Tooth- and Tissue-Supported Provisional Restorations for the Treatment of Patients with Extended Edentulous Spans

CHRONOPOULOS VASILIOS, DDS, MSc, Dr. Odont.*
STEFANOS KOURTIS, DDS, Dr. Odont.†
NIKOLAOS KATSIKERIS, DDS, Dr. Odont.‡
WILLIAM NAGY, DDS§

ABSTRACT

Dental implants have been used successfully for decades in the treatment of edentulous patients and offer great comfort compared with complete dentures. However, completely edentulous patients or patients with several teeth with poor prognosis that will be all extracted have to be provided with an interim complete denture until the implants have been uncovered. Complete dentures are a less attractive option for the patients because of functional, esthetic, and psychological reasons. The use of complete dentures over implants during the patients' healing period has been associated with numerous complications.

The aim of this paper was to present a new type of provisional restoration supported by hopeless teeth and soft tissues.

CLINICAL SIGNIFICANCE

These provisional restorations can be used during the osseointegration period to avoid the use of a complete denture. The teeth can thus be restored with fixed restorations during the whole osseointegration period to provide better comfort and avoid the psychological stress of using a removable prosthesis. Additionally, the problems associated with dentures over implants or grafts (pressure, implant exposure, etc.) can be eliminated.

(*J Esthet Restor Dent* 21:7–18, 2009)

INTRODUCTION

The treatment of patients with dental implants requires an osseointegration period of 3 to 6 months, according to the classical protocol of delayed loading.[1,2] During this period, a tooth-supported provisional restoration can be used for the partially edentulous patient—if there are adjacent teeth in acceptable clinical condition or if there is a removable partial denture.

Dental implants have been used successfully for the treatment of edentulous patients and offer great comfort compared with complete dentures.[3,4] Completely edentulous patients or patients with several teeth with poor prognosis have

*Lecturer, Department of Prosthodontics, University of Athens, Athens, Greece
†Assistant Professor, Department of Prosthodontics, University of Athens, Athens, Greece
‡Director, Clinic for Oral and Maxillofacial Surgery, Hospital "G. Gennimatas", Athens, Greece
§Professor, Director of Graduate Prosthodontics, Baylor College of Dentistry, Dallas, TX, USA

DOI 10.1111/j.1708-8240.2008.00223.x

Figure 1. Case A. Initial clinical situation.

Figure 2. Case A. Initial clinical situation.

to be provided with a complete denture until implant uncoverage stage.

The use of a complete denture over implants requires periodic relining with soft-tissue conditioners, a time-consuming clinical procedure. Complete dentures are also a less attractive option for the patients because of functional, esthetic, and psychological reasons. The use of complete dentures over implants during healing time of the implants has been associated with early implant exposure, infection over healing screws, loosening of healing abutments, and other minor complications.[5,6]

AIM

The aim of this study was to present a new type of provisional restoration supported by teeth with poor prognosis and soft tissues that can be used to avoid the use of a complete denture during the osseointegration period.

CASE PRESENTATIONS

Case A

Initial Clinical Steps

A 55-year-old Caucasian male patient presented seeking prosthetic treatment. The patient suffered from periodontal disease, and all maxillary teeth showed poor prognosis, except the canines and the second left molar with mobility 2 and pocket depths 7 to 8 mm, whose prognosis was doubtful (Figures 1–3). The patient was not satisfied with the existing removable partial denture in the mandible and demanded fixed restorations for both arches.

After detailed clinical examination and full mouth radiographies, initial periodontal treatment was performed on all mandibular teeth and on the maxillary teeth with doubtful prognosis. The existing fixed partial denture (FPD) extending from the upper left canine to the first left molar was removed and replaced by a provisional restoration.

Initial impressions were obtained with alginate, and study casts were made by using Type III hard stone. Face bow registrations and a centric relation registration were made. The study casts were mounted on a semiadjustable articulator, and a diagnostic wax-up was completed on all maxillary teeth.

