Three-Year Follow-Up of a Single Immediate Implant Placed in an Infected Area: A New Approach for Harvesting Autogenous Symphysis Graft

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INTRODUCTION

A restoration in the anterior region of the mouth is challenging from the surgical and the prosthetic point of view. The goal of implant therapy today is not only to attain osseointegration of the implant but also to enhance and maintain the soft tissue esthetics around dental implants. Maintaining the soft tissue architecture around the implant restoration to mimic the contralateral tooth in the anterior esthetic area is required for a successful restoration. Immediate implant placement and provisionalization maintains the soft and hard tissue architectures, avoids the need for additional surgeries, and shortens treatment time.[1–3] Clinical trials showed a high success rate of immediate implant placement in fresh extraction alveolus.[4–6] Careful analysis of soft and hard tissue is a prerequisite for immediate implant placement in the anterior region of the mouth.[7] Kois[8] named 5 diagnostic factors used to assist in predictable immediate implant placement. Of the 5 diagnostic factors, 3—that is, the form, biotype of the periodontium and height of the alveolar crest before tooth extraction—address the importance of soft and hard tissue components.

Presence of an active apical and/or periodontal infected residual socket may be considered a relative contraindication for the immediate implant placement.[9] An infected alveolus confirms the presence of bacteria that will induce inflammatory activity, increase the bone resorptive process, and result in a higher risk of implant failure.[10] Lindeboom et al[11] compared the survival rate of immediate and delayed implant placement into infected residual alveolus. The author showed a 92% survival rate of immediately placed implants compared with a 100% survival rate of delayed placement implants. Additionally, there was more midbuccal soft tissue recession in the immediate placement compared with the delayed placement protocol 1 year after placement. Another study by Seigenthaler et al[12] demonstrated an equal survival rate of the immediate and delayed implant placement into infected alveolus.

Complete debridement of the alveolus with primary stability of the implant is a prerequisite for immediate placement. Immediate placement of an implant in the presence of a chronic infection and a deficient buccal plate in a patient with a high smile line is very challenging and complex. Autogenous bone graft harvested from intraoral or extraoral sites has been used for predictable guided bone regeneration.[13,14] Certain complications of the donor sites have been reported.[15,16] The purpose of this clinical report is to discuss the surgical and restorative protocols for immediate implant placement and provisionalization in the presence of a large periodontal abscess with a buccal plate defect in an area that demands attention to esthetics using a novel technique for harvesting an autogenous mandibular symphysis graft with a single vertical incision.

