Rehabilitation of edentulous patients with complete-arch screw-retained prostheses has been considered an optimal treatment choice. The prosthesis provides the greatest satisfaction and oral health-related quality of life because of its retention and stability.\textsuperscript{1,2} An implant survival rate of 100\% after 5 years\textsuperscript{3} and 97.7\% after a mean time of 8 years\textsuperscript{4} has been reported in patients with adequate bone support. However, a considerable number of fractures have been reported related to severely resorbed mandibles treated with endosteal dental implants.\textsuperscript{5-7} One of the most affected populations is postmenopausal women.\textsuperscript{6,8-12}

The mandibular fracture might occur during implant placement\textsuperscript{10} or later during function\textsuperscript{13} because the implant's presence weakens an already compromised mandible.\textsuperscript{5} When a fracture occurs during implant placement, the mandible requires immediate fixation, and the implant therapy is generally interrupted. If a fracture occurs during function, in addition to a surgical procedure for mandibular reduction and immobilization, the solution generally involves implant removal and prosthesis loss because the fracture typically occurs at the implant-bone interface. As the risk of mandibular fracture is difficult to eliminate in patients with severe resorption, a fixation technique was developed. This technique uses a titanium plate to immobilize the implant region. The titanium plate is placed during the same surgical procedure as the implant therapy. With this technique, several of the consequences mentioned previously can be avoided.

\textbf{CLINICAL REPORT}

Fixation of a severely resorbed mandible for complete arch screw-retained rehabilitation: A clinical report

Vinicius Fabris, DDS, MSD\textsuperscript{a} and Atais Bacchi, DDS, MSD, PhD\textsuperscript{b}

\textbf{ABSTRACT}

Severely resorbed mandibles with placed endosteal dental implants can fracture. Therefore, techniques to reduce the risk or minimize the consequences of these fractures are needed. This clinical report presents a technique for placing a titanium plate in a severely resorbed mandible subjected to complete-arch implant therapy. The titanium plate is placed in the same surgical procedure as the implants, allowing immediate implant loading. This technique provides safe implant-supported treatment for patients with severe mandibular resorption. (J Prosthet Dent 2016;115:537-540)

\textbf{CLINICAL REPORT}

A healthy, 56-year-old woman sought treatment for the absence of retention and stability in her mandibular complete denture and for related masticatory pain. Upon initial examination, the patient presented both maxillary and mandibular edentulous ridges (Fig. 1) supporting conventional complete dentures. The panoramic radiographic examination (Fig. 2) revealed a resorbed mandible at the “D” level of the Misch classification (severe resorption – bone only at basal level).\textsuperscript{14} The maxillary ridge presented moderate resorption, which according to the patient provided adequate retention and stability for the complete denture. No additional pathology was diagnosed in the hard or soft tissues.

Computed tomography was used to measure the height of the mandible. The anterior region between the mental foramina had a mean height of 12 mm, which presented a risk of fracture during implant placement or during function. Additionally, the mental foramina were superficial at the ridge crest, which may have caused her masticatory pain.

Treatment options were discussed with the patient, and a complete-arch screw-retained mandibular prosthesis with a maxillary complete denture was chosen.\textsuperscript{15}

\textsuperscript{a}Adjunct Professor, Department of Oral Surgery, Meridional Faculty, Rio Grande do Sul, Brazil.

\textsuperscript{b}Adjunct Professor, Department of Prosthodontics, Meridional Faculty, Rio Grande do Sul, Brazil.
A mandibular fixation before implant therapy was planned because of the risk of mandibular fracture. A mandibular prototype (Bioparts) was fabricated for surgical planning based on the computed tomography (Fig. 3). The mandibular prototype also allowed for the modeling of the 10-hole, commercially pure titanium (TiCP) plate (Ø 2.4×80 mm, Ref 449400; Synthes; Johnson & Johnson) used for mandibular fixation (Fig. 3).

Before the surgical procedure, impressions of the edentulous arches were made with irreversible hydrocolloid (Cavex ColorChange; Cavex Holland BV) and poured with Type IV dental stone (Fujirock; GC Corp). Custom trays were made in autopolymerizing acrylic resin (Clas Mold; Classico Dental Products) for a definitive impression. Border molding was obtained with modeling plastic impression compound (Impression Compound; Kerr Corp), and the definitive impression was made with polyether impression material (Impregum soft; 3M ESPE) and poured in Type IV dental stone (Fujirock; GC Corp). Record bases with occlusion rims were made and adjusted according to esthetic and functional principles. A centric relation interocclusal record was obtained, and the casts were mounted on a semi-adjustable articulator (A7 Fix; BioArt). Artificial teeth (Trilux; VIPI Dental Products) were arranged and evaluated in the mouth to verify the esthetics (midline, occlusal plane, relation to high lip), lip support, occlusal vertical dimension, maximum intercuspation, and phonetics. The surgical template for the mandibular arch was made in transparent autopolymerizing acrylic resin (Clas Mold; Classico Dental Products) by duplicating the arrangement of the teeth.

