



Immediate Implants and Immediate Loading in Periodontally Compromised Patients—A 3-Year Prospective Clinical Study



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To avoid the necessity of a removable provisional prosthesis, and therefore preserve the patient's functional outcome, esthetics, and quality of life, a clinical protocol was developed to approach periodontally compromised patients presenting a full-arch irreversibly lost dentition: full-arch extraction and immediate replacement with a provisional acrylic resin implant-supported fixed partial denture (FPD). A total of 23 periodontally compromised patients (11 women, 12 men; 4 smokers, 4 controlled diabetics) were included in this study. Pretreatment casts were taken and vertical dimension of occlusion was determined. In most patients, 6 Straumann implants were distributed along the arch according to the surgical guide or bone availability, with the most distal ones in the maxilla slightly tilted so they could emerge more distally. A total of 168 implants (146 Straumann, 10 Nobel Biocare, 8 Biomet 3i, and 4 Lifecore) were placed (83 in the maxilla, 85 in the mandible). Of those in the maxilla, 74 were loaded immediately (implant stability quotient mentor [ISQm] > 70) and 9 placed with delayed loading (ISQm ≤ 70). Of the 85 implants placed in the mandible, all were loaded immediately (ISQm > 70). If an FPD had not been fabricated already, impressions were taken during surgery to do so. The prosthesis was then adapted (cemented or screwed) to the 6 implants within the first 48 hours postsurgery. After 2 months, definitive impressions were taken, and a definitive porcelain-fused-to-metal implant-supported 12-element FPD was fabricated and cemented or screwed to all 6 implants. Of the 168 implants, 108 were immediate implants and 159 immediately loaded. Only 2 implants (1 in the mandible, 1 in the maxilla) did not osseointegrate. This yields a 3-year cumulative survival rate of 98.74% (98.65% in the maxilla, 98.82% in the mandible). From a total of 26 immediately loaded prostheses (12 in the maxilla, 14 in the mandible), 6 were cemented and 20 screw-retained. The 3-year cumulative survival rate was 100%. Immediate loading in mandibular and maxillary periodontally compromised patients presents itself as a predictable technique with a 100% cumulative survival rate for provisional and definitive prosthetic rehabilitations. (Int J Periodontics Restorative Dent 2010;30:447–455.)

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Previous data demonstrate that individuals with a strong susceptibility to periodontal disease can be treated successfully with osseointegrated implants.^{1–3} Implants placed in patients with a history of periodontitis have a 5-year survival similar to that observed for implants inserted in nondiseased patients. Although the 10-year survival of single-stage implants was somewhat lower than has been observed for nondiseased patients, implant placement remains a good treatment alternative for periodontally compromised patients.⁴ Implants can also be used with success in patients treated for chronic and aggressive periodontal disease, as well as in recalcitrant periodontal patients.^{2,5,6}

Immediate implant placement into fresh extraction sites is considered to be a predictable and acceptable procedure.^{7–9} Advanced periodontal destruction is often associated with tooth extraction. Oral rehabilitation for such extractions may include an implant-supported reconstruction. Immediately loaded implants present an alternative treatment modality for periodontally compromised patients that might provide a better opportunity to meet patient needs.^{5,10,11}

Table 1 Patient demographics

	No. of patients	No. of smokers	No. of controlled diabetics
Women	11	0	1
Men	12	4	3
Total	23	4	4

Patient desires have pushed the envelope toward early function while minimizing the inconvenience of a conventional transitional prosthesis during healing from extraction and implant placement.¹² Immediately placing dental implants at the time of tooth extraction has yielded favorable and predictable results, while early loading of dental implants placed immediately has been studied and met with equally predictable results.^{13–15} Advantages of immediate placement include better bone and soft tissue preservation, reduced postoperative pain, a significant reduction of clinical chair time, and greater patient acceptance. The main rationale, and one of the most important reasons for immediate implant placement, is to preserve alveolar bone height and width.^{16,17} Immediate placement can lead to a favorable crown-implant ratio, better esthetics, and a favorable interarch relationship.^{9,16,17}

Implant therapy involving a maxillary lift in periodontally compromised patients can be accomplished successfully, as well as the treatment of advanced periodontal destruction with immediately loaded implants and simultaneous bone augmentation.^{1,11}

Implant-supported fixed prostheses are an acceptable and predictable treatment option for the rehabilitation

of patients who have lost their teeth as a result of periodontal disease. This observation seems to be valid in both edentulous and partially dentate arches.¹⁸ In the edentulous patient, the literature supports immediate placement and immediate loading in the mandible using cross-arch stabilization of the implants and a fixed passive-fitting prosthesis on multiple implants having verifiable primary stabilization on placement.¹⁹

Periodontally compromised patients, especially young adults in need of a full-arch implant-supported rehabilitation, are, most of the time, candidates for immediate implant placement followed by immediate function. The psychologic implications and the natural refusal for a removable prosthesis, even provisional, lead patients to delay the decision to extract their teeth, risking even more bone loss. To avoid the necessity of a removable provisional prosthesis, and therefore preserve the patient's functional outcome, esthetics, and quality of life, a clinical protocol to approach periodontally compromised patients presenting a full-arch irreversibly lost dentition was developed: full-arch extraction and immediate replacement with a provisional acrylic resin implant-supported fixed partial denture (FPD).