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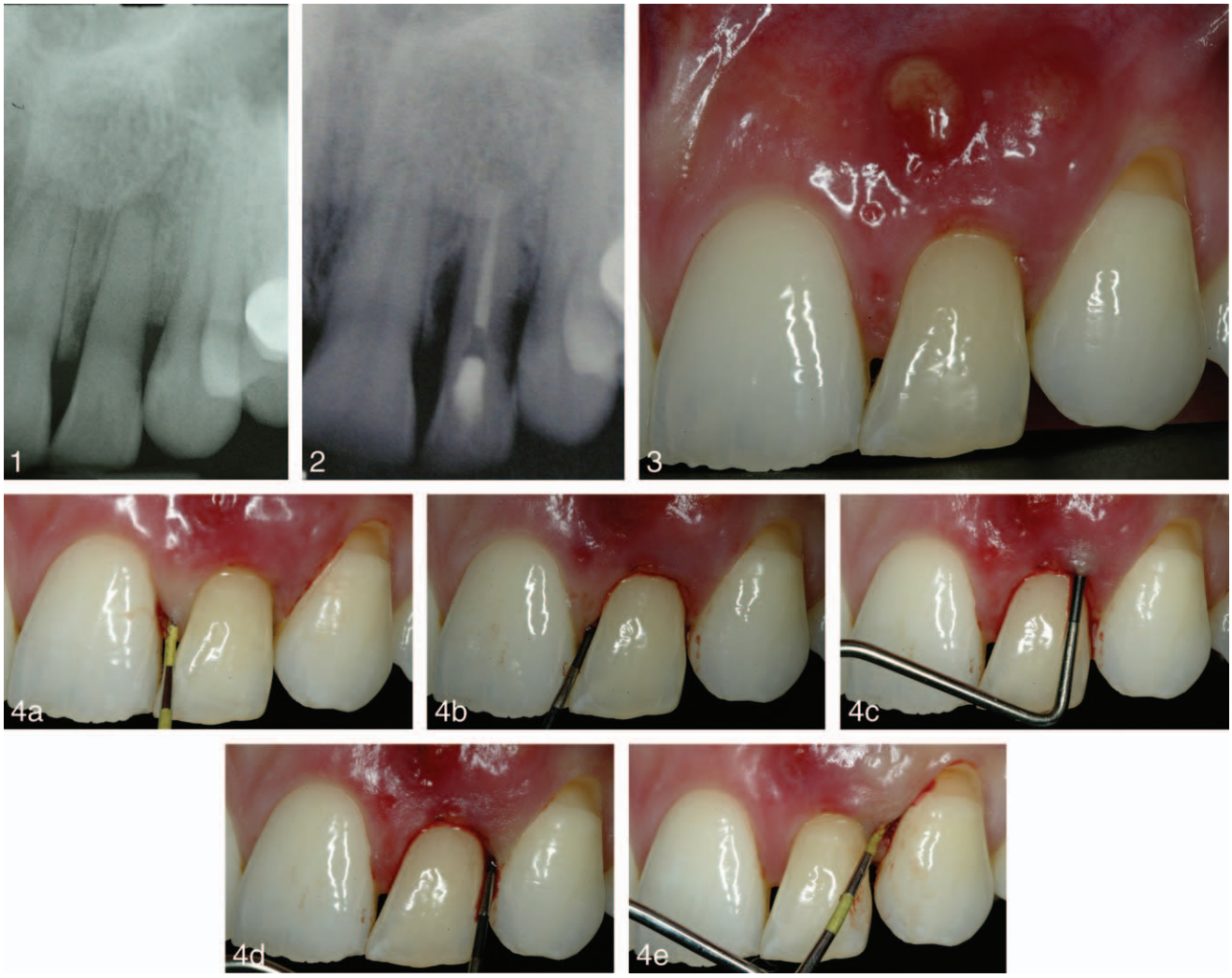


Figures 1–4. Figure 1. Periapical radiograph of tooth #10, January 2003. **Figure 2.** Periapical radiograph of tooth #10, August, 2003. **Figure 3.** Pretreatment frontal view. **Figure 4.** (a) Bone sounding, distal side of tooth #9. (b) Pretreatment bone sounding, mesial side of tooth #10. (c) Bone sounding, buccal side of tooth #10. (d) Bone sounding, distal side of tooth #10. (e) Bone sounding, mesial side of tooth #11.

Case Report

The patient was a 43-year-old white woman who was referred to the Center for Implant Dentistry at Loma Linda University from the endodontic department. Her chief complaint was that she had an infection in her maxillary front tooth for more than 7 months. A lesion with a buccal fistula track and purulent discharge had started on tooth #10 in January 2003. The diagnosis was necrotic pulp with localized periodontal abscess (Figure 1). Scaling was performed, and the patient was placed on systemic antibiotics—amoxicillin 500 mg (1 capsule every 8 hours for 1 week) and clindamycin 300 mg (1 tablet every 6 hours for 1 week) —on separate occasions. The exudate ceased while the patient was taking the antibiotic and would return shortly after the antibiotic course was finished.

Initially the patient was treated in the periodontic and the endodontic clinics. Pulpectomy and root canal treatment was performed using mineral trioxide aggregate. The patient was under endodontic evaluation for 6 months (Figure 2). The lesion did not respond to any further antibiotic treatment. In September 2003, the patient was transferred to the center for implant dentistry for possible implant placement in the area of tooth #10. Review of the patient's medical history revealed no medical contraindications to surgical and prosthodontic treatment. The patient admitted to having 2 alcohol cocktails per week but had no history of smoking. The patient was not aware of any

parafunctional oral habits, and her oral hygiene regimen consisted of brushing twice a day and flossing.

