



Immediate Placement of Bone Level Straumann Implants: A Case Series



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Endosseous dental implants have revolutionized the methods clinicians use to treat edentulous and partially edentulous patients. Traditional implant protocol specifies a healing period of several months after tooth extraction, as well as an unloaded healing period prior to restoration. Over the last decade, numerous studies have documented successful immediate placement of endosseous dental implants in fresh extraction sites and have found positive results with early functional loading. The purpose of this article is to present a clinical treatment protocol for the immediate placement and early loading of dental implants and to report the clinical and radiographic outcomes of the SLActive surface Straumann Bone Level implant placed in either maxillary or mandibular fresh extraction sockets. (Int J Periodontics Restorative Dent 2011;31:57–65.)

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Since the principle of osseointegration was introduced, an enormous increase in its awareness, coupled with excellent long-term results, has revolutionized dental treatment modalities.^{1,2} The use of osseointegrated dental implants has become a successful procedure for the treatment of complete³ or partial⁴ edentulism and single-tooth replacements in both the anterior and posterior regions of the mouth.^{5,6} In the last 3 decades, dental implants and surgical procedures have been developed to ensure predictable results and to improve function and esthetics.^{7,8}

The classic treatment protocol includes a healing period of several months after tooth extraction (during which a provisional denture must be worn), the surgical placement of implants, and another healing period of 3 to 6 months. This implies almost 1 year in reduced quality of life, and for many individuals, great psychological stress.

To reduce these problems, immediate implant placement into extraction sockets and early loading have come into focus during the last few years.^{9–11} Both of these surgical

and prosthetic procedures require a fast integration of the implant into the surrounding bone that depends on primary stability¹² and the implant's surface properties, along with other factors.¹³ Macrodesign plays an important role in achieving high torque values and, consequently, elevated primary implant stability.¹⁴ It has also been recognized that altered implant surface topography can permit a more rapid development of the bone-to-implant interface of an adequate durability to allow for early loading.¹⁵

The purpose of this article is to present a clinical treatment protocol and the clinical and radiographic outcomes of patients treated with early loaded SLActive surface Straumann Bone Level implants (Institute Straumann) placed in fresh extraction sockets.

Case series

All patients ($n = 3$; two men, one woman) were in good systemic health and underwent initial periodontal therapy in the ambulatory of their general dentist. Plaque control was performed until an excellent level was achieved, with deposits being absent or minimal. The day before surgery, patients received 1 g amoxicillin two times daily (followed for an additional 5 days). Patients rinsed with a 0.12% chlorhexidine mouthwash immediately prior to surgery and used this same treatment as a postoperative oral rinse for the first 30 days.

Sutures were removed 7 days postoperative. Patients were controlled weekly up until the prosthetic rehabilitation was carried out, and then on a monthly basis. Postoperative care included selective stain polishing, oral hygiene reinforcement, and plaque removal.

Patient 1

A 43-year-old man presented with a request to assess his maxillary right lateral incisor and to discuss the options for a prosthetic replacement. Clinical examination revealed a general squared tooth form, a thick biotype, and leakage of the crown; the patient reported numerous previous decementations. Radiographic examination revealed a tooth that had undergone endodontic therapy and was restored with a fiber post and metal-ceramic crown. A radiopaque area in proximity to the apex was also evident (Fig 1a). Given that the lateral incisor would require at least endodontic retreatment and construction of a new core foundation and crown and would still be compromised, the patient elected to pursue the option of tooth replacement. An immediate implant placement and early loading approach with a flapless procedure was the treatment choice for this patient.

To guarantee an optimal implant position using flapless surgery, a surgical stent was fabricated using an autopolymerizing acrylic resin. The incisal margin of the tooth was marked, and the acrylic stent was cut on that level and used to adjust drills during surgery (Figs 1b to 1d). An SLActive surface Straumann Bone Level implant (4.1×10 mm) was placed immediately after extraction (Figs 1b to 1d). A 4-mm bottle-shaped healing abutment was inserted. A resin tooth was bonded to the adjacent teeth and used as a provisional restoration (Fig 1e). Six weeks after the surgical phase, an accurate impression was taken using a Bone Level Transfer piece (Institute Straumann). After another 2 weeks, a galvanic-ceramic crown was luted onto the single implant. At the 1-year follow-up, the implant appeared functionally loaded and there were excellent signs of healthy peri-implant mucosa (Figs 1f and 1g).

Fig 1 Patient 1.