Method and materials

A total of 23 periodontally compromised patients were selected to be included in this study (Table 1). All patients were submitted to a periodontal clinical evaluation, a previous radiographic study (panoramic radiograph, computed tomography scan), and had study casts taken with the vertical dimension and initial intermaxillary relations determined. In most patients, 6 Straumann implants (minimum, 4 in the mandible; maximum, 10 in the maxilla) were distributed along the arch according to the surgical guide or bone availability, with the most distal ones in some maxillae slightly tilted so they could emerge more distally. A total of 168 implants (146 Straumann, 10 Nobel Biocare, 8 Biomet 3i, and 4 Lifecore) were placed (83 in the maxilla, 85 in the mandible). Implant stability was measured with the Osstell Mentor resonance frequency system with an implant stability quotient mentor (ISQm) value of 70 as a boundary condition for immediate loading.²⁰ Of those placed in the maxilla, 74 were immediately loaded (ISQm > 70) and 9 were placed with delayed loading (ISQm ≤ 70). Of the 85 implants placed in the mandible, all were loaded immediately (ISQm > 70). At least 3 implants



Fig 1 (left) Initial clinical situation and (right) panoramic radiograph of a patient included in the study. All maxillary teeth were periodontally compromised. Maxillary treatment plan: extraction of all present teeth, six implants, full-arch provisional fixed prosthesis (< 48 hours after implant placement), and a porcelain-fused-to-metal implant-supported definitive rehabilitation (2 to 4 months later). Mandibular treatment plan: extraction of the incisors, two implants, an immediate provisional FPD, and a porcelain-fused-to-metal implant-supported definitive rehabilitation (2 to 4 months later). Exeresis of the cyst in the third quadrant was also planned with two implants at the left second premolar and first molar sites and a porcelain-fused-to-metal implant-supported rehabilitation, and periodontal treatment of the remaining teeth.



Fig 2 Implant placement and intermaxillary register.



Fig 3 Pick-up impression at the time of surgery.

on each arch were immediate implants (placed in extraction sockets).

Depending on gingival biotype and vertical alveolar bone loss, the vertical position of the implants was slightly deeper and palatal to compensate for forward gingival margin level retraction.

Immediate loading was considered to be within the first 48 hours after implant placement. Of the 26 placed immediate provisional prostheses, 22 presented a fixed antagonist

dentition (natural dentition or fixed prostheses) and 4 opposed full-arch removable prostheses. All patients were rehabilitated with a definitive implant-supported porcelain-fused-to-metal prosthesis. Radiographic controls were taken for all patients at 6, 12, 18, 24, and 36 months. All patients were submitted to plaque control recalls every 3 months.

Figures 1 through 9 present a case report of a patient receiving immediate implants with immediate loading.



Fig 4 Healing caps were positioned and suturing was completed.



Fig 5 A screw-retained full-arch provisional fixed prosthesis was delivered within the first 48 hours postsurgery (immediate loading).



Fig 6 Panoramic radiographic control following implant placement. Although periodontally compromised, the maxillary right second and third molars and the left third molar were not extracted during surgery to help in controlling the vertical dimension during provisionalization.



Fig 7 Metal framework passive fit (left) clinical and (right) radiographic controls.

Fig 8 Metal framework situated on the working cast.



Fig 9 (left) Clinical and (right) radiographic view of the definitive porcelain-fused-to-metal implant-supported rehabilitation.

Results

Of the 168 implants placed, 108 were immediate implants and 159 were immediately loaded. Although 9 implants had delayed loading, prosthesis delivery was not affected since 2 months were needed to guarantee implant osseointegration for both immediate and delayed loading protocols. Only 2 implants (1 in the mandible, 1 in the maxilla) did not osseointegrate, probably a result of provisional prosthesis fracture and

therefore nocive occlusal forces before fracture repair. Neither of these implants were placed in a smoker or diabetic patient, were tilted, or were placed in extraction sites. This yields a 3-year cumulative survival rate of 98.74% (98.65% in the maxilla, 98.82% in the mandible) (Table 2).

From a total of 26 immediately loaded prostheses (12 in the maxilla, 14 in the mandible), 6 were cemented and 20 were screw-retained, distributed as seen in Table 3. A 3-year cumulative survival rate of 100% was found.

Table 2 Results seen over 3 years for implants placed in each arch

Implants (n = 168)	Placed	Immediate implants	Immediate loading	Osseointegrated	Not osseointegrated	3-year CSR
Maxilla	83	50	74	82	1	98.65%
Mandible	85	58	85	84	1	98.82%
Total	168	108	159	166	2	98.74%

CSR = cumulative survival rate.

