Case Report

Immediate Loading of a Dental Implant Placed in Fresh Socket With Acute Dehiscence-Type Defect: A Clinical Case Report

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Background: The aim of the present clinical case is to show buccal bone repair around a dental implant placed by flapless technique and immediately loaded in fresh socket with acute buccal dehiscence-type defect.

Methods: A 58-year-old female presented with a fistula on the buccal side and a root fracture at the left lateral incisive. The dental extraction was performed without mucogingival flap elevation; the absence of buccal bone plate was recorded. A screw-shaped implant was placed. Immediately after the surgical procedure, the patient received temporary prosthetic restoration, and 3 months later definitive metal-ceramic restoration was positioned.

Results: Four years later, a fracture of the crown and gingival inflammatory process were observed. The crown was removed and a fracture of the zirconia abutment was reported. Surgical reentry was performed, gingival flap was raised, and buccal bone repair was observed.

Conclusion: Biologically, it is very difficult to explain the bone repair process around implants in the acute dehiscence-type defect, and only biologic speculations explain the outcome of this clinical result. J Periodontol 2010;81:953-957.

KEY WORDS
Alveolar bone loss; case report; implant-supported dental prosthesis; immediate denture; tooth socket.

To preserve the alveolar bone level from the collapse of healing events, authors1,2 have placed dental implants into a fresh extraction socket, obtaining a high success rate.

Covani et al., analyzing bone remodeling around implants placed immediately after tooth removal, observed a healing pattern of coronal bone around immediate implants with new bone apposition around the neck of the implants and, at the same time, bone resorption with horizontal width reduction of the bone ridge.

Besides bone preservation assessment, soft tissue management around implants represents a major aesthetic concern for patients. To maintain an excellent esthetic profile of the soft tissues around implant-prosthetic restoration, recently authors3-5 have proposed immediate implant loading (occlusal load applied to temporary crowns positioned immediately to implants) placed in fresh extraction sockets from premolar to premolar. All three studies obtained a survival rate of 100% with radiographic and clinical results comparable to those obtained following the standard protocol, suggesting an immediate restoration of single-tooth implants placed in fresh extraction sockets to replace a missing tooth.

However, recession of the marginal peri-implant mucosa may occur, inducing an adverse effect on the final esthetic outcome.6,7 Gingival tissue biotype8 and thickness of the facial bone9 may influence the frequency and extent of marginal mucosal recession. In addition, Araujo and Lindhe10 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, leading to recession of the facial marginal mucosa. It was also suggested that disruption of the vascular supply to the facial bone by the elevation of surgical flaps might be an important contributory factor.11-13

Thus, investigators recommended placing implants into extraction sockets with minimal flap elevation14 or without elevation of surgical flaps15 to minimize marginal mucosal recession enhancing esthetic results.

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Immediate Loading With Acute Dehiscence-Type Defect

Because few studies focused on immediate loading of implants placed in infected extraction sockets, the aim of the present clinical case was to show bone tissue repair around a dental implant placed and immediately loaded in an acute buccal dehiscence-type defect socket.

**CASE DESCRIPTION AND RESULTS**

In February 2005, at the Department of Dentistry, San Raffaele Hospital, Milan, Italy, a 58-year-old female presented a fistula on the buccal side and a root fracture at left lateral incisor (Fig. 1A). She was in good general health, with no chronic systemic diseases and not a smoker. Tooth extraction and immediate placement of the implant and immediate loading was decided upon. The local ethical committee approved the study and the patient gave her informed consent for immediate implant placement into a periodontally infected socket.

**Surgical Protocol**

One hour before surgery the patient received 1 g amoxicillin, and 1 g twice daily for 7 days after the surgical procedure. Surgery was performed under local anesthesia.

The dental extraction was performed without mucogingival flap elevation, and with a periodontal probe (Fig. 1B) the absence of buccal bone plate was recorded. All granulation tissue was carefully removed from the socket, and rinsed by physiologic solution.

The implant site was prepared with standard drills following the palatal bony walls as a guide, and the apical portion of the implant was placed ≥4 mm beyond the root apex. To ensure primary stability, the drilling protocol included underpreparation of the implant site without screw tapping or countersinking. The coronal margin of the fixture was located at the palatal level of the bone crest (Fig. 1C), with a minimum insertion torque of 35 Ncm.

A screw-shaped implant with a rough surface with a progressive thread design and external hexagon was used. Chlorhexidine mouthwash was prescribed twice daily for the next 15 days.

**Prosthetic Protocol**

Immediately after the surgical procedure, the patient received a temporary abutment and prosthetic restoration. Transfer copings were inserted into the internal hexes of the implant with a seating instrument and secured with abutment screw (Fig. 1D). An impression was made with a polyether material using an individual impression tray.

The temporary crown was cemented (Fig. 1E) and maintained in full contact in centric occlusion. The patient followed a soft diet (avoiding bread and meat) for 2 months.