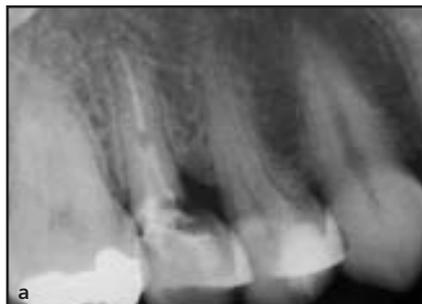
Fig 1a The maxillary right lateral incisor had previously undergone endodontic therapy and was restored with a fiber post and metal-ceramic crown. Note the radiopaque area in proximity to the apex.

Figs 1b to 1d Use of the surgical stent. (b) The incisal margin of the tooth was marked and the acrylic stent was cut on that level, (c) which was used to adjust the drill during surgery. (d) The implant and its mounting was then placed immediately after extraction.

Fig 1e Tissue healing at 7 days. A resin tooth bonded to the adjacent teeth was used as a provisional restoration.

Figs 1f and 1g (f) Intraoral and (g) radiographic view of the definitive prosthesis at the 1-year follow-up.



Fig 2 Patient 2.**Fig 2a** Radiograph showing the severely decayed maxillary right second premolar with previous root canal treatment.**Figs 2b and 2c** (b) Radiographic and (c) clinical views of the definitive prosthesis at the 1-year follow-up. Note the soft tissue maturation.

Patient 2

A 32-year-old woman with no general health problems presented pain in the buccal area of the right maxilla. The radiograph showed a maxillary right second premolar with previous root canal treatment that was severely decayed (Fig 2a). The surgical procedure was performed under local anesthesia using articaine and 1:100,000 epinephrine (Ubiseine, 3M ESPE). The tooth was carefully luxated and extracted, and an SLActive surface Straumann Bone Level implant (4.1 × 10 mm) was placed immediately with a flapless procedure. Transmucosal healing was assessed with a 4-mm bottle-shaped healing abutment. Six weeks after surgery, an impression was taken using the Bone Level Transfer piece. After 2 weeks, a metal-ceramic crown was luted on

the implant. At 1 year postsurgery, the outcome, when evaluated both clinically and radiographically, was satisfactory. No problems were reported and soft tissue maturation was observed (Figs 2b and 2c).

Patient 3

A 63-year-old man who was an ex-smoker with a noncontributory medical history underwent clinical examination, which revealed a Class III anterior tooth relationship. Parafunctional facets were observed on the anterior teeth, but there was no report of craniomandibular dysfunction or associated symptoms. All mandibular incisors appeared painful during mastication, were periodontally involved, and required extraction (Fig 3a). Two immediately

placed implants were planned to support a fixed partial denture (FPD) in the mandible. The incisors were carefully luxated and extracted, and two SLActive surface Straumann Bone Level implants (3.3 × 10 mm) were immediately placed at the lateral incisor sites with a partial-thickness flap procedure (Figs 3b and 3c). Transmucosal healing was assessed with two 4-mm bottle-shaped healing abutments. Six weeks after surgery, an impression was taken using a Bone Level Transfer piece (Fig 3d). At 8 weeks, a zirconia FPD (Etkon CAD/CAM, Institute Straumann) was luted onto the titanium abutments (Fig 3e). At 1 year postsurgery, the implants were functionally loaded and showed excellent signs of healthy peri-implant mucosa (Figs 3f to 3h).

Fig 3 Patient 3.

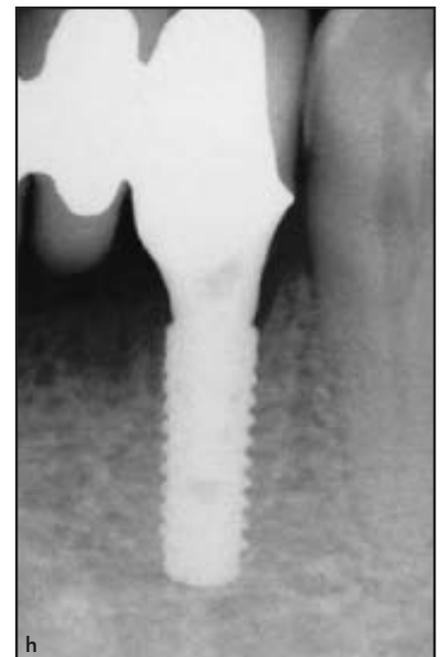
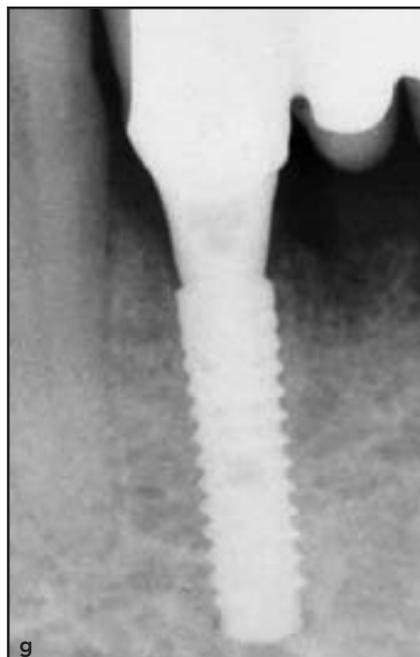
Fig 3a The mandibular incisors appeared to be severely periodontally involved and required extraction. The tooth radix at the right central incisor was amputated previously.