Treatment Plan

The initial treatment plan included the extraction of all existing teeth and the restoration of the maxilla with six implants with delayed loading, immediately after the extractions in the areas of lateral incisors, first premolars, and first molars. For the osseointegration period, the patient should

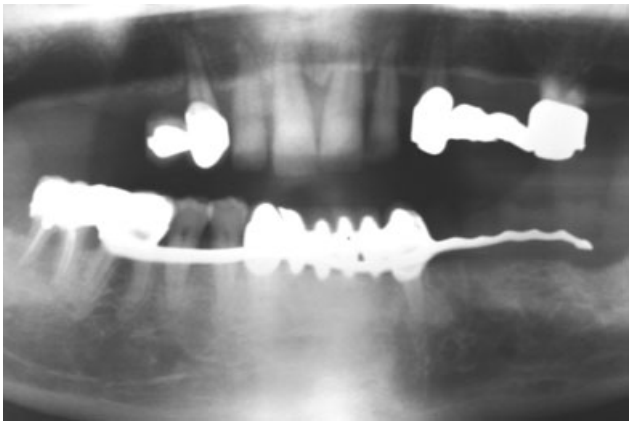

Figure 3. Initial radiographic situation.

Figure 4. Initial metal framework for the provisional restoration.

use a complete denture, which he refused to do.

The patient's demand was to remain edentulous under no circumstances. For this reason, the treatment plan was modified, and a tooth- and tissue-supported provisional restoration was planned for the maxilla.

For the mandible, the treatment plan included two implants in areas of the first left premolar and molar with an implant-supported FPD and two metal ceramic crowns on the first and second right molar.

Construction of the Provisional Restoration

The construction included a cast metal framework covered by polymer resin. The cast metal framework was partially surrounding the remaining teeth (maxillary canines and first left molar) and included a rest on the left tuberosity. The framework was veneered with polymer resin. For marginal accuracy, the prosthesis was intraorally relined before cementation.

Teeth extractions and insertion of the provisional restoration were scheduled on the same appointment. In this way, ovate pontics could be formed over the extraction sockets in order to support the soft tissues and the interdental papillae.

Because immediate insertion after tooth extraction was demanded, there was no possibility for a try-on session. Optimal fit of the metal framework is essential to ensure proper clinical function of the prosthesis over the following months. For this reason, an initial framework was constructed on the working cast by using base metal alloy (Wiron 99, Bego Co., Bremen, Germany) and was tried clinically for verification (Figure 4). The initial framework was bypassing the remaining teeth from the palatal surfaces and reaching the tuberosity. In this way, the accuracy of the working cast was verified, and a new, final metal framework was cast from the same alloy and veneered with polymer material (Gradia, GC Co., Tokyo, Japan) (Figure 5).

Implant Placement

The anterior maxillary teeth, all incisors, and first right premolar, were extracted, and six implants (Xive, Dentsply/Friadent Co., Mannheim, Germany) were immediately inserted in the areas of the maxillary lateral incisors and premolars, both right and left (Figure 6). The provisional restoration was adjusted to avoid any

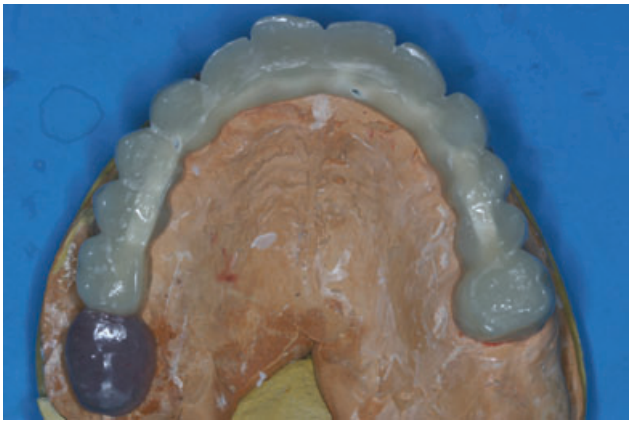

Figure 5. The provisional restoration covered with polymer material.

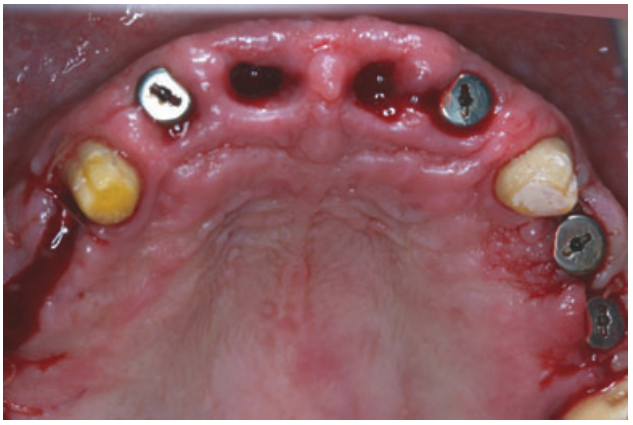

Figure 6. Immediate postextractive insertion of the implants.

pressure over the implants and support the soft tissues in the extraction sockets of the maxillary right central incisor and left lateral incisor. All implants were covered with healing abutments, and the soft tissues were adapted and sutured for open healing. In this way, a better support for the peri-implant soft tissues and a more favorable emergence profile for the final restoration could be achieved.

