Immediate Placement and Provisionalization With Buccal Plate Preservation: A Case Report of a New Technique

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INTRODUCTION

Alveolar ridge resorption after tooth extraction is a frequently observed phenomenon that may either decrease the predictability of dental implant placement or impair the final esthetic results.[1,2] Better understanding of the biologic process behind extraction-socket healing has led to the development of techniques to preserve the natural architecture of the alveolus after extraction, such as immediate implant placement in fresh sockets and the use of osseous graft materials.[3]

It is now known that resorption will especially target the buccal plate if the socket is not grafted immediately after dental extraction,[3,4] thereby increasing the risk for facial soft tissue recession.[4] Even when minimal, such resorption usually has significant adverse clinical effects, particularly in the esthetic zone. Despite successful osseointegration of a dental implant, an anterior implant restoration may be judged to be a failure if the soft tissue appearance is poor.[5–8] Surgical techniques meant to preserve natural bone and soft tissue contours after tooth extraction are thus of great interest to contemporary clinicians, especially true if an implant is placed and provisionalized immediately after tooth extraction.

Numerous studies have focused on immediate functional loading of dental implants to minimize the delay between the surgical and prosthetic treatment phases.[9,10] This technique is increasingly being applied when replacing teeth in the maxillary anterior region, where esthetic outcomes are important.[11–17] However, some studies[12,15,16] have reported that recession of the marginal peri-implant mucosa may occur after immediate implant placement. This recession, in turn, may adversely affect the final esthetic outcome.

Factors that have been reported to influence the frequency and extent of marginal mucosal recession include the tissue biotype,[17] the condition and thickness of the facial bone,[18] and the orofacial position of the implant shoulder.[19,20] Connecting a provisional crown immediately after implant insertion[8,21] and grafting of the facial peri-implant marginal defect with bone or bone substitutes[21–23] also have been cited as factors. In addition to these parameters, an experimental study[24] showed that the facial socket wall, which is composed almost entirely of bundle bone, may be susceptible to resorption in the vertical and horizontal planes. Such crestal bone resorption may lead to recession of the facial marginal mucosa.

Any alteration of the soft or hard tissues may impair the final esthetic outcome of immediately loaded implants in the anterior area. To better preserve the alveolar ridge and maintain optimal soft tissue contours, we previously introduced a novel buccal plate preservation (BPP) technique.[25,26]

This simple surgical technique may help to prevent recession of the facial wall of the extraction socket without interfering with the healing process. It involves placement of particulate bone-graft material underneath the soft tissues in a surgically created pouch adjoining the buccal plate. It thus maintains optimal soft tissue contours and predictably provides a solid base for optimal esthetics and functional replacement of a missing tooth. Although we originally used this technique in the wake of tooth extraction when a delayed implant placement was planned, it also can be used effectively in conjunction with immediate implant placement and provisionalization, as the following case report illustrates.

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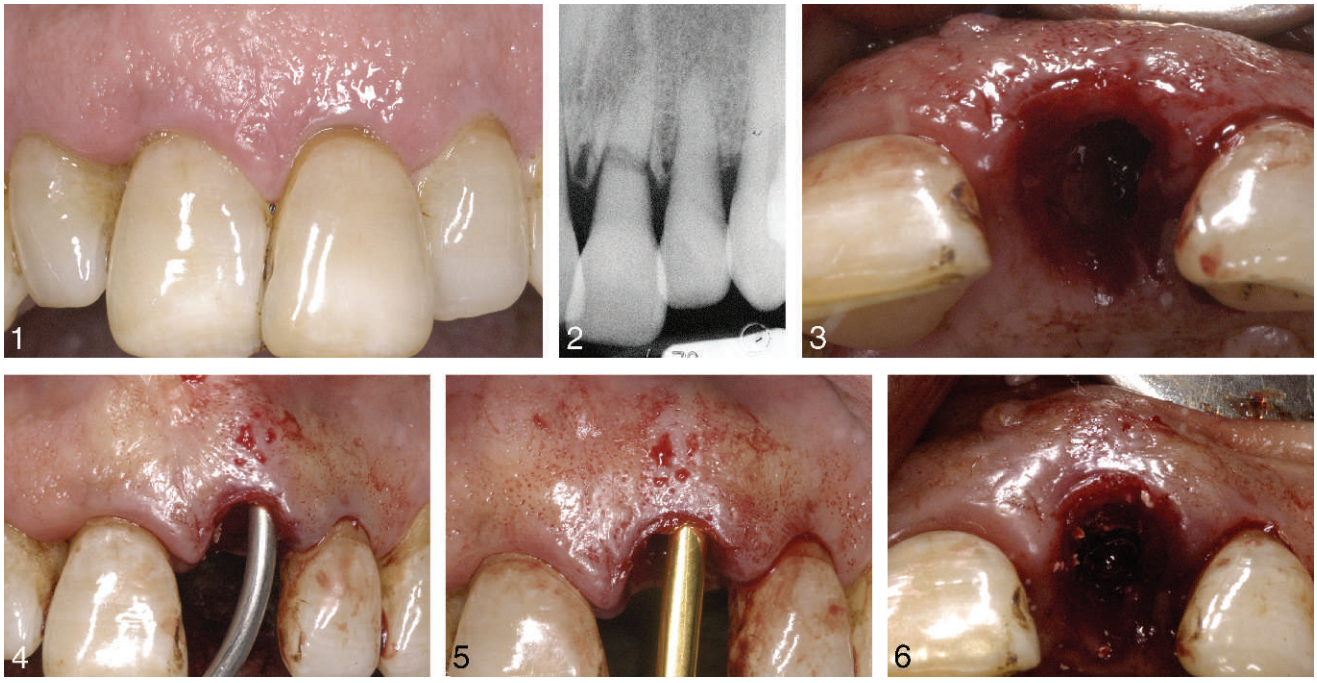