**Follow-Up**

Follow-up visits were performed by a dental hygienist (Elisabetta Polizzi, Department of Dentistry, San Raffaele Scientific Institute, Milan, Italy) every 6 months after implant placement. The following clinical parameters were checked: plaque, bleeding index at four surfaces around the implant, pain, occlusion, and prosthesis mobility. Success criteria for implant survival were implant stability, absence of radiolucency around the implant, mucosal suppuration, and pain.

**Radiographic Examination**

Intraoral digital radiographic examinations were made at baseline, 12, 24, and 48 months after implant placement. The periapical radiographs were taken perpendicularly to the long axis of the implant with a long-cone parallel technique using an occlusal template to measure the marginal bone level. A radiologist (RC) measured the changes in marginal bone height over time. The marginal bone level was considered from the reference point represented by the more coronal portion of the implant in contact with the bone, to the point where the bone tissue met the implant surface at the mesial and distal sites. The difference in bone level was measured by software.

**Placement of the Definitive Prosthesis**

Three months after implant placement, the temporary crowns and abutments were removed, and a prepared definitive zirconia abutment was screwed onto the osseointegrated implant. Definitive metal-ceramic restorations were then cemented onto the definitive abutment (Fig. 2). Four years later a fracture of the crown and gingival inflammatory process were observed. The crown was removed and a fracture of the zirconia abutment was observed. After the patient gave her written informed consent, surgical reentry was performed, a gingival flap was raised, and complete buccal bone repair was observed (Fig. 3).

**DISCUSSION**

Immediate restorations of implants placed in fresh extraction sockets may provide a successful treatment procedure. Alveolar bone volume preservation following placement of dental implants in fresh extraction sockets improves esthetic and functional prosthodontic result. The minimum marginal bone level change and a likely moderate recession of gingival margin reported in previous studies may be caused by a flapless implant surgery, because...
flap reflection induced tissue loss, negatively influencing implant esthetic outcomes.\(^3\)

The initial stability of implants is one of the main requirements for immediate loading. Probably bone quality and quantity are in charge for resonance frequency analyses values >60 ISQ (implant stability quotient), necessary for a successful healing process, because the amount of micromotions over threshold values could stimulate connective tissue formation at the bone–implant interface.\(^24\)

In an animal model study,\(^25\) four-wall defects of different dimensions (1 to 2.25 mm wide) that occurred in the marginal portion of the recipient sites following implant installation recovered during healing. Further, at sites where the buccal bone wall was intentionally removed, healing was incomplete, but the dimension of the defect was reduced by the limited amounts of new bone formation extending from the lateral and apical borders of the defect.

These findings are in contrast to clinical results obtained in the present case, which show not only a good maintenance of gingival margin, but also a bone repair around the implant immediately positioned and loaded in acute bone dehiscence-type defect.

Biologically, it is very difficult to explain the bone regeneration process around implants in the acute bone dehiscence-type defect, and only biologic speculations explain the outcome of this clinical result.

It might be hypothesized that hydroxylation-hydration of implant surfaces also improved the adhesion and subsequently the stabilization of the blood clot within 24 hours. The blood clot acts as a physical matrix that induces and amplifies the migration, proliferation, and differentiation of various types of cells, subsequently leading to fibroplasia and angiogenesis.\(^26\) In this context, it must be pointed out that both stabilization of the blood clot and early angiogenesis were considered to be important factors strongly influencing wound healing. Experimental studies in animals have indicated that formation of blood capillaries precedes the formation of new bone because osteogenic cells were observed to arise from pericytes adjacent to the connective tissue of small blood vessels.\(^13,25,27\) Neovascularization of the blood clot and subsequently new bone formation appeared to start from open bone marrow spaces of the adjacent defect borders.

With flapless procedure, blood clot fills the intrabony defect and provides a seal between the gingival flap
and the implant surface. Plasma proteins, primarily fibrinogen, imposed onto the internal aspect of the gingival surface and the implant surface provide the initial basis for an adherence of stable fibrin clot. The uninterrupted maturation of the fibrin clot is essential for the formation of a new connective attachment rather than the junctional epithelium, because intact fibrin clot blocks apical migration of the epithelium.

However, if induced forces acting on the wound margins exceed the tensile strength of the implant–gingival flap interface, wound healing will be characterized by junctional epithelium. This healing modality might be promoted by the implant surfaces. Actually, some studies demonstrated that the surface of the implant was able to influence the production of cytokines, growth factors, and phenotypic expression of the cells, and consequently modulate the healing process of the tissues even distally.

This study in mini-pig models. In implants placed immediately into fresh extraction sockets, osseointegration also occurred without initial bone contact, with bone-to-implant contact increasing from 11.7% to 47.38% at middle level and from 53.4% to 67.38% at apical level from day 7 to day 60.

However, great variability exists in humans with respect to hard tissue formation within extraction sockets. Thus, whereas a provisional connective tissue consistently forms within the first weeks of healing, the interval during which mineralized bone is laid down is much less predictable.

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The authors report no conflicts of interest related to this case report.

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