The provisional restoration was cemented by using temporary cement (Temp Bond , Kerr Co., Orange, CA, USA), and excess cement was removed meticulously. The available space for oral hygiene and the occlusion were checked carefully.

Osseointegration and Soft-Tissue Management

The osseointegration period of 4 four months was uneventful. The provisional restoration needed recementation at monthly recalls. Because of the open healing, the implant uncoverage surgery was avoided, and the soft tissues were stable. The clinical condition of the remaining teeth was satisfactory with evident periodontal improvement and no increase in mobility (Figure 7). Following the osseointegration period, the existing provisional restoration was modified into a tooth- and implant-supported prosthesis.

At this time, the healing abutments were removed and replaced with titanium prefabricated abutments (Esthetic abutments, Dentsply/Friadent Co., Mannheim, Germany). Titanium abutments were used instead of the commonly used temporary abutments, as the former offer increased stability and more accurate fit and are available in an inclined shape.

The tissue-supported rest at the tuberosity was removed, and the restoration was cemented temporarily. Selected pressure was applied in order to shape the interdental papillae in the anterior maxillary region, adding polymer material at weekly recalls. At the end of 8 weeks, the soft tissues were stable, without infection, and with an adequate contour (Figure 8).

The remaining teeth were reexamined and evaluated carefully before the final impression. The periodontal condition was significantly improved, and the mobility was reduced to +, probably because of splinting with the implants. For these reasons, the treatment plan was modified, and the teeth were not extracted and were included in the final restoration. The patient was informed in details and conceded not to extract the

Figure 7. Clinical situation after osseointegration with open healing.

Figure 8. Titanium abutments on the anterior maxillary implants. Selective pressure has been applied in the pontic areas to enhance the desired tissue contour.

Figure 9. The existing provisional restoration that served as a guideline.

teeth, despite their initial doubtful prognosis.

Construction of the Final Restoration

The final impression was made by using polyether impression material (Impregum, 3M-ESPE Co, Seefeld, Germany). The single-mixing technique with a custom impression tray was applied. The construction of the working cast and the mounting on the articulator were accomplished as usual.

The existing transitional restoration was used as a guideline to reproduce tooth position, shape, length, and anterior and canine guidance (Figure 9).

The final restoration was cemented on prefabricated titanium abutments (Esthetic abutments) that were modified individually by using a silicone impression (index) from the provisional restorations.

The restoration included implant-supported FPD between the lateral incisors with the central incisors as pontics, splinted implant crowns of the premolars, and single crowns on the canines and the second left molar. The patient was satisfied with the treatment plan, as he remained at all stages dentulous with fixed restorations. He was also pleased with the final result, both functional and esthetic (Figure 10).

Case B

Initial Clinical Steps

A 50-year-old Caucasian female patient presented for full-mouth prosthetic treatment. The patient

Figure 10. The final restoration.

Figure 11. Case B. Initial clinical situation.

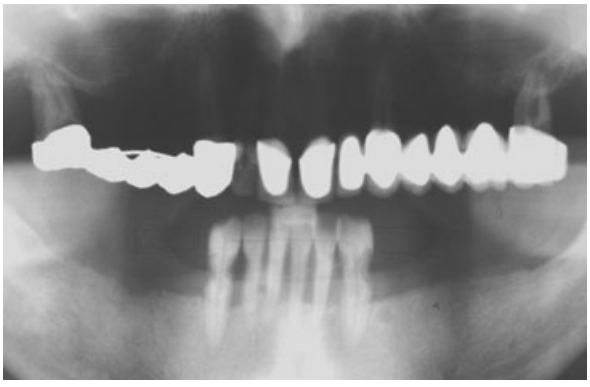

Figure 12. Initial radiographic situation.

