



A TECHNIQUE FOR IMMEDIATE OCCLUSAL IMPLANT LOADING OF A COMPLETELY EDENTULOUS MANDIBLE: A CLINICAL REPORT

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The protocols described are designed for immediate implant loading of the completely edentulous mandible and to provide the patient with a prosthesis that incorporates structural durability and esthetics in a time efficient manner. Incorporating appropriate diagnostic and surgical procedures, this clinical report describes the use of custom-fabricated transparent devices that help the clinician identify implant position, thereby reducing the procedural time and improving the structural durability and esthetics of the immediate prosthesis. (*J Prosthet Dent* 2012;107:221-226)

Immediate implant loading has been documented as a predictable option for restoring missing teeth. This concept was developed to provide restoration of the dentition immediately after implant placement, and thereby reduce treatment time, patient discomfort, and postoperative care.¹⁻⁵ In addition, immediate loading has a positive psychological effect on both partially and completely edentulous patients.⁶⁻¹²

Immediate implant loading of the completely edentulous mandible is well documented in the literature. Its success is partly due to good bone quantity and quality in the anterior mandible, which has been considered the most successful region for this procedure.^{3,13-17} Histologic and histomorphometric evaluation confirmed that immediate occlusal loading could present a high level of bone-to-implant contact in humans.¹⁸ The use of a fixed screw-retained immediate prosthesis is the most described solution for treating these situations. It is necessary to place the prosthesis as soon as possible after surgery,

which reduces postoperative pain and before postoperative swelling, which jeopardizes ease of positioning of the implant-supported restoration.^{19,20} The rehabilitation of the edentulous mandible with an immediate occlusally loaded implant-supported prosthesis is equally successful when loading is applied the same day or the day after implant placement.²¹ High success rates have been documented with a combination of 4 implants placed between the mental foramen and consecutive immediate loading with a fixed acrylic resin prosthesis.²²

Because of technical problems, the Novum procedure (Nobel Biocare, Göthenburg, Sweden), which uses precision-fit surgical and prosthetic templates to load the implant with a prefabricated prosthesis on the same day, does not guarantee clinical outcomes comparable to those of conventionally loaded restorations.^{23,24} A commonly used technique for providing immediate loading involves the use of temporary abutments and a prefabricated prosthesis, which is refitted around the abutments. After the abutments are positioned on the

implants, autopolymerizing acrylic resin is used intraorally to connect the abutments and prosthesis.²⁴⁻²⁷ A similar technique is prosthesis conversion, which adapts the patient's existing denture to the temporary abutments.^{3,28} This protocol includes the use of specific transmucosal components that help the clinician during the indirect procedure by moving the prosthesis interface more coronally.²⁹ This clinical report describes a protocol that involves the use of transparent devices to better identify implant position during the transfer procedure for immediate occlusal loading in the edentulous mandible.

CLINICAL REPORT

A 65-year-old healthy white man complaining of functional and esthetic problems with his complete dentures was referred for treatment. The patient had been wearing maxillary and mandibular complete dentures for about 30 years and was no longer satisfied with the esthetics of the maxillary complete denture or with

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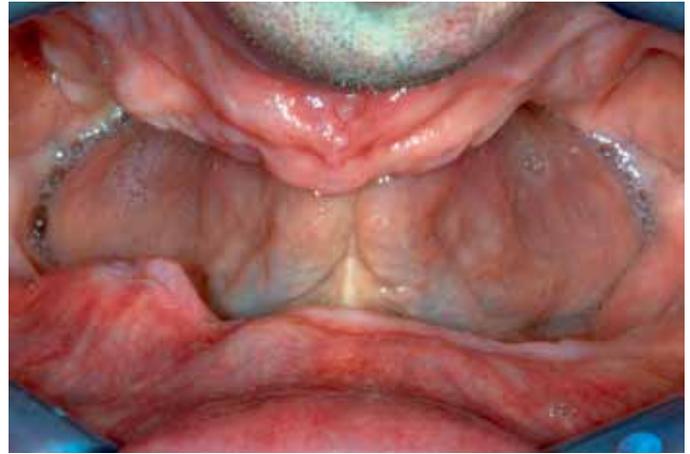
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1 Pretreatment frontal view with prostheses.



2 Pretreatment frontal view.



3 Mandibular interim complete denture, occlusal view.



4 Transparent surgical guide, occlusal view.

the stability of the mandibular prosthesis (Fig. 1). The initial examination for possible implant placement included extraoral and intraoral evaluations with and without the existing prosthesis, analysis of the dentures, and radiographic examination of the residual bone (Fig. 2). To address the patient's chief complaint, the treatment plan included the fabrication of a maxillary complete denture and an implant-supported complete denture for the mandible. Implant-supported or implant-assisted restorations were considered but were not chosen for treatment because the patient was concerned only with the esthetics of the existing complete denture. Anterior vestibuloplasty was discussed with the patient for the maxillary arch but was not planned (Fig. 2). Tissue conditioning material (Hydro-cast; Kay-See Dental Manufacturing Co, Kansas City, Mo) was used to improve

the condition of the soft tissue before definitive impression procedures, and no interim prosthesis was fabricated. In the mandibular arch, 4 dental implants were planned with an interim immediate acrylic resin-based prosthesis designed to be screw-retained and left in place for 3 months before definitive prosthesis fabrication.

