

Case Report

Using Mini Dental Implants to Improve the Stability of an Existing Mandibular Complete Denture in a Patient with Severe Ridge Resorption

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Abstract

This case report presents a completely edentulous patient with severe ridge resorption who was not satisfied with his new mandibular complete denture. Three mini dental implants were placed to retain and improve the stability of his mandibular denture. In addition, a technique was employed to incorporate a metal framework into the existing implant overdenture.

Keywords: MDI, implant overdenture.

Introduction

Treating edentulous patients with a severely resorbed mandibular ridge always presents a challenge to dentists. According to a survey, 66% of elderly subjects are dissatisfied with their complete dentures because of discomfort and poor fit and retention.¹ The survey further revealed that soreness and pain cause more problems for subjects with mandibular dentures than for those with maxillary dentures.¹ Overwhelming evidence in support of implant overdentures led to the McGill Consensus Statement and more recently to the York Consensus Statement that a mandibular two-implant retained overdenture should be considered “the first choice of standard of care for edentulous mandibles.”^{2, 3}

The diameter of conventional dental implants ranges from 3.75 mm to 5 mm, and patients must have sufficient bone width for implant placement. Hence, for patients having a narrow alveolar ridge and lacking in keratinized mucosa, conventional implants may not be the best treatment option. In this situation, mini dental implants (MDI) serve as an alternative. Four implants should be placed between the mental foramina to retain a mandibular overdenture.⁴⁻⁶

Overdenture fractures are frequently reported because of the large space occupied by abutments and retentive components in implant overdentures.⁷ As such, a cobalt-chromium metal framework is usually needed to reinforce implant overdentures. However, incorporating a metal framework into existing dentures is difficult if not impossible.

In this report, we present the case of a completely edentulous patient with severely resorbed ridges who was not satisfied with his mandibular denture after we delivered a new set of complete dentures. Three MDIs were placed to retain his existing mandibular denture, and a metal framework was inserted into his mandibular overdenture to reinforce the denture.

Case report

A 62-year-old male patient was referred to the Department of Dentistry of National Taiwan University Hospital for prosthetic treatment. He has worn a set of complete dentures for about twenty years. His chief complaints were poor retention of his mandibular denture and inability to chew comfortably. No major systemic diseases or drug allergies were reported. Severe ridge resorption of both jaws was noted in the clinical examination (Fig1). In addition, hard palate shape was flat, House's palatal throat form was Class II, Neil's lateral throat form was Class II, and ridge shape was flat in the maxilla and knife-edge to flat in the mandible. These conditions indicated the difficulty of achieving good denture retention and stability. Implant therapy in the mandible was suggested but was rejected by the patient due to financial factors. Therefore, the fabrication of new and complete dentures was arranged.

Final impressions were made with green-compound border molding (Compounds, Kerr Corporation, Romulus, Mich., USA) and polyether impression (ImpregumTM PentaTM Soft, 3M ESPE, Meuss, Germany) (Fig2), and master casts were created with Type IV dental stone (Silky-Rock, Whip Mix Corporation,

Louisville, Ky., USA). After face-bow transfer and bite registration, the master casts were mounted on a semi-adjustable articulator (Denar[®] Mark II Articulator, Whip Mix Corporation, Louisville, Ky., USA). SR Vivodent PE (Ivoclar Vivadent AG, Schaan, Liechtenstein) and SR Ortholingual DCL artificial teeth (Ivoclar Vivadent AG, Schaan, Liechtenstein) were selected for the anterior and posterior regions, respectively. Lingualized occlusion was used. After delivering the complete dentures (Fig3), the patient was satisfied with the maxillary denture but was still suffering from the instability and poor retention of the mandibular denture. Therefore, he finally accepted the intervention of mandibular implant therapy.

The new mandibular denture was duplicated to obtain an image guide for evaluating bone quality and quantity with a cone beam CT (i-CAT, Imaging Sciences International, LLC, Hatfield, Pa., USA). The images were reconstructed and analyzed with the ImplantMax system (ImplantMax, Saturn Image Inc., Taipei, Taiwan). Only three MDIs were planned between the mental foramina due to limited keratinized mucosa, short interforaminal distance, and financial reasons. A surgical stent was constructed by transferring the



Fig1 a. Frontal view showing severe ridge resorption of both jaws
b. Occlusal view of maxillary arch.
c. Occlusal view of mandibular arch showing the narrow ridge and lacking of keratinized gingiva