Clinical examination of tooth #10 revealed no mobility . The soft tissue evaluation revealed buccal fistula with a discharge buccal to tooth #10 (Figure 3). Two periapical radiographs taken at different angles showed a buccal bone defect that had progressed considerably compared with the periapical radiograph taken at the initial exam. The initial impression was a persistent chronic periodontal abscess due to a possible root fracture.

The patient selected an implant to replace the fractured tooth. Upon clinical examination the patient had a thin gingival biotype. The mesial and distal papilla scored grade 2 according to interdental papilla loss classification.[17] The bone sounding was as follow: 4 mm on the distal side of tooth #9, 6 mm on the mesial side of tooth #10, 10 mm on the midbuccal side and 8 mm on the distal side of tooth #10, and 5 mm on the mesial side of tooth #11. The tooth shape was triangular (Figure 4). The patient had a high smile line with a symmetrical gingival zenith.

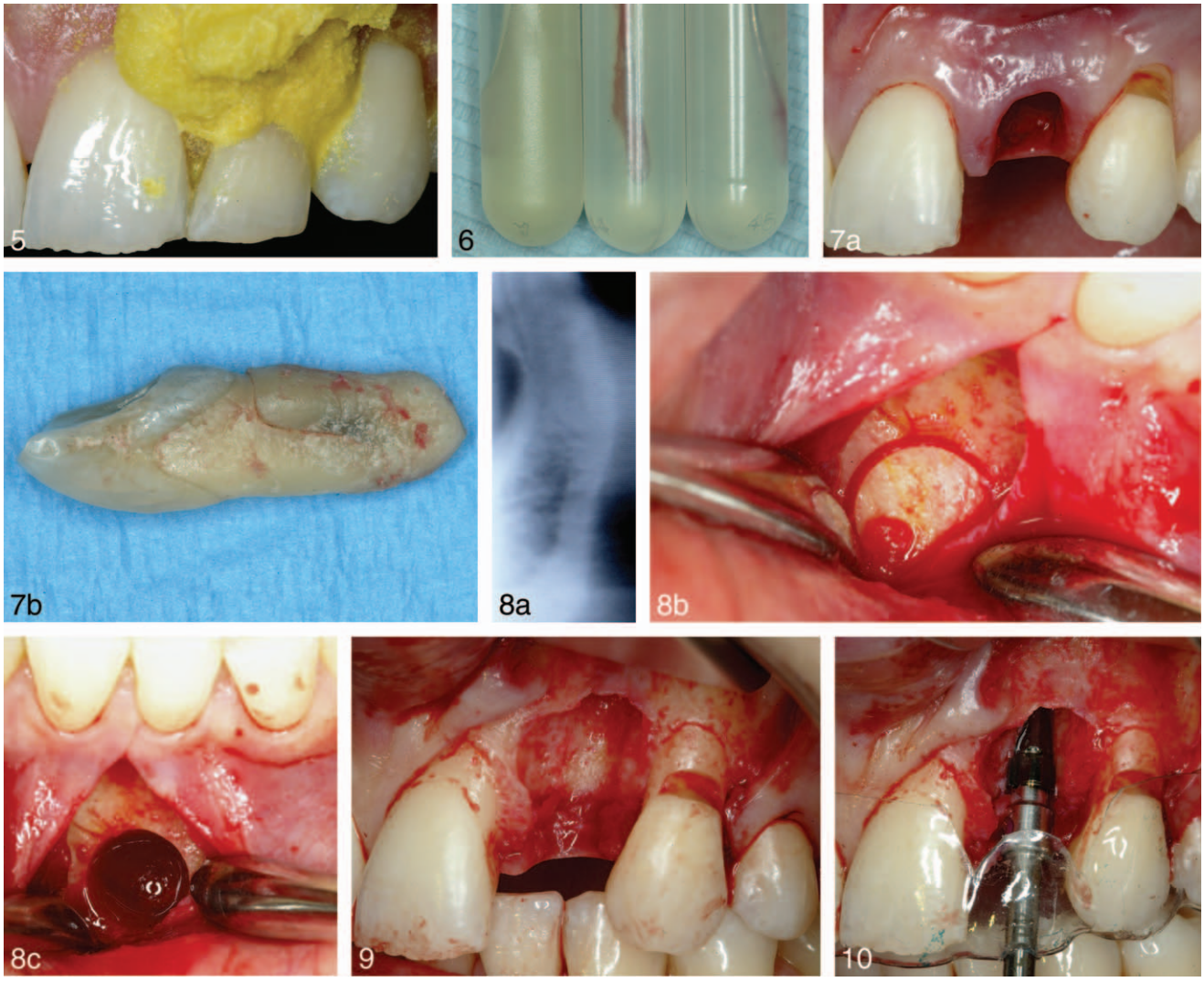
The treatment dilemma was whether to perform the extraction first followed by the bone graft and then the delayed implant placement, which could lead to hard and soft tissue changes. Immediate implant placement and provisionalization would preserve the soft tissue contour; however, the buccal abscess had not been responsive to systemic antibiotics and might complicate the implant placement stability and jeopardize the bone graft needed to repair the buccal defect.