During the initial examination, preliminary impressions of the edentulous arches were made with irreversible hydrocolloid materials (Jeltrate Plus, Dentsply Caulk, Milford, Del). Preliminary casts were fabricated with Type III dental stone (Dental Hydrocal, Kerr Corp, Romulus, Mich), and the maxillary cast was used for the fabrication of a custom tray (SR Ivolen; Ivoclar Vivadent, Schaan, Liechtenstein). After border molding with modeling plastic impression compound (Impression Compound; Kerr Corp), a definitive impression

for a maxillary complete denture was made (Permlastic; Kerr Corp, Romulus, Mich). The definitive cast for the maxillary complete denture was fabricated with Type IV dental stone (New Fuji-Rock, GC Corp, Tokyo, Japan). The inter-occlusal registration was obtained by using record bases with wax rims and wax (Aluwax Dental Products Co, Allendale, Mich) as the registration material. Before proceeding with the completion of the definitive maxillary complete denture and interim mandibular complete denture, a trial insertion was performed to visualize the final functional and esthetic outcome. A definitive complete denture was then fabricated for the maxillary arch and an interim complete denture, prepared to be modified at the implant placement, was fabricated for the mandible (Fig. 3). The mandibular denture was duplicated in transparent autopolymer-

izing material (Ortho Resin; Dentsply DeTrey GmbH, Konstanz, Germany) to fabricate a surgical guide, which was opened on the lingual side of the incisal edge of the mandibular teeth (Fig. 4). This surgical guide was made to be used first during placement of the implants and also during the immediate loading procedures. Additionally, a vacuum-formed plastic template (Essix Tray-Rite; Dentsply DeTrey) was fabricated for the mandibular complete denture (Fig. 5). Therefore, on the day of surgery, a definitive maxillary complete denture and an interim mandibular complete denture (Fig. 3) to be modified after implant placement were prepared. In addition, a surgical guide fabricated from the interim denture (Fig. 4) and a plastic vacuum-formed template were prepared for the immediate occlusal loading procedure (Fig. 5).

The patient was anesthetized (4% articaine with 1:100,000 epinephrine, Alfacaina SP; Dentsply Italy Srl, Rome, Italy), and a midline crestal incision was made to maximize keratinized mucosa on each side of the incision. A full-thickness mucoperiosteal flap was elevated to better visualize the mental foramen and residual ridge anatomy. A reduction of the knife-edge residual bone was performed before the implant placement, predominantly in the mandibular right quadrant. By following the indications of the radiographic diag-

nosis and using the surgical guide, 4 dental implants (Osseotite tapered FNT; Biomet 3i, Palm Beach Garden, Fla) were placed between the mental foramen. The 2 distal implants were placed at an incline to reduce the distal cantilever of the prosthesis and to avoid the anterior loop of the mandibular inferior alveolar nerve. For all of the implants, an insertion torque higher than 50 Ncm and an Implant Stability Quotient higher than 70 (Osstell Integration Diagnostics, Gothenburg, Sweden) were obtained. After the insertion of 4 straight conical abutments (Biomet 3i), the tissues were sutured (5/0 Vicryls, Ethicon; Johnson & Johnson, Cincinnati, Ohio). The proper heights of the multiunit abutments were selected to be slightly above the sutured soft tissue. All of the abutments were torqued to 32 Ncm (Contra Angle Torque Driver; Biomet 3i) according to the manufacturer's recommendations.

Before the insertion of the temporary cylinders for the multiunit abutments, the interim complete denture was relined with a silicone material (Fit Checker; GC Corporation, Tokyo, Japan) to identify the position of the implants. The temporary cylinders (Biomet/3i) were torqued to 10 Ncm (Contra Angle Torque Driver; Biomet/3i), and the surgical guide was adapted around the cylinders. The vacuum-formed shell, was placed on the surgical guide, to help locate

the temporary cylinders, which were recorded with a diamond rotary instrument (FG Diamond Bur; Komet Italia srl, Milan, Italy) and a marker (Fig. 6). The vacuum-formed plastic template was then transferred to the interim complete denture, guiding an appropriate denture reduction for the cylinder transfer procedure. The use of the transparent devices and the identification of the implant position through the relining material resulted in a minimal denture reduction on the prosthesis without compromising esthetics and structural integrity (Figs. 7, 8). The proper position of the mandibular complete denture was verified by using the remaining soft tissues in the molar region and from the occlusal relationship with the definitive maxillary complete denture. Dental dam was placed around the temporary cylinders, and cotton pellets were secured inside the screw access holes before the transfer of the temporary cylinder with autopolymerizing acrylic resin (Tokuso Rebase Fast; Tokuyama Dental, Yamaguchi, Japan). Once the acrylic resin was polymerized, the abutments were unscrewed and the prosthesis finalized. The distal extension and the flanges were removed for ease of cleaning, and the surfaces were polished (Figs. 9,10). The interim implant-supported complete denture was then inserted, and the screws were torqued to 12 Ncm. The occlusion was verified and adjusted to even contact in centric



5 Vacuum-formed acrylic resin template, occlusal view.



6 Position of temporary cylinders identified through transparent surgical guide and vacuum-formed acrylic resin template.



