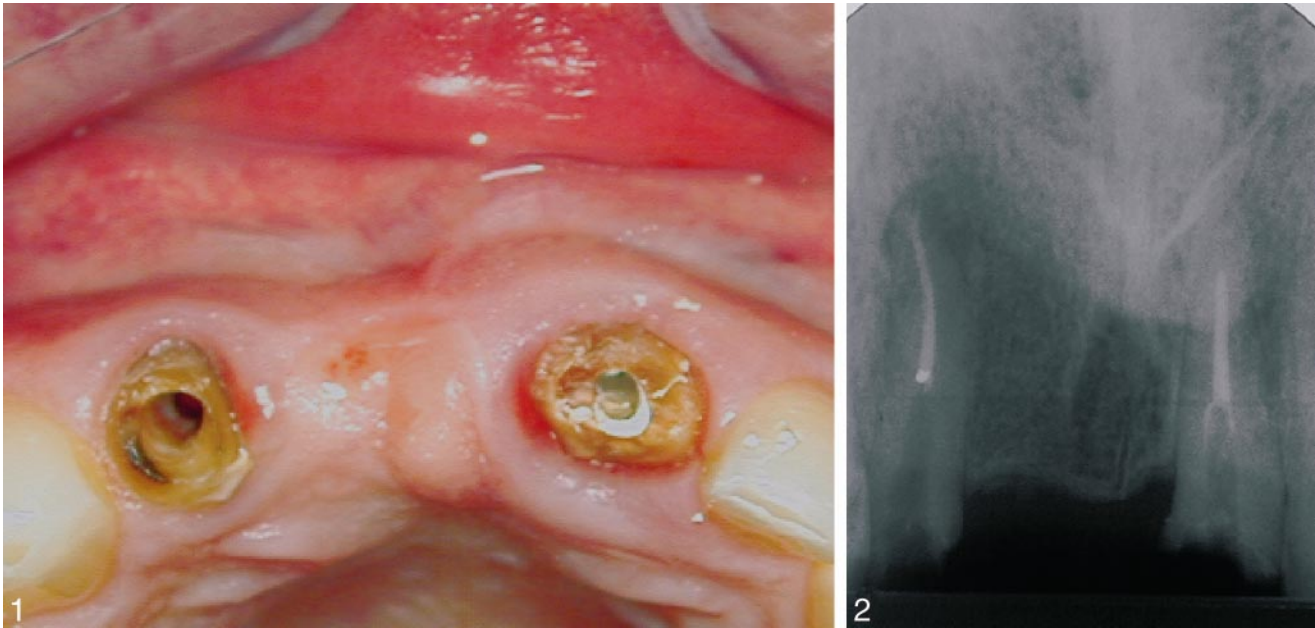
INTRODUCTION

Treatment options to replace a single missing anterior tooth include fixed partial dentures, removable partial dentures, resin-bonded bridges, and implant-supported crowns. One of the critical considerations in the selection of a particular treatment modality is its effect on the esthetic outcome. Restoration of the soft-tissue contours is equally as important as restoration of the tooth form.¹

Loss of a tooth due to trauma and consequent loss of bone often result in

a deficient labial contour in the edentulous space that may compromise the esthetic outcome of any planned restoration.² Depending on the anticipated restorative modality, the soft-tissue profile may be enhanced by augmentation of the soft tissues alone.³ However, if an implant is the chosen method of restoration, bone augmentation is often necessary to make it possible to place the implant in an ideal position. Thus, site development is of the utmost importance.⁴ In many cases, multiple surgical procedures are required to

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FIGURES 1–2. FIGURE 1. This shows the condition at initial presentation and demonstrates the deficient labial bone contour. The fracture in tooth #9 is highlighted by cement penetration. FIGURE 2. The preoperative radiograph illustrates the mesial bone loss related to the fracture in tooth #9.

prepare the receptor site so that the end result will satisfy the patient's functional and esthetic expectations.^{5,6}

If the requirement is to augment the bone horizontally, available techniques include onlay grafts,⁷ guided bone regeneration,⁸ and expansion of the edentulous ridge.⁹ Careful selection from the available surgical techniques, with appropriate consideration of the clinical circumstances, may reduce the number of surgical procedures that the patient has to undergo, avoid the need for a donor site for autogenous bone, and potentially shorten the overall treatment time.