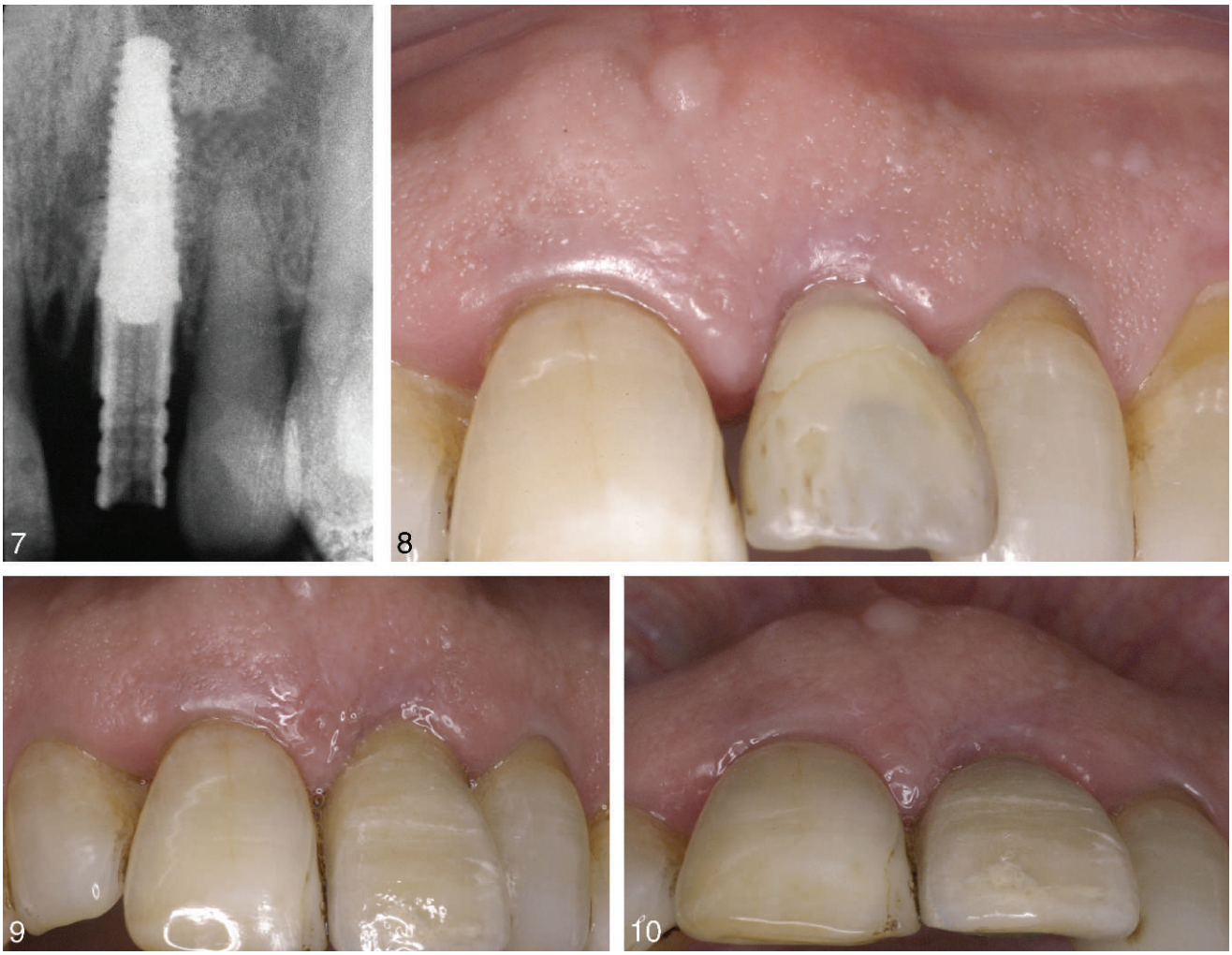
Figures 1–6. Figure 1. The 66-year-old male patient was referred by his dentist for extraction of a left central incisor whose root had fractured. **Figure 2.** Radiographic examination confirmed the fracture of the tooth and indication for the extraction. **Figure 3.** After the extraction, the socket was thoroughly debrided to remove residual granulation tissue. **Figure 4.** A speriosteal elevator was used to carefully perform limited soft tissue dissection in a full-thickness manner, creating a pouch on the facial aspect of the middle of the socket facial to the buccal plate. **Figure 5.** Once the dissection had advanced beyond the mucogingival line to approximately two-thirds the depth of the socket, a periosteal elevator was used to expand the pouch in the mesiodistal direction. **Figure 6.** Bone-graft material was delivered in the pouch with the aid of a small syringe, a surgical curette, or both until adequate filling of the pouch. The final appearance of the soft tissue should exaggerate the appearance of the root eminence of the tooth before extraction.