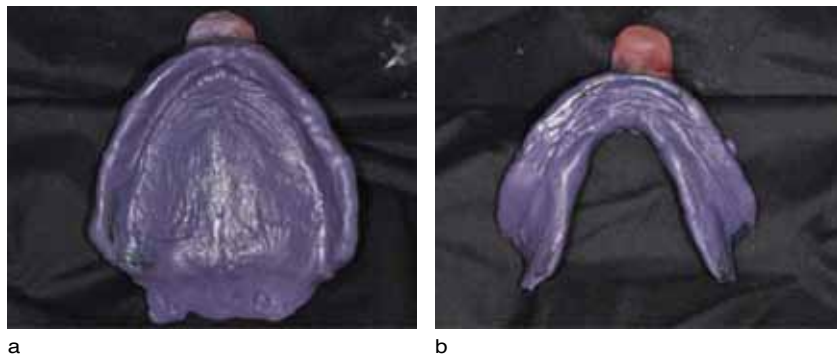


Fig2 Final impression
a. Maxillary impression
b. Mandibular impression

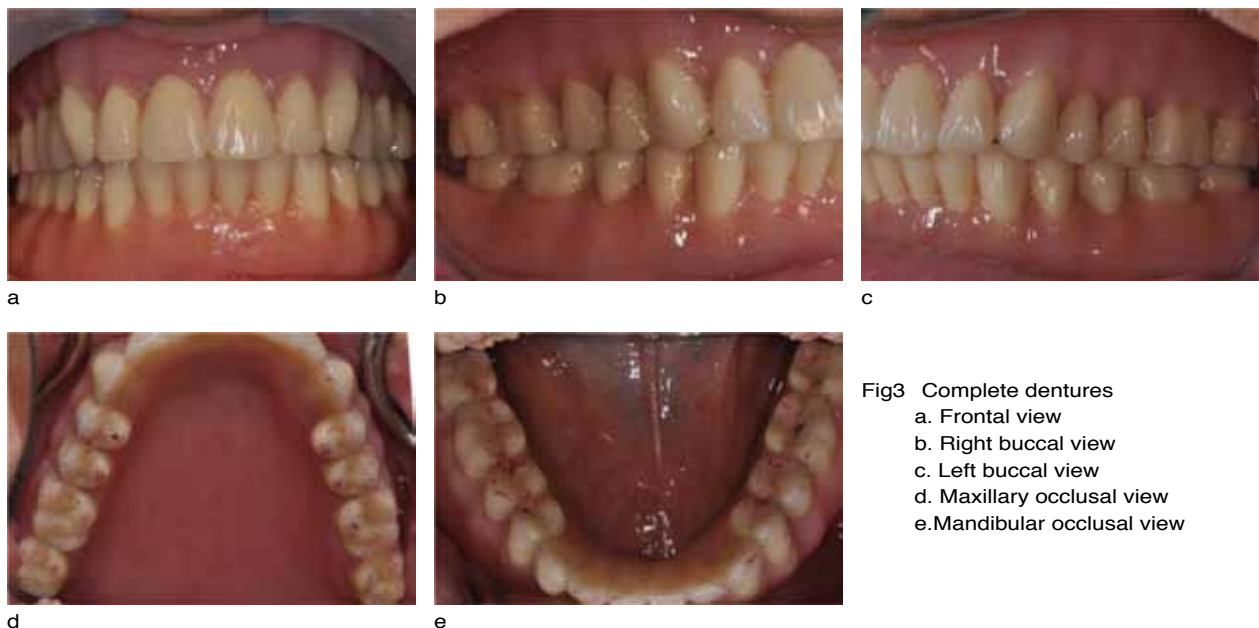


Fig3 Complete dentures
 a. Frontal view
 b. Right buccal view
 c. Left buccal view
 d. Maxillary occlusal view
 e. Mandibular occlusal view

planned implant positions to the image guide (Fig4). The surgery was performed by an oral surgeon (Fig5), and three MDIs (2.1x10 mm, IMTEC Sendax MDI™, 3M ESPE, St. Paul, Minn., USA) were inserted in the mandibular area between the mental foramens. The denture was adjusted and relined with resilient relining material, and metal housings (MH-2, 3M ESPE, St. Paul, Minn., USA) were picked up after three months of osseointegration.

To avoid denture fracture, we suggested that a new mandibular denture with metal framework reinforcement be made. However, the patient preferred to use his present denture. Therefore, we tried to fabricate a metal framework that can be incorporated into his present mandibular overdenture. A cobalt-chromium casting framework was designed and fabricated first on his mandibular cast. Subsequently, using the denture as an individual tray, the closed

