

# Mandibular Rehabilitation with Dental Implants: A case report

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## Abstract

*This case report presents a treatment option and procedure of mandibular rehabilitation involving marginal mandibulectomy and the use of a myocutaneous flap. Using a free mucosal graft, dental implants and a bar-retained overdenture, the facial appearance and oral functions of the patient were restored.*

**Keywords:** Dental implant, marginal mandibulectomy, overdenture, tissue bar.

## Introduction

Although the technique of using microvascular free flaps for the reconstructive treatment of mandibular defects has advanced dramatically, oral functions and the perceptions of patients often indicate significant impairment even after mandibular continuity is restored. Common treatment options for mandibular defects include the use of (1) no prosthesis, (2) conventional dental/tissue-supported prosthesis, and (3) implant-retained/supported prosthesis. Patients suffer from poor masticatory ability without prosthetic rehabilitation. Meanwhile, with conventional prosthetic treatment, patients regain some mastication ability; they gain the most favorable masticatory outcomes with implant-retained prosthetic treatment.<sup>1</sup> This case report presents a mandibular rehabilitation procedure with dental implants for a victim of gingival cancer.

## Case report

A 56-year-old male patient suffered from squamous cell carcinoma of the gingiva at the left mandibular premolar and molar areas (staging pT2N0M0) in 2006. He underwent major operations, including wide tumor excision, left marginal mandibulectomy, selective neck dissection, and reconstruction with a radial forearm free flap. No post-operative radiotherapy or chemotherapy was performed. After three years of healing, no recurrence was noted. He was referred to our hospital in 2009 for prosthetic rehabilitation with dental implants.

The patient had a medical history of hypertension under medical control. There were no other systemic diseases or allergic reactions. Extraorally, the patient showed obvious asymmetry and insufficient lip support on the lower face (Fig 1a). Intraoral examination showed a skin graft extending from tooth 32 to the left ascending ramus (Figs. 1b and 1c). The skin graft was coarse, thick, and sinking to about 1 cm under compression. Teeth 16, 46, and 32–37 were missing.



Fig1a Frontal view of smiling patient



Fig1b Intraoral frontal view



Fig1c Occlusal view of the lower arch



Fig1d Panoramic radiograph before treatment

The panoramic radiograph revealed decreased alveolar bone height in the lower left region due to marginal mandibulectomy (Fig1d).

The final treatment plan for missing teeth 16 and 46 involved the placement of two single-implant crowns. The thick grafted skin flap was to be debulked surgically. Three implants were inserted, and the free mucosal graft was placed over the deformed area. The definitive restoration for the left mandibular edentulous area was an implant-supported overdenture.

Before surgery, diagnostic wax-up was conducted (Fig2a) and an image guide was fabricated (Fig2b). The patient wore the image guide for the CT scan. The CT images were analyzed with commercial 3D reconstruction software (ImplantMax, Saturn Imaging Inc., Taipei, Taiwan) to determine the sizes and positions of implants (Fig2c). The image guide was then transferred into a surgical stent. Under general anesthesia, the patient successively received tissue debulking, dental implant placement, and free mucosal grafting around the implants (Fig3a–3c). During the free mucosal grafting, a tremendous discrepancy between the tissue surface of the surgical stent and bone level was noted after the partial thickness flap was elevated (Figs. 3b and 3d). The surgical stent was hand molded and re-lined with soft liner (Lynal, Dentsply Caulk,



Fig2a Diagnostic wax-up



Fig2b Image guide fabrication

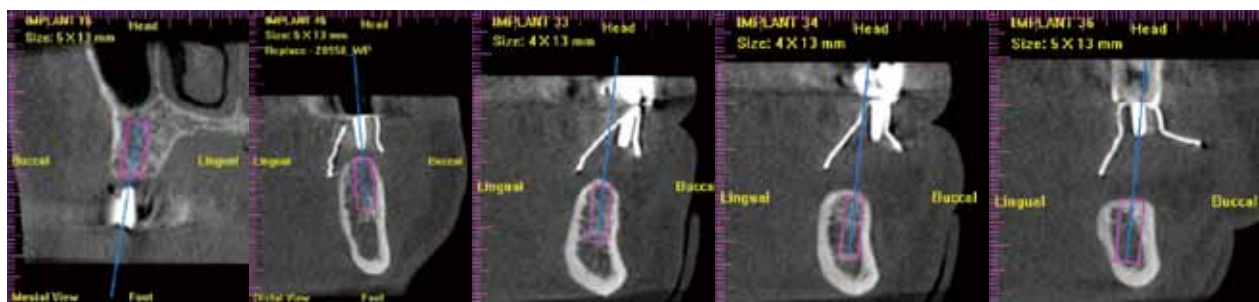


Fig2c Dental CT planning



Fig3a Tissue debulking



Fig3b Placement of dental implants. A tremendous discrepancy between the tissue surface of the surgical stent and the bone level was noted