7 Vacuum formed acrylic resin template, with positions of cylinders marked, placed over interim complete denture.



8 Interim complete denture prepared for transfer procedure. Note that acrylic resin reduction was performed with guidance from transparent vacuum formed template.



9 Interim implant-supported complete denture, occlusal view.



10 Interim implant-supported complete denture, intaglio view



11 Definitive maxillary complete denture and interim implant-supported mandibular complete denture immediately after implant placement.



12 Definitive maxillary complete denture and definitive implant-supported complete denture 4 months after implant placement.

and light group function. The screw access holes were closed with gutta percha (Gutta Percha Points; Roydent Dental Products, Johnson City, Tenn), cotton, and a provisional material

(Fermit; Ivoclar Vivadent, Schaan, Liechtenstein) (Fig. 11). One week after the implant placement and prostheses insertion, the sutures were removed and the occlusion was verified

and minimally adjusted. The patient's progress was followed at 3 weeks and at 2 months after the procedure.

Three months after the implant placement, when osseointegration

was considered optimal and tissues were remodeled, the definitive implant-supported complete denture was fabricated with Computer Aided Design/Computer Aided Manufacturing (CAM StructSURE Precision Milled Bars and Frameworks; Biomet/3i). The titanium-acrylic resin prosthesis was torqued to the implant heads at 32 Ncm (Contra Angle Torque Driver; Biomet/3i). The distal cantilever extensions were extended to the first molar, respecting the anterior-posterior spread, and a lingualized occlusal scheme was followed (Fig. 12).³⁰ The patient has been observed for 3 years and no complications have been reported.

DISCUSSION

This clinical report illustrates a practical technique for improving the predictability and efficiency of an immediate complete-arch occlusal loading procedure in the edentulous mandible. In these situations, immediate loading is commonly used since it provides a high success rate and improves patient comfort.^{1,20} Different prosthetic protocols have been described, and the transfer procedure is one of the most used for providing immediate occlusal loading after implant placement.²³

The predictability of the transfer technique, especially when the implants are intentionally or accidentally tilted, might be reduced given the difficulties in identifying the position and angulation of the implants. The use of the 2 transparent devices described allows a limited and selective immediate prosthesis reduction before the transfer procedure because the implants are better identified and transferred. This helps the prosthesis to provide immediate adequate esthetics because the clinician is unable to unscrew the prosthesis and no modifications can be made during the first weeks after implants.^{4,5} At the same time, the immediately loaded prosthesis provides structural durability, thereby limiting complications

such as fracture. Furthermore, reducing the amount of acrylic resin used provides improved marginal precision and adequate cross-arch stabilization of the implants.^{1,2,14,22} Moreover, prosthetic and technical aspects should be completed in the shortest possible time to improve patient comfort after the surgical procedure.⁷ The use of the 2 transparent devices also favors easier identification of the position of the cylinders, and for this reason, the denture preparation for the transfer procedure becomes less time consuming.

Limitations need to be considered especially when reduced bone resorption has limited interarch space. In these situations, the use of this technique can be difficult and technique sensitive. Moreover, a consideration of the reduced thickness and height of the prosthesis reinforcement should be part of the acrylic resin prosthesis design. This technique should be used only for the fabrication of an interim prosthesis that needs to be substituted with a definitive one as soon as implant integration and hard and soft tissue stability are achieved.

SUMMARY

In the treatment of edentulous mandibular arches with an implant-supported complete denture, immediate occlusal loading was performed with a modified transfer procedure. Before surgery, an immediate denture and 2 transparent guides were fabricated. The transparent devices were used during the surgery for proper implant positioning and then used to limit the amount of acrylic resin reduction of the prefabricated denture. This protocol improved the structural durability, esthetics, and marginal adaptation of the immediate prosthesis and also reduced the time necessary for the procedure.

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NOTEWORTHY ABSTRACTS OF THE CURRENT LITERATURE

Effect of implant diameter on reliability and failure modes of molar crowns

Freitas-Júnior AC, Bonfante EA, Martins LM, Silva NR, Marotta L, Coelho PG.
Int J Prosthodont 2011;24:557-61.

The reliability and failure modes of molar crowns supported by three different implant-supported designs were tested according to the following groups: group 1, one standard-diameter implant (3.75 mm); group 2, one narrow-diameter implant (3 mm); and group 3, two narrow-diameter implants (3 mm). Loads were applied as mouth-motion cycles using a step-stress accelerated life-testing method. β values for groups 1 and 3 (1.57 and 2.48, respectively) indicated that fatigue accelerated the failure of both groups, but not for group 2 (0.39). Abutment screw failure was the chief failure mode. Strength and reliability were significantly higher for groups 1 and 3 compared to group 2.

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