Extraction and replacement of a central incisor requires careful management to preserve the existing soft-tissue contours, preserve the fragile labial plate of bone, and avoid the need for still further augmentation procedures.¹⁰

Immediate placement of implants into extraction sockets in the correct circumstances is now widely accepted to have comparable success rates to delayed placement.^{11,12}

However, attention should be given to the timing of the removal of a hopeless

tooth, as this may influence the treatment outcome.

CASE REPORT

A 30 year-old man presented complaining that his upper anterior bridge was loose. The bridge replaced the right central incisor, which had been lost due to a baseball injury 10 years previously. It was retained by full-coverage crowns on the right lateral incisor and left central incisor, with metal posts in each root. The patient requested replacement of the missing tooth with an implant-supported crown, as he desired to have front teeth that were not joined together.

The patient's medical history was unremarkable, and his dentition was otherwise intact.

At the initial appointment, the bridge was easily removed with finger manipulation. The posts had become separated from the roots but were still attached to the bridge. Examination revealed that some of the coronal tooth tissue of both abutments had fractured inside the prosthesis. The lateral incisor appeared to be restorable in a conventional manner. However, the left

central incisor had a root fracture that appeared to extend to the osseous crest (Figure 1). This fracture significantly compromised the restorability and long-term prognosis of the tooth.

Radiographic examination revealed acceptable endodontic therapy had been completed for both teeth. The height of bone at the crest of the ridge was within 5 mm of the contact points of the planned restorations, suggesting predictable soft-tissue esthetics.^{13,14}

There had been some bone loss at the mesial of the left central incisor, which was probably related to the fracture in the root (Figure 2). Utilizing a wide platform implant and placing it slightly to the mesial of the original root position would obliterate this small bone defect. This would have the added benefit of slightly increasing the width of bone between the implant and the adjacent tooth distally. The edentulous ridge had good vertical contour but was deficient labially, a Class 2 site according to the classification of Salama and Salama.¹⁵ It would therefore be necessary to augment the ridge buccally to allow place-

ment of an implant of the desired diameter in the ideal location.

TREATMENT PLAN

After discussion with the patient regarding the options, risks, and benefits, the treatment plan was finalized. The first surgical phase would involve placement of an implant into the edentulous space after expanding the bone labially, utilizing the edentulous ridge expansion (ERE) technique¹⁶ to restore the osseous and soft-tissue contour. At the same appointment, prior to the implant placement, the adjacent teeth were to receive new bonded posts to enable them to support a fixed provisional restoration during the healing period.

The second surgical appointment was to occur after osseointegration of the first implant and involve uncovering the implant, extraction of the fractured left central incisor, and immediate implant placement. The first implant and the lateral incisor would be used to support the provisional restoration during the period required for integration of the second implant and maturation of the soft tissues after exposure of the first implant. Ultimately, both implants and the lateral incisor were to be restored with individual ceramic crowns.

Staging the surgical phases of treatment would allow preservation of the necessary support for an esthetically pleasing and functional fixed provisional restoration.

SURGERY 1

Fiber-reinforced posts (Fiberkor, Jeneric Pentron, Wallingford, Conn) were bonded into the roots of teeth #7 and #9 and they were prepared to accept a prefabricated provisional bridge (Biotemps, Glidewell Laboratory, Newport Beach, Calif; Figure 3). Once the restorative treatment had been completed, the area was irrigated copiously with a solution of chlorhexidine digluconate 0.12%.¹⁷ (Oris, Dentsply International, York, Pa).