Figure 13. Remaining abutment teeth in the maxilla.

suffered from severe periodontal disease, and all maxillary and mandibular teeth (that supported FPD and removable partial denture [RPD]) showed poor prognosis (Figures 11 and 12). The patient rejected the use of any removable prostheses both in the provisional stage and in the final treatment plan. The initial treatment steps were identical to those in Case A.

Treatment Plan

Provisional Restoration

A stage approach was adopted that included the use of an initial tooth- and tissue-supported provisional restoration as a first step and the fabrication of transitional implant-supported restorations (second step) until the final restoration.

The treatment plan for this patient in the maxilla included the construction of an initial long-term provisional restoration supported by the two remaining central incisors. Additional support was gained by the extension of the framework to the retromolar areas (Figures 13–15). At the end of the osseointegration period, the teeth would be extracted, and a second

Figure 14. The maxillary provisional restoration.

Figure 15. The maxillary provisional restoration.

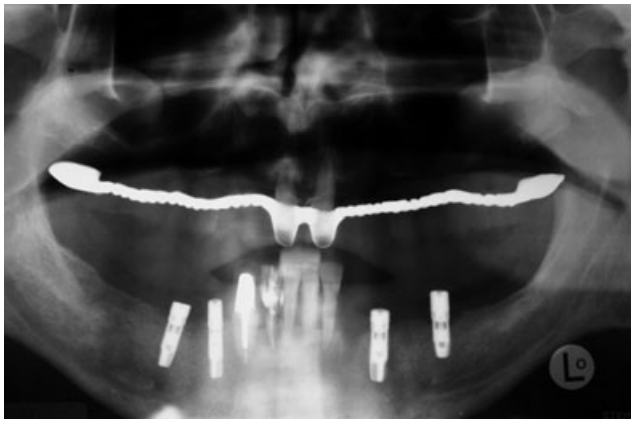

Figure 16. Four implants inserted in the posterior areas of the mandible.

Figure 17. Eight implants inserted in the maxilla. Note the metal framework of the maxillary provisional restoration.

implant-supported transitional restoration was planned to occlude with the transitional implant-supported restoration of the mandible.

In the mandible, the anterior teeth (except the left canine) were maintained to support a provisional RPD for the osseointegration period. To avoid the use of a complete denture in the mandible, four implants were inserted initially at the posterior areas of the first premolars and molars (Figure 16). At the end of osseointegration period, the teeth were extracted and two additional implants were inserted in the lateral incisor areas (Figure 17). At this time, a screw-retained transitional restoration supported by the posterior implants was planned for the mandible until the osseointegration of the anterior implants.

Final Restoration

Implant-supported cement-retained restorations were planned for both arches, with eight implants in the maxilla and six in the mandible.

Construction of the Provisional Restoration (First Step)

The construction stages of the provisional restoration in the maxilla were identical to those in case A. The framework was veneered with polymer material (Figures 13–15).

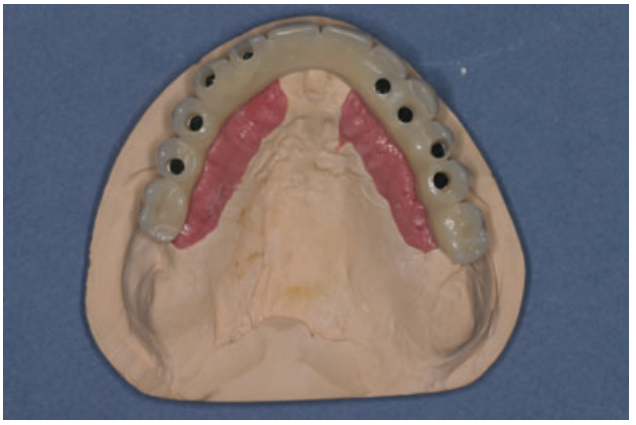

Figure 18. The maxillary screw-retained implant supported transitional restoration.

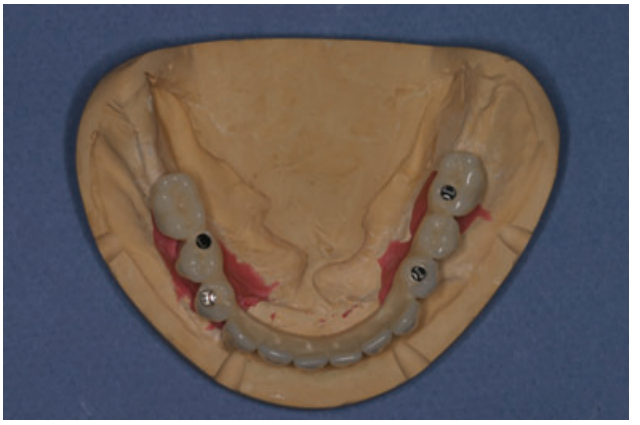

Figure 19. The mandibular screw-retained implant-supported transitional restoration.