The antibiotic cephalexin (500 mg) and the anti-inflammatory dexamethasone (4 mg) were administered preoperatively. The surgery was performed in a hospital environment under general anesthesia and nasotracheal intubation. Local anesthesia with lidocaine 2% (1:200 000) was used to improve vasoconstriction.

An extraoral incision was made according to the demarcation in Figure 4. After the mandibular bone was exposed, the titanium plate was fixed on the buccal surface of the mandible with TiCP screws (Ø 2.0×8 mm, Ref 411908; Synthes; Johnson & Johnson) (Fig. 5). The plate and the screws were positioned considering...
the anatomic structures and the position of the future implants as previously planned.

Four external hexagon implants (Ø3.75×9 mm; Titanax Ti Cortical; Neodent) were placed between the mental foramina in the anterior mandibular region with an insertion torque of 45 Ncm. Mini conical abutments (Neodent) with a transmucosal height of 3.0 mm were connected to the implants (Fig. 6). A resorbable suture (Vicryl 4.0; Ethicon) was used in the periosteum and muscular structures, and a nonresorbable suture was used in the skin (mono-nylon 6.0; Ethicon).

Impression copings (Neodent) were screwed on the mini conical abutments and joined to each other with metal rods and autopolymerizing acrylic resin (Pattern Resin; GC Corp) to obtain a verification jig. The jig was removed and connected to abutment analogs (Neodent) to obtain an implant position cast with Type IV dental stone ( FujiRock; GC Corp). The implant position cast was used to fabricate and evaluate the fit of the prosthetic framework, which was cast in cobalt-chromium alloy (Biosil F; Dentsply Intl) with the lost-wax technique.

New impression copings (Neodent) were connected to the mini conical abutments (Neodent) and joined to the surgical template with autopolymerizing acrylic resin (Pattern Resin; GC Corp). Polyvinyl siloxane impression material (Express XT; 3M ESPE) was inserted into the surgical template. The centric relation record was refined using autopolymerizing acrylic resin (Pattern Resin; GC Corp) at 3 points of the surgical template, 1 anterior and 2 posterior. The surgical template was unscrewed from the implants and removed from the patient’s mouth. Abutment analogs (Neodent) were connected to the impression copings, and the definitive cast was poured in Type IV dental stone ( Fujirock; GC Corp). A silicone putty index (Zetalabor; Zhermack) obtained from the buccal surfaces of the initial arrangement of teeth was used to guide the prosthetic waxing with the framework on the definitive cast, and both maxillary and mandibular prostheses were made with heat-polymerized acrylic resin (Classico; Classico Dental Products).

The complete-arch screw-retained mandibular prosthesis was connected to the mini conical abutments, and the maxillary complete denture was adjusted and delivered. The occlusion was adjusted, and instructions were given to the patient, specifying that she eat only soft foods during the initial healing period. A panoramic radiograph was made (Fig. 7). The patient has been followed for 2 years without any complication (Fig. 8). The location of the extraoral incision has shown no complication or esthetic deficit.

**DISCUSSION**

The described treatment can improve the prognosis for complete-arch implant-supported prostheses in patients with severe resorption of the mandible and risk of fracture. The technique was developed because of several reports of mandibular fracture after treatment with endosteal dental implants.6,7,10 The mandibular atrophy that occurs after teeth are removed significantly reduces vertical and horizontal bone dimensions, increasing the bone’s susceptibility to fracture.5,6,11 This becomes more
critical when associated with other local and systemic conditions, such as significant reduction in bone density, implant placement where thin bone walls remain, fixation penetrating the cortical basal region, and perimplantitis. Prosthetic factors such as excessive cantilevers also represent a risk of fracture.

The titanium plate used for mandibular fixation in the present report is commonly used to immobilize fractured mandibles. Using this rigid fixation, the risk of fracture during implant placement and when the prosthesis is in function should be reduced. However, if a fracture does occur, the complications can be assumed to be fewer because the fractured mandible will already be immobilized, averting the need for a new surgical intervention.

Overdentures retained by 2 implants are also effective treatment options for edentulous patients. However, this option was not the first choice for the current patient because of the position of the mental foramina on the crest of the residual ridge. Thus, overdentures would not solve the problem of mastication pain, as the denture would still put pressure on the mental nerves.

The clinical technique used has been followed for 2 years without any complication. This technique has also been applied to 6 other patients who presented with similar bone conditions, and no complications have been found after a follow-up period of 5 years. All patients reported satisfaction with the treatment, and none related any episodes of functional pain, limitation, or discomfort.

**SUMMARY**

This clinical report describes the use of a titanium plate for fixation of severely resorbed mandibles that had been subjected to endosteal dental implant therapy; the goal was to reduce the risk and consequences of trans- or postoperative fractures. This technique does not require an additional surgical procedure. It also prevents significant complications from fractures during implant installation or during function and allows for immediate implant loading.

**REFERENCES**


**Corresponding author:**
Dr Atais Bacchi
Rua Senador Pinheiro, 302
99070-220, Passo Fundo, RS
BRAZIL
Email: ataisbacchi@yahoo.com.br

Copyright © 2016 by the Editorial Council for The Journal of Prosthetic Dentistry.