A partial-thickness flap was raised,

preserving the papillae on the adjacent teeth. The edentulous bone ridge was split vertically at the crest in a mesiodistal direction, using a #64 Beaver blade (Sable Industries, Oceanside, Calif), the handle of which was tapped using a mallet. The labial bone was gradually expanded using bone expanders (Friadent North America, Irvine, Calif). This was facilitated by making vertical relieving incisions in the bone, again using the #64 Beaver blade (Figure 4). Once the desired labial expansion had been achieved, the apical portion of the osteotomy was completed with internally irrigated drills, with the assurance not to involve the fragile, expanded crestal bone (Figure 5). A 4.5-mm × 13-mm, stepped, tapered screw implant (Friadent North America) was placed and the flap was sutured with 5.0 silk (Ethicon, Somerville, NJ; Figure 6). In accordance with the ERE technique, no attempt was made to obtain primary closure, and the suture served merely to maintain the vertical position of the soft tissues. The crestal soft tissue was left to heal by secondary intention.

The provisional bridge was adjusted so that there was no pressure from the pontic on the surgical site, and was cemented with temporary cement (Tempocem, DMG, Hamburg, Germany; Figure 7). Healing was uneventful.

SURGERY 2

Four months after the initial surgery, the provisional bridge was removed. The implant was exposed by raising a full-thickness flap from the palatal aspect of the implant. The flap was then rolled forward to increase the soft-tissue thickness on the labial aspect. A titanium MH6 (Friadent North America) abutment was placed on the implant in the #8 position and the provisional bridge was modified to be retained by this implant and the #7 natural tooth (Figures 8 and 9). The fractured tooth, #9, was extracted carefully using periotomes. The socket was inspected to verify that there was no loss of integrity of the labial plate of bone and was

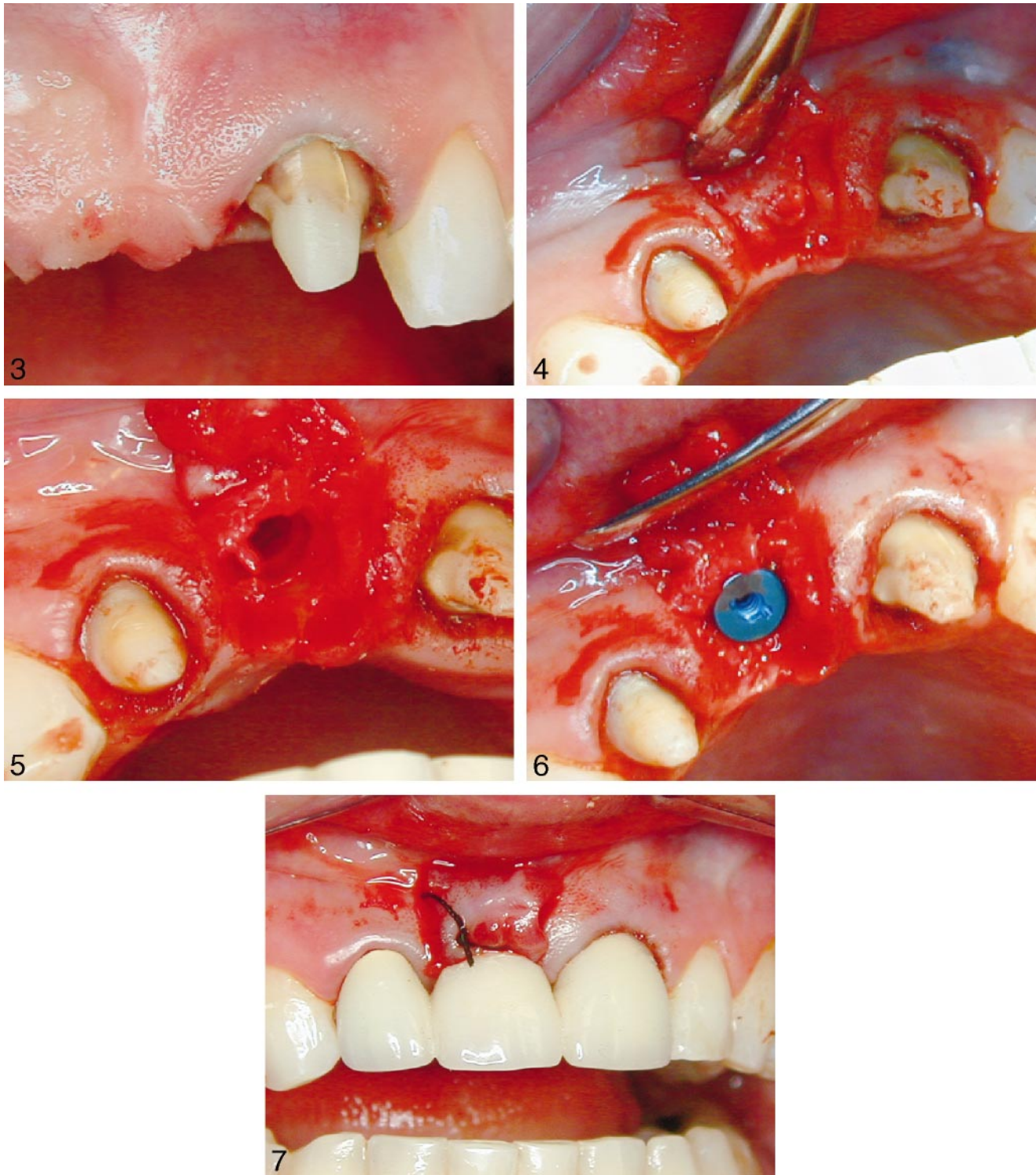
deemed to be suitable to receive an implant immediately. A trial implant was used to verify that the chosen implant would obliterate the socket. After thorough curettage and irrigation of the extraction socket with a solution of tetracycline in saline, the osteotomy was prepared and a 5.5-mm × 13-mm, tapered, stepped screw implant (Friadent North America) was placed. A customized healing abutment was fabricated by adding composite to a stock temporary abutment (Protect Abutment, Friadent North America) in order to support the soft tissues, and the modified provisional bridge was re cemented (Figure 10).