Table 3 Distribution of definitive prostheses

Definitive prosthesis	Immediately loaded prostheses (total)	Cemented	Screw-retained	3-year CSR
Maxilla	12	5	7	100%
Mandible	14	1	13	100%
Total	26	6	20	100%

CSR = cumulative survival rate.

Discussion

The success of immediate implants has been well documented histologically. The clinical outcome and the degree of osseointegration did not differ for screw-type implants when placed in mature bone or an extraction socket with a bone-to-implant gap of 2 mm or less.^{21,22} The width of the gap (jumping distance) at the time of implant placement has a significant impact on the percentage and height of alveolar bone, as well as the percentage of bone-to-implant contact.^{23,24} For horizontal defect dimensions ≤ 2 mm, spontaneous bone healing and

osseointegration can be expected.^{25,26} In situations where the horizontal defect dimension is > 2 mm, membranes and membrane-supporting materials should be considered.

Current results further documented that marginal gaps at buccal and palatal/lingual sites were resolved through new bone formation from the inside of the defects and substantial bone resorption from the outside of the ridge (horizontal buccal resorption 56%, lingual/palatal resorption 30% at 12 months).^{17,27,28}

Implant placement failed to preserve the hard tissue dimension of the region following tooth extraction. The

buccal and lingual bone walls were resorbed. At the buccal aspect, this resulted in some marginal loss of osseointegration.²⁹ The process of bone modeling and remodeling at an implant placed in a fresh extraction socket differs from the resolution of marginal defects that may occur following implant insertion in a healed ridge.²⁷ This may be one of the reasons why some gingival recession has been seen with metal exposure, especially in the mandible after immediate implant placement. This gingival recession was visible after 1 year despite immediate implants being placed deeper to specifically avoid this problem.

The use of demineralized freeze-dried bone allograft, xenograft, and hydroxyapatite have been described extensively, but none have shown a superior outcome to one another.^{30,31} Sites treated with a membrane barrier and Bio-Oss (Geistlich) showed a higher position of the gingival margin when compared to sites treated with barriers alone.³²

Bio-Oss reduced horizontal resorption of buccal bone significantly. There is a risk of mucosal recession and adverse soft tissue esthetics with immediate implant placement. However, this risk may be reduced by avoiding buccal positioning of the implant in the extraction socket.³³ High predictability of immediate implants with simultaneous bone augmentation can also be achieved with a single-step transmucosal healing approach,^{34–36} as the results of this study show. Tapered or standard cylindric implants yielded clinically equivalent short-term outcomes after immediate implant placement into the extraction socket.³⁷ Grunder,³⁸ in a report on 5 mandibles and 5 maxillae, found a mandibular survival rate of 97.3% after 2 years for 43 implants, of which 31 were placed in extraction sockets; the maxillary survival rate was 87.5% after 2 years for 48 implants, 35 of which were placed in extraction sockets.

Clinically, it has been observed that the immediate placement of a provisional affects the peri-implant tissue morphology according to its emergence profile. The result was a wider contour of the peri-implant soft tissue located in a more apical position, consistent along the rehabilitated arch.³⁹ It was hypothesized

that the immediate modulation of the soft tissue helps, from the beginning of the rehabilitation, to achieve better final soft tissue integration of the metal-ceramic fixed prosthesis.

The combination of extraction sockets and native bone implants can be immediately loaded with a fixed full-arch prosthesis and remain stable for more than 5 years. The bone loss adjacent to these implants is similar to that seen surrounding those placed and restored using traditional protocols.⁴⁰ Factors affecting favorably the survival of implants placed to support full-arch porcelain-fused-to-metal prostheses include immediate implantation, higher potential contact surface area values, and implant location.

The clinical results indicate that immediately loaded tilted implants may achieve the same outcomes as upright implants in both arches,⁴¹ as was also found in this study.

Among the numerous included papers reporting on mandibular fixed prostheses, the pooled implant survival estimates were 97% at 5 years and 88% for maxillary fixed prostheses.⁴² Higher survival rates were found for the maxillary prostheses in this study and practically the same for the mandible. In a meta-analysis of 13 prospective trials,⁴³ early and immediate implant loading was not associated with worse outcomes compared to conventional loading, as the current 3-year prospective study also seems to conclude.

Conclusion

Immediate loading in mandibular and maxillary periodontally compromised patients presents itself, for the 26 consecutive clinical cases analyzed and followed during the 3-year period of this study, as a predictable technique with a 100% cumulative survival rate for the provisional and definitive prosthetic rehabilitations. The implant osseointegration cumulative success rate (98.74%) is very similar to that for delayed loading. In this way, immediate implant placement and immediate loading with transitional fixed implant-supported rehabilitations allow periodontally compromised patients to function with minimal or no transition through the edentulous state. Benefits include minimal swelling and discomfort with little to no functional challenges, in conjunction with a decreased healing time and an optimized esthetic result.

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