Case Report

The 66-year-old male patient was referred by his dentist for extraction of a left central incisor whose root had fractured (Figures 1 and 2). The treatment plan included rehabilitation with an implant-supported restoration with immediate placement after extraction and immediate provisionalization. The patient's past medical and social history were noncontributory, and he had good oral hygiene.

The incisor was extracted atraumatically in 2 pieces. The socket was thoroughly debrided to remove residual granulation tissue (Figure 3). A straight periosteal elevator was used to carefully perform limited soft tissue dissection in a full-thickness manner, creating a pouch on the vestibular aspect of the middle of the socket facial to the buccal plate (Figure 4). This dissection started coronally, at the marginal bony ridge of the extraction socket, and slowly proceeded in the apical direction, using small mesiodistal movements. Extreme care was paid to avoid tearing the soft tissue. Once the dissection had advanced beyond the mucogingival line to approximately two-thirds the depth of the socket, a curved periosteal elevator was used to expand the pouch in the mesiodistal direction. The goal was to stretch the soft tissues away from the underlying bony plate (Figure 5), and no attempts were made to decorticate the buccal plate.

Granules (500-1000 μm) of bovine sintered xenograft (Endobon Xenograft Granules, BIOMET 3i, Palm Beach Gardens, Fla) were rehydrated with saline and placed in the pouch using a syringe. The bone-graft material was then compressed with a small surgical curette, and more graft material was added and compressed until adequate filling of the pouch was achieved without overstretching the soft tissues. The quantity used was approximately 0.1 cm^3 and normally is <0.2 cm^3, regardless the size of the tooth. Care was taken to avoid the migration of the graft material too far apically, where the mucosa is more flexible and thin, although should migration



Figures 7–10. Figure 7. A 13 mm length × 4-mm-diameter tapered was placed, engaging the native bone above the alveolus, slightly palatal from the buccal plate. Additional xenograft material was placed in the gap between the buccal bone and the implant surface. **Figure 8.** A custom abutment and resin crown were fabricated immediately and delivered to the patient few hours after the surgical procedure. No sutures were required, and no attempt was made to coronally reposition the flap. **Figure 9.** Delivering of the final restoration, 3 months after the surgical procedure. **Figure 10.** Occlusal view of the final restoration. The soft tissue profile was appearing still convex and similar to the profile of the contralateral area.

occur, the graft material can be repositioned using manual pressure. The final appearance of the soft tissue should exaggerate the appearance of the root eminence of the tooth before extraction. This is done to counteract some dispersion and exfoliation of the graft (Figure 6).

A 13 mm length × 4-mm-diameter tapered implant (BIOMET 3i, Palm Beach Gardens) was then placed according to the manufacturer's protocol, engaging the native bone above the alveolus, slightly palatal from the buccal plate (Figure 7). Additional xenograft material was placed in the gap between the buccal bone and the implant surface. After the completion of the surgical procedure, the position of the implant was transferred to a model with an impression pick-up that was connected to the surgical stent with self-curing resin. A healing abutment was then screwed to the implant, and the patient was dismissed with instructions to consume only a liquid diet and return in the afternoon for delivering of the provisional.