Procedure in Detail

Local application of a tetracycline antibiotic (500 mg diluted in 10 mL saline) was done every other day for 1 week (Figure 5). The buccal fistula was resolved by the fifth day. The buccal area of tooth #10 was wiped and isolated, and intracrevicular microbiology samples were taken for Gram staining and culturing after 1 week of topical antibiotic application (Figure 6). The result was no anaerobic culture growth, and no polymorphonuclear leukocytes. A chlorhexidine gluconate 0.12% oral rinse (Peridex, 3M ESPE Dental Products, St Paul, Minn) was prescribed to be used 1 week before and 1 week after surgery.

A local anesthesia (2% xylocaine with 1:100 000 epinephrine, Novocol Pharmaceutical of Canda Inc, Cambridge, Ontario, Canada) was administered labially and palatally. The tooth was atraumatically extracted using a periotome, surgical elevator, and surgical forceps (Figure 7). Complete debridement of the extraction alveolus was performed, and the defect size was mapped. An autogenous graft was harvested from the mandibular symphysis area using a single vertical incision beyond the mucogingival junction, apical and mesial to tooth #26 based on the tomographic and periapical radiographs using a 4.75 mm diameter trephine (Figure 8). The donor site was filled with Avitene (Avitene Microfibrillar Collagen Hemostat, Davol Inc, Warwick, RI) for hemostasis. The vertical incision was sutured using a polyglactin 5.0 suture (Vicryl sutures, Ethicon Inc, Guaynabo, Puerto Rico). The harvested bone was milled and prepared. After that a mucoperiosteal flap was performed with sulcular incisions around tooth #9 and tooth #11 and a vertical releasing incision distal to tooth #11 (Figure 9). The palatal and interproximal bone were intact. The buccal plate had a bone defect which extended 10 mm apical to the interproximal bone height.

The osteotomy was prepared based on a clearform surgical template (Figure 10). A rootform implant (Nobel Replace Select, 3.5 $\times$ 16 mm, Nobel Biocare AB, Goteborg, Sweden) was placed. Five implant threads were exposed on the labial side with no palatal exposure; however, the implant was within the bony walls of the alveolus palatal to the buccal defect. The temporary abutment was placed and the particulated autogenous bone graft that was harvested from the mandibuar symphysis was placed over the exposed implant threads and within the bony defect of the extraction socket for tooth #10 (Figure 11). A resorbable membrane (Bio-Gide, Geistlich Pharma North America, Princeton, NJ) was laid over the grafted defect. A temporary abutment was hand tightened and recontoured. The coronal part of the extracted tooth was hollowed and relined using a composite material (PermaFlo, Ultradent Products Inc, South Jordan, Utah) around the temporary abutment and used as a provisional crown. The provisional crown was eliminated from centric and eccentric tooth contacts. The flap was sutured using polyglactin 5.0 (Vicryl Sutures, Ethicon Inc., Guaynabo, Puerto Rico) and ePTFE monofilament suture (Gore-Tex, W. L. Gore and



Figures 5–10. Figure 5. Tetracycline antibiotic application. **Figure 6.** Microbial sample for culture test. **Figure 7.** (a) Traumatic extraction of tooth #10. (b) L-shaped fracture of tooth #10. **Figure 8.** (a) Tomographic radiograph mesial to tooth #26. (b) Incision design for symphysis donor site. (c) Outline of symphysis block graft. **Figure 9.** Anterior maxillary recipient site defect after complete debridement of the lesion. **Figure 10.** Surgical procedure of implant placement with guide

Associates Inc, Flagstaff, Ariz) material (Figure 12) and removed 2 weeks after surgery. The soft tissue healing around the implant and at the donor site was uneventful and the patient had minimal discomfort (Figure 13).