Cementation and occlusion were performed as described in the previous case.

Implant Placement

Eight implants (Replace Select tapered, Nobel Biocare, Goetheburg, Sweden) were inserted in the maxilla at regions of lateral incisors, canines, and first and second premolars.

In the mandible, four implants (Replace Select straight, Nobel Biocare) were inserted in areas of first premolars and first molars bilaterally (Figures 16 and 17). The maxillary provisional restoration was recemented immediately after implant placement. The RPD in the mandible was used with soft-tissue conditioner replaced at 3-week recalls. The osseointegration period and the soft-tissue healing, after implant uncoverage, were uneventful.

Implant Uncoverage, Construction of Transitional Restorations (Second Step)

After implant uncoverage, the supporting maxillary and mandibular teeth were removed, and new screw-retained transitional restorations were constructed for both arches. Eight implants were used in the maxilla and four in the mandible. For the support of the transitional restorations, temporary nonengaging abutments (Replace Temporary Abutments) were used and modified in the laboratory.

The existing provisional served as a guideline for the new transitional restoration, and the patient could be easily adapted to the new situation (Figures 18–20).

Final Restorations

At the end of the osseointegration period of the mandibular anterior, implants for the final construction could be initiated. After impression making, face-bow and centric relation registration were obtained, and the working casts were constructed and mounted on a semiadjustable articulator.

The final restoration for both arches consisted of implant-supported cemented restorations. Custom-made abutments (Gold Adapt Nobel Biocare, Goetheburg, Sweden) were used that were modified individually according to the desired contour with overcasting (Figures 21–23). Although prefabricated titanium abutments offer a simple and economic solution, the use of custom-made abutments in this case was mandatory, as the cervical contour should be individualized and the abutment height was limited and inadequate. The metal ceramic restorations were also cast with gold alloy.

Figure 20. Transitional restoration tried on the patient.

Figure 21. Control of the available space with a silicone index from the diagnostic wax-up. Customized abutments in adequate dimensions.

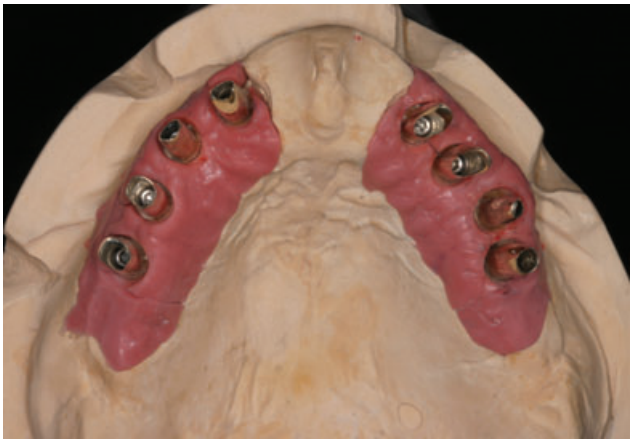

Figure 22. The maxillary custom-made abutments.

Figure 23. The mandibular custom-made abutments.

The final result fulfilled the patient's demands and expectations (Figures 24–26). The patient was totally satisfied, as she had fixed restorations throughout the whole treatment period.

DISCUSSION

The restoration of patients with numerous existing hopeless teeth is a great challenge for the clinician. On the other side, the patient is confronted with an immediate denture that cannot fulfill his or her functional and esthetic demands. The psychological impact is often of great importance for a person who was used to having natural teeth. Extended edentulous spans are also a clinical problem if they cannot be restored temporarily with classical provisional restorations.

The use of a long-term fixed provisional restoration supported by teeth with poor prognosis and retromolar soft tissues can be very helpful to restore a patient during the osseointegration period. The hopeless teeth may be extracted

Figure 24. The final restorations.

Figure 25. The final restorations.