Fig3c Free mucosal graft surrounding implants



Fig3d The hand-molded surgical stent was relined with soft liner intraorally and attached to the three dental implants by temporary abutments



Fig3e Post-operative panoramic radiograph



Fig4a The free mucosal graft did not survive after 2.5 months of follow up



Fig4b Granulation tissue formation around the middle implant was noted after 6 months of follow up



Fig5a Stereolithography model and the surgical stent fabricated for the 2nd operation

Milford, DE, USA) intraorally to fit the bone surface. The free mucosal graft from the hard palate was sutured on the recipient site. The relined surgical stent was placed on the free mucosal graft and attached to the three dental implants (Brånemark MK IV, Nobel Biocare AB, Göteborg, Sweden) by temporary abutments (Brånemark, Nobel Biocare AB, Göteborg, Sweden) (Fig3d). Two single implants

were placed at the positions of teeth 16 and 46; three implants were placed at the lower left area (Fig3e).

Unfortunately, the free mucosal graft did not survive after 2.5 months of healing (Fig4a). Granulation tissue formation around the middle implant was noted after 6 months of follow up (Fig4b). Hence, simultaneous vestibuloplasty and free mucosal grafting was planned. With the help of CT scans and the stereolithography model, a special surgical stent was fabricated for the operation (Fig5a).<sup>2</sup> The stent was easily adapted to the operation and attached to the implant temporary abutments (Fig5b). The stent was removed after 2 months of healing, and the free mucosal graft survived well this time.

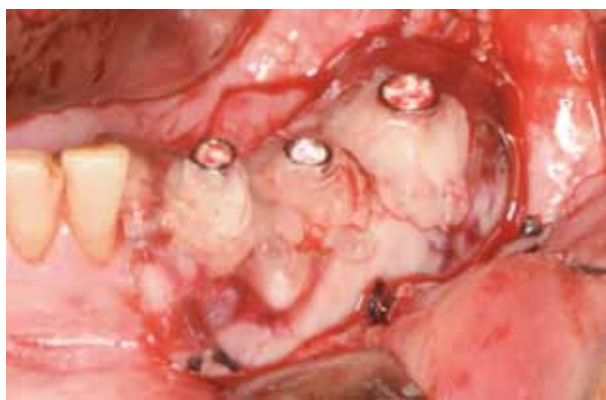


Fig5b The stent was easily adapted to the operation and attached to the implant temporary abutments

During the follow-up period for the lower left area, teeth 16 and 46 were restored with cement-type single implant crowns (Fig6a). After 3.5 months of healing, prosthetic restoration was started for the lower left area. The open tray impression technique with additional silicone (Elite HD, Zhermack SpA, Badia Polesine, RO, Italy) was used (Fig6b). Dental implant positions were verified carefully between the master cast and intraoral conditions

using temporary abutments and acrylic resin (DuraLay, Reliance Dental Mfg. Co, Worth, IL, USA) (Fig6c). After the casts were mounted on the articulator, tooth setting and wax-up were performed. A clear vacuum-formed wax-up template was made to check the adequacy of space for a tissue bar connecting the three implants (Fig6d). The tissue bar, made to ensure the adequate resistance of the overdenture, consisted of two Hader bars perpendicular to each other (Fig6e). The tissue bar (Fig6f) was made with casting metal alloy (Jelstar, JF Jelenko & Co., Armonk, NY, USA) and tried intraorally using the one-screw test to assure passive fitness. The framework for the overdenture totally covered the tissue bar except the two Hader bars and had retention beads on the surface (Fig6g). During the wax denture try-in, jaw relationship was verified and border extension was corrected with impression wax (Iowa Impression Wax, D-R Miner Dental, OR, USA) (Fig6h). The tissue surface of the master cast was corrected with silicone material (Gingifast Rigid, Zhermack SpA, Badia Polesine, RO, Italy), and the overdenture was fabricated by injection molding method (Fig6i). Two yellow clips (Authentic Hader Riders, Preat



Fig6a Teeth 16 and 46 positions were restored with cement-type single implant crowns



Fig6b Open tray impression technique with additional silicone



Fig6c The positions of dental implants were verified carefully between the master cast and intraoral conditions using temporary abutments and acrylic resin



Fig6d Suck-down template for space analysis



Fig6e The tissue bar consisted of two Hader bars perpendicular to each other



Fig6f The tissue bar was made with casting metal alloy and tried intraorally. Fitness and bone level were checked in the periapical radiograph