At 3 months the provisional crown discolored and was changed with a custom lab-made temporary crown. The bone sounding was done after 6 months of healing as follows: 3 mm on the distal side of tooth #9, 3.5 mm on the mesial, 3 mm on the midbuccal, 3.5 mm on the distal side of implant #10, and 3.5 mm on the mesial side of tooth #11 (Figure 14).

A final impression was made 6 months after implant placement. Custom zirconia abutment (Procera, Nobel Biocare AB, Goteborg, Sweden) was fabricated. A cement-retained ceramic crown was processed and cemented (Figure 15). The importance of maintaining a high standard of oral hygiene was stressed to the patient. Tooth brushing and dental flossing techniques were also reinforced. Chlorhexidine (Periodex, 0.12%, 3M ESPE Dental Products) mouth rinse was prescribed once daily for 7 consecutive days.

The prognosis was highly favorable. The patient was instructed that the long-term prognosis of the restoration would depend on the maintenance of oral hygiene. The patient was followed up for 3

Figures 11–16. Figure 11. Autogenous bone graft placed on the labial side to cover the exposed threads and repair the bone defect. **Figure 12.** The temporary abutment and crown were seated on the implant. **Figure 13.** Soft tissue healing 3 months after the implant placement. **Figure 14.** (a) Posttreatment bone sounding, mesial side of tooth #10. (b) Posttreatment bone sounding, midbuccal side of tooth #10. (c) Posttreatment bone sounding, distal side of tooth #10. **Figure 15.** (a) The final restoration, 6 months after implant placement of tooth #10. **Figure 16.** (a) Periapical radiograph 3 years after the implant placement of tooth #10. (b) The final restoration, 3 years after implant placement of tooth #10.

years (Figure 16) after which she moved out of the area. No significant soft or hard tissue changes were observed during the follow up period.

Discussion

Immediate implant placement and loading was planned to maintain the soft and hard tissue complex, avoid the need for additional surgeries, and shorten treatment time. Presence of an intact interproximal and palatal alveolar bone is crucial for a predictable result. Local antibiotic application eliminated the pathogenic bacteria and resolved the chronic periodontal abscess.

Autogenous bone graft has been used as a gold standard for grafting procedures because of the osteogenic, osteoinductive, and osteoconductive capacity.[13,14] Intraoral harvested bone from mandibular symphysis can be used for predictable guided bone regeneration.[14] The popularity of using the mandibular symphysis as a donor sites is because the local availability of the donor site eliminates the need for extraoral sources; up to 10 mL of corticocancellous bone graft can be harvested, and a predictable bony gain up to 6 mm in horizontal and vertical dimensions is achieved. [14,15] However, although the mandibular symphysis has many advantages, there are some complications of using such a technique, which makes it less attractive for dental practitioners. Postoperative morbidity and patient discomfort have been reported as a major concern of harvesting bone from the mandibular symphysis.[14–16] Misch[16] reported that 29% of patients had altered lower

incisor sensation, 9.6 % had a paresthesia for up to 6 months, and 10.7% had incision dehiscence at the donor site. Chin ptosis is also a concern because of the disturbance of the muscle attachments resulting from harvesting bone from the mandibular symphysis area.

The technique described in this article uses a single vertical incision to harvest the bone from the symphysis area running parallel to the muscle fibers. This technique eliminates the detachment of muscles and reduces the risks of neurosensory disturbance, chin ptosis, and patient discomfort. However, careful mapping of the apex of the anterior teeth is needed, and compared with the classical approach, the amount of harvested bone is limited to 1 or 2 trephines because of the limited access mandated by the single vertical incision.

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