Figure 26. The final restorations.

before the final impression but can contribute significantly to the patient's comfort. Although the patient may be restricted to soft foods and these constructions are prompt to frequent decementation, they are well accepted by the majority who choose this alternative solution instead of a complete denture.

The problems associated with the clinical use of tooth- and tissue-supported provisional restorations concern decementation, and, in one case, only a framework fracture was noted after 1 year of service because the patient postponed the implant placement.

All problems from the use of a complete denture subsided, and there is no load transfer to the healing abutments or cover screws. An additional clinical advantage is the possibility of applying selective pressure for proper soft-tissue management.[7] The patient can also evaluate the esthetics and phonetics of the future restoration without the difficult adaptation to a complete denture. Furthermore, the provisional restoration can be used as a guideline of the laboratory construction of the framework by using silicone impressions (index) and the cutback technique.[8]

Because of the different number, position, and clinical condition of the supporting teeth, it is not possible to have any statistical evaluation of the applied restorations. As an overview, however, more than 100 patients have used these constructions for periods ranging from 3 to 18 months. On several occasions, the provisional restoration had to be modified because of extreme tooth mobility and extraction. Decementation was observed frequently and could be prevented

by monthly recalls. In certain clinical cases, however, the supporting teeth could be used in the final restoration, as their clinical condition was not suggesting extraction. No adverse effect or inflammation was observed on the retromolar soft tissue.

Immediate loading of dental implants is an alternative treatment option that avoids all of the abovementioned problems, but it still remains questionable if it can be applied in all clinical cases.[9–13]

DISCLOSURE

The authors do not have any financial interest in the companies whose materials are included in this study.

REFERENCES

1. Branemark PI. Osseointegration and its experimental background. J Prosthet Dent 1983;50:399–410.
2. Adell R, Lekholm U, Rockler B, Branemark PI. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg 1981;10:387–416.
3. Cox JF, Zarb GA. The longitudinal clinical efficacy of osseointegrated implants: a 3-year report. Int J Oral Maxillofac Implants 1987;2:91–100.
4. Adell R, Erickson B, Lekholm U, et al. A long-term follow up of osseointegrated implants in the treatment of totally edentulous jaw. Int J Oral Maxillofac Implants 1990;5:347–58.
5. Friberg B, Jemt T, Lekholm U. Early failures in 4,641 consecutively placed Branemark dental implants: a study from stage 1 surgery to the connection of completed prosthesis. Int J Oral Maxillofac Implants 1991;6:142–6.
6. Kourtis S, Sotiriadou S, Voliotis S, Challas A. Long term clinical results from the use of implants in four private dental clinics. Part I: implant survival and evaluation of risk factors. Part II: surgical and prosthetic restorations. Implant Dent 2004;13:373–85.
7. Kourtis S, Psarri Ch, Andritsakis P, Doukoudakis A. Restorations for optimizing esthetics in anterior maxillary implants: a case report. J Esthet Restor Dent 2007;19:6–18.
8. Kourtis SG. Selection and modification of prefabricated implant abutments according to the desired restoration contour: a case report. Quintessence Int 2002;32:383–8.
9. Szmucler-Moucler S, Piatelli A, Farero GA, Dubruille JH. Considerations preliminary to the application of early and immediate loading protocols in dental implantology. Clin Oral Implants Res 2000;11:12–35.
10. Glauser R, Ree A, Cundgreen A, et al. Immediate occlusal loading of Branemark implants applied in various jawbone regions: a prospective 1-year clinical study. Clin Implant Dent Relat Res 2001;3:204–13.
11. Chow J, Hui E, Liu J, et al. The Hong Kong Bridge Protocol. Immediate loading of mandibular Branemark fixtures using a fixed provisional prosthesis: preliminary results. Clin Implant Dent Relat Res 2001;3:166–74.
12. Colomina LE. Immediate loading of implant fixed mandibular prostheses: a prospective 18-month follow up clinical study—preliminary report. Implant Dent 2001;10:23–9.
13. Honushi K, Ucluda H, Yamamoto K, Sugimura M. Immediate loading of Branemark system implants following placement in edentulous patients: a clinical report. Int J Oral Maxillofac Implants 2000;15:865–72.

Reprint requests: Kourtis Stefanos, DDS, Dr. Odont., Department of Prosthodontics, University of Athens, Plaza Chrys. Smyrnis 14, Athens 17121, Greece; Tel: 30-697-2838900; email: stefkour@dent.uoa.gr