Fig6g The framework for the overdenture totally covered the tissue bar except the two Hader bars and had retention beads on the surface



Fig6h Border extension was corrected with impression wax during the wax denture try-in

Fig6I The tissue surface of the master cast was corrected with silicone material, and the overdenture was fabricated by injection molding method. Two yellow clips were placed in the overdenture

Cooperation, Santa Ynez, CA, USA), which may provide about 800 grams of retention force each, were placed in the overdenture. The overdenture was then delivered to the patient, and it showed adequate occlusion, retention, and resistance (Fig7a). A group-function occlusal scheme was designed. The patient was satisfied with his esthetic appearance and restored chewing function (Fig7b). After 2 years of follow-up, the implant-supported overdenture still functioned well, and the clips showed only little wear requiring no replacement. Peri-implant bone levels were all stable (Fig7c).

## Discussion

With microvascular flaps, implant-assisted prosthetic placement has become possible for patients suffering from mandibular discontinuity defects. However, although dental implant-retained/supported prostheses may improve the quality of life, tongue function should always be evaluated first whenever mandibular rehabilitation is considered. If tongue function is impaired by diseases or resection, patients will not eat with the affected area even with a stable prosthesis because the tongue cannot manipulate food bolus to such area.<sup>3</sup> In the present case, marginal mandibulectomy did not affect the movement and sensation of the patient's tongue. Therefore, the prosthesis can improve the lower lip support and chewing

function of the patient.

Peri-implant mucositis is one of the common complications of implant-supported prosthetic placement in reconstructed mandibles.<sup>4</sup> Mandibular defects are treated using microvascular flaps, and the thick and movable skin tissue around the implants provides an environment for bacterial accumulation and growth.<sup>5</sup> Impression also becomes very difficult due to the inadequate height of impression coping extruding above the tissue. Debulking, skin grafting, or palatal grafting has been suggested for recurrent hyperplasia or granulomatous tissue formation around implants placed in an osseocutaneous flap.<sup>6</sup> The thin, keratinized, and immobilized soft tissue also facilitates the maintenance of oral hygiene. In the present case, possible reasons for the failure of the first free mucosal graft include (1) extended operation time for adaptation of the surgical stent and (2) insufficient blood supply from the recipient site that was just tissue thinned. The technique for fabricating a well-adapted surgical stent presented in this report can shorten operation time and secure the free mucosal graft. A two-stage approach is suggested for patients. Tissue debulking and implant placement is performed in the first stage, and implant exposure and free mucosal grafting are performed in the second stage to enhance blood supply and increase the graft survival rate.

The lips and cheeks are often involved in



Fig7a Overdenture delivery

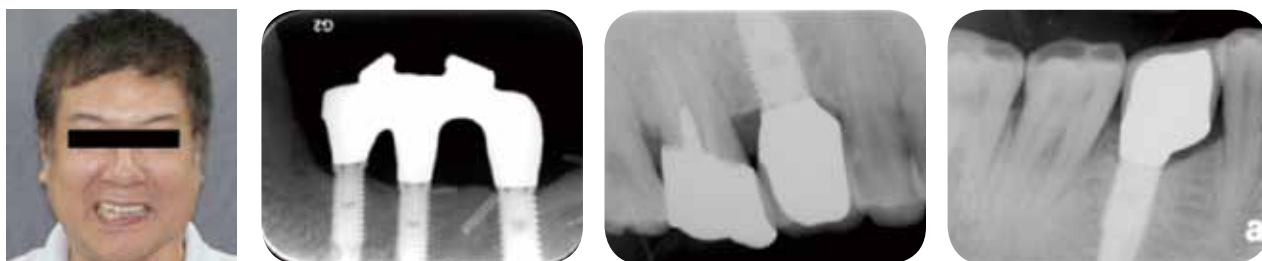


Fig7b Extraoral smile view after restoration

Fig7c After 2 years of follow up, periapical x-ray images show stable peri-implant bone levels

mandibular defects, so patients need prosthetic tissue support. As such, a buccal flange of the prosthesis is usually necessary. The overdenture design presented in this report helps keep maintain peri-implant hygiene and reduce the risk of peri-implant mucositis. A bar-retained implant supporting the overdenture has the advantages of splinting implants to share occlusal loads, providing adequate retention, keeping easy hygiene maintenance, providing adequate lip and cheek support, and allowing ease of repair.

## Conclusion

This case report presents a treatment option and procedure of mandibular rehabilitation involving marginal mandibulectomy and the use of a myocutaneous flap. Using a free mucosal graft, three dental implants, one cast tissue bar, and one overdenture, the facial appearance and oral functions of the patient were restored.

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