Figs 3b and 3c Implants were placed immediately at the (b) right and (c) left lateral incisor sites with a partial-thickness flap procedure.

Fig 3d Healthy peri-implant soft tissues and improved horizontal thickness, provided by the bottle-shaped healing abutments, were observed.

Fig 3e A zirconia FPD was luted to the titanium abutments.

Figs 3f to 3h (f) Clinical and (g and h) radiographic appearance of the implants at the 1-year follow-up.



Discussion

The placement of implants into fresh extraction sockets was introduced in the late 1980s.^{16,17} The rationale for immediate implant placement is to use the process of new bone formation in the extraction socket to achieve osseointegration.¹⁸ The implant survival data seem similar to alternative (early or delayed) surgical approaches,¹³ although other aspects such as esthetic outcomes, preservation of the alveolar process, impact of the remaining infection, and use of bone substitutes or membranes are still debated. Implant placement immediately after tooth extraction offers several advantages, especially concerning the shortening of treatment time and reduction of surgical procedures, but could present some surgical difficulties relating to the achievement of primary intraosseous stability.

Early implant loading reduces the treatment period and the need for a provisional removable prosthesis during the healing process, giving a positive psychologic advantage; scientific research results suggest that it is a safe and effective procedure.^{12,19} However, the evidence supporting claims from select dental implant surfaces are still controversial,²⁰ and in particular, the effect of the implant surface on the outcomes of different loading protocols requires further research.¹⁹

The Straumann Bone Level implant has Straumann SLActive surface technology, which, compared with the previous SLA Straumann surface, seems to provide an interesting ac-

celeration during bone healing. The SLActive hydroxylated and chemically active implant surface is produced by microstructuring commercially pure titanium under controlled conditions in a nitrogen atmosphere, preventing atmospheric contamination, and is then stored in sealed tubes containing isotonic saline at a pH of 4 to 6 to maintain the chemically active stage of the surface. Animal studies showed a faster and more structured bone formation with greater blood vessel production and higher osteocalcin activity in the first 14 days following implantation.²¹ This accelerated healing also confirmed up to a 60% greater bone-to-implant contact²² and a significantly higher unscrewing torque compared with the SLA surface after 2 and 4 weeks.²³ A randomized controlled trial provided clinical support for the potential of chemically modified SLA surfaces in enhancing implant stability during the osseointegration process.²⁴

In this case report study, a flapless procedure was chosen for patients 1 and 2 since it has been shown to produce a minor reduction in buccal bone plate resorption and increase the vascularity of the peri-implant mucosa.²⁵⁻²⁸ To avoid a second surgery and relative discomfort to the patient, transmucosal healing was performed. Jung et al²⁹ evaluated the radiographic crestal bone changes around Bone Level implants placed either with submucosal or transmucosal healing at different levels relative to the alveolar crest. No significant differences regarding marginal bone loss and the level of the bone-to-implant contact were

detected between implants with a submucosal or transmucosal healing.

In patient 1, a tooth in an area of high demand was replaced. To achieve esthetic outcomes using an immediate implant placement procedure, very careful patient selection and precise implant positioning must be performed.³⁰⁻³² The patient presented a thick biotype and squared tooth form, which are considered good indications for immediate implant placement in esthetic areas.³³

In relation to the optimal buccolingual position, Buser et al³⁴ recommended that the implant shoulder be placed 1 to 2 mm lingual to the emergence of the adjacent teeth to ensure maintenance of an adequate width of buccal bone and stable mucosa over the buccal implant surface. This recommendation is supported by the findings of another study,³³ in which the buccolingual position of the implant shoulder was found to be a highly significant factor in determining the degree of buccal marginal tissue recession. To guarantee this correct buccolingual implant position using flapless surgery, a simple and cheaper device was used: a surgical stent fabricated directly with autopolymerizing acrylic resin (Figs 1b to 1d).

The Bone Level implant incorporated a platform-switching concept. Although strong long-term scientific evidence for the esthetic advantages of this solution is not known, this concept seems to be a step in the right direction in reducing bone loss and improving the esthetic results of oral implants.³⁵

Within the limits of this case report study, the clinical and radiographic results appear to support early implant loading, since it seems to respect the biology of the peri-implant soft tissue and ensure esthetic satisfactory outcomes in either maxillary or mandibular fresh extraction sockets and for surgery procedures with or without the use of a flap.

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