Healing was uneventful and, after an additional 4 months, the restorative phase was completed. Implant level impressions were made, ceramic abutments (Cerabase, Friadent North America) were fabricated for the 2 implants and final preparation of the #7 natural tooth was completed. Individual ceramic crowns were cemented to complete the case (Figures 11 and 12).

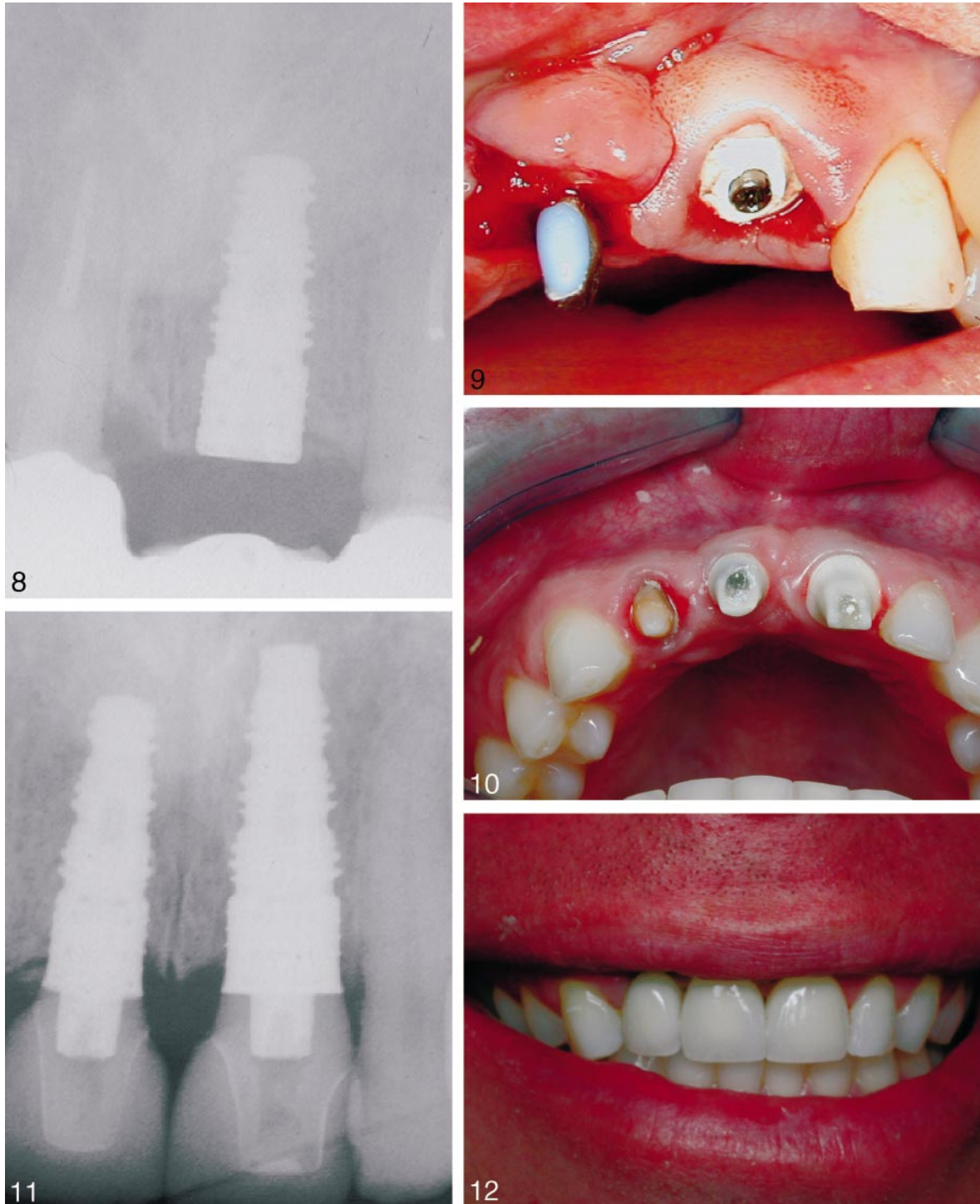
DISCUSSION

Careful selection of available surgical modalities and the sequencing of treatment is necessary when considering replacement of anterior teeth with implant-supported restorations.

In a recent case report,¹⁸ El Askary achieved similar results by harvesting symphyseal cortical bone and placing an onlay bone graft to augment a deficient edentulous ridge. In the case described in this report, the desired ridge contour was restored and existing soft-tissue profiles were preserved without the need for an additional surgical site. At the same time, retaining the fractured incisor slightly longer than would normally have been required ensured adequate support for the first fixed provisional restoration, thereby avoiding the need for an additional procedure. This treatment plan was made possible because there were teeth adjacent to the edentulous site that had previously been prepared for full-coverage restorations. If the adja-



FIGURES 3–7. FIGURE 3. Tooth #9 is shown after restoration with a post and core. The fracture is clearly visible. FIGURE 4. The crestal bone incision and labial relieving incisions are demonstrated. FIGURE 5. The ridge is expanded to the desired dimension using osteotomes. FIGURE 6. After the implant had been seated, a cover screw is seated firmly. FIGURE 7. The provisional bridge is placed to complete the initial surgical appointment.



FIGURES 8–12. FIGURE 8. Immediate postoperative radiograph of #8 implant. FIGURE 9. A temporary abutment was placed on the implant #8 and the soft tissues were displaced labially to further enhance the labial contour. The implant has been placed in the extraction socket of tooth #9 and a custom healing abutment was fabricated to support the labial gingival contour. FIGURE 10. Custom ceramic abutments were seated on both implants (the final preparation of tooth #7 has not yet been completed). FIGURE 11. Radiograph of the finished case showing the implants with ceramic abutments and crowns. FIGURE 12. The final presentation shows the esthetically pleasing ceramic crowns and preservation of the interdental papillae.

cent teeth had been intact, a different treatment approach would have been indicated.

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