A custom abutment and resin crown were fabricated immediately and delivered to the patient (Figure 8) a few hours after the surgical procedure. No sutures were required, and no attempt was made to coronally reposition the flap. The patient

was maintained on the liquid diet for the next 2 wk. Chlorhexidine gluconate oral rinse also was prescribed for 2 wk to enhance plaque control. After 3 months, the final restoration was delivered (Figures 9 and 10).

Results

The appearance and the contours of the ridge were well maintained, after extraction. A convexity on the buccal aspect of the extraction area, giving an illusion of root eminence, was achieved, laying the ground for a good functional and esthetic replacement of the missing tooth with an implant-supported prosthesis.

Discussion

Extraction sockets are self-healing defects. In a relatively short time, the void left by the root of the extracted tooth is filled by new bone.[1] As this biophysiologic phenomenon occurs, however, the architecture of the edentulous ridge may change adversely due to buccal bone resorption. Such changes may jeopardize implant placement or lead to an unfavorable esthetic final result.[2] Although the degree of bone loss is neither certain nor constant, varying among individuals and anatomic situations, most alveolar width and height resorption occurs in the first 6 months after extraction.[2]

When clinicians face situations where immediate implant placement is not indicated, two options have existed: (1) allow the socket to heal naturally without grafting or (2) graft the socket. Natural healing without grafting increases the risk of hard tissue loss, soft tissue loss, or both, especially on the buccal plate due to resorption. Grafting the socket requires a longer healing time before implant placement.

We have developed a third option, namely, grafting not inside the socket but externally to the buccal plate in a surgically created pouch.[25,26] This technique can only be applied when the natural architecture is intact and the buccal plate is present. In a 4-wall intact socket, this approach is aimed at optimizing the ability of the bone graft to improve regeneration and maintain or improve labial and buccal contours without interfering with the natural healing capability of the alveolus after extraction. The rationale behind it is that slowly resorbing or nonresorbing particles of bovine xenograft get incorporated in the soft tissues, thereby preventing recession and enhancing the soft tissue appearance of the edentulous ridge.

Bovine xenograft has been shown to have a very low resorption rate in many different sites. This tendency may be regarded as less than ideal in potential implant-placement sites, but according to several studies, once incorporated in bone, the particles may help prevent resorption of the newly regenerated area in the long term.[27,28] It also has been shown that in the esthetic area, regenerating the facial aspect of the buccal plate with a nonresorbable membrane and bovine xenograft may prevent bone remodeling from taking place at the head of the implant and causing soft tissue recession and other esthetic complications.[18,29] The latter approach consists of a full guided bone regeneration procedure aiming to overbuild the bone around the neck of the implant and thus prevent bone resorption. This procedure is requiring the membrane removal and a later stage.

The possibility of immediately connecting a provisional restoration to implants placed into fresh extraction sites has been extensively investigated.[30–37] Some case reports have found a 100% 12-month survival rate for immediate, nonfunctional restorations of single-tooth postextraction implants.[30–32] Favorable peri-implant tissue responses also have been reported around such implants, along with results that were clinically and radiographically comparable to those achieved after a conventional delayed protocol. Several uncontrolled prospective studies also have investigated the immediate functional loading of postextraction implants in edentulous mandibles[33–35] or in partially edentulous sites.[34]

Connecting a provisional crown immediately after implant insertion[8,21] has been reported among the many factors that can influence the frequency and extent of marginal mucosal recession. In addition to these factors, an experimental study[24] showed that the facial socket wall, which is composed almost entirely of bundle bone, may be susceptible to resorption in the vertical and horizontal planes. Such crestal bone resorption may lead to recession of the facial marginal mucosa. Any alteration of the soft or hard tissues may impair the final esthetic outcome of immediately loaded anterior implants.

Conclusions

In 4-wall extraction sockets, the buccal plate preservation technique described in this article may help to maintain or improve the appearance and contours of the ridge after tooth extraction, laying the ground for a good functional and esthetic replacement of the missing tooth with an implant-supported prosthesis. The procedure also can enhance the soft tissue appearance when implant placement and loading are indicated immediately after tooth extraction. Although the preliminary results of using this technique are promising, further investigation is warranted to confirm its efficacy; understand the biology underlying it; and identify factors that may influence it, such as the thickness of buccal plate after extraction, presence of contiguous teeth, type of bone graft with or without membrane, and position of the implant.

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