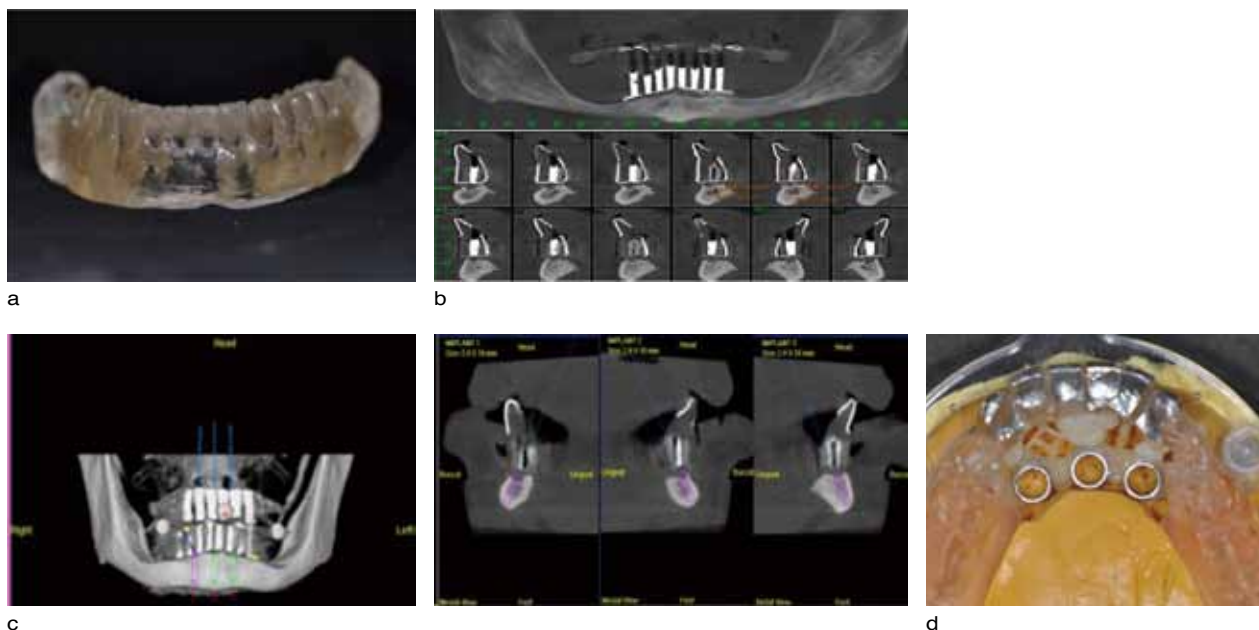


Fig4 a. Duplication of the new mandibular denture as an image-guide
 b. Cone beam CT with the image-guide.
 c. ImplantMax system to verify the implant position
 d. Locate the implant position and convert the image-guide into a surgical stent



a



b

Fig5 a. Three MDIs inserted between mental foramen
b. Panoramic film after the surgery

mouth impression technique was performed with polyether material. After pouring a master cast with Type IV dental stone, the master cast with the denture was mounted on a verticator. Occlusal jig was made with plaster (MG Hi-Koseton, Osaka, Japan). The denture base was removed, and the framework was positioned on the master cast. Thereafter, wax denture base was added, finished, and processed into thermal polymerized resin (Lucitone199®, Dentsply International Inc., Milford, Del., USA) (Fig6).

The metal housings were picked up again intra-orally, and the denture was followed for

two months. The patient reported a marked improvement in the retention and stability of his mandibular denture as well as in his chewing ability.

Discussion

MDIs have been developed for twenty years, and their “long-term” use was approved by FDA in 1997. These implants have small diameter, making their placement far less invasive and less costly than that of conventional dental implants. The most suitable clinical indications for MDI placement are as follows:



a



b



c



d



e

Fig6 a. Framework on the mandibular cast
b. Using present denture as an individual tray and closed mouth impression with polyether material
c. Master cast was mounted, occlusal jig was made, and the denture base was removed
d. With framework on the master cast, laboratory rebasing performed
e. Checking tissue fitness during delivery



a



b

Fig7 Two-month follow-up

a. Buccal view

b. Occlusal view

1. Inadequate bone width or keratinized tissue for standard root-form implants (3.5–4 mm in diameter).
2. Patient lack of acceptance of grafting.
3. Compromised health of patients, precluding extensive surgical procedures.

The overall MDI survival rate was 94.2% in a retrospective analysis of 2514 implants placed over a five-year period.⁴ Other studies reported survival rates beyond 90%.^{6–9} The survival rate is lower in the posterior maxilla (hazard ratio, HR=3.37), atrophy ridge (HR=3.32), smokers (HR=2.28), and removable prostheses (HR=4.3). Thus, case selection is very important for MDI therapy.

In the present case, severe mandibular ridge resorption was noted. Bone quality was Type I to II according to Lekholm and Zarb's (1985) classification, 10 and bone quantity was Type VI according to Cawood and Howell's (1988) scale.¹¹ Keratinized mucosa over the anterior region was about 4–5 mm in width, and interforaminal distance was about 17 mm. Four MDIs are recommended for mandibular MDI overdentures, but only three MDIs were placed because the diameter of the metal housings was 4–5 mm and interforaminal distance was short. Although the patient reported a marked improvement in the retention and stability of his mandibular dentures as well as in his chewing ability, long-term close evaluation is still needed.

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