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Journal of Prosthodontics and Implantology

Editorial

The Journal of Prosthodontics and Implantology seeks to improve knowledge and promote greater awareness of prosthetic and implant dentistry through increased communication and exchange of scientific information. To achieve this goal, we encourage clinicians and researchers to submit manuscripts for publication and thereby help spread the benefits of academic cooperation worldwide.

To become an international academic journal, we should work hard to realize the following two goals: ensuring smart content and adopting a smart submission process. First, all published manuscripts should be of interest to target readers, namely, fellow researchers and clinicians. Second, an electronic evaluation system enabling the online submission, evaluation, and revision of manuscripts, as well as the maintenance of a databank for reviewers, should be adopted. Due to our limited budget, manuscript submission still depends on email correspondence. However, I believe that with a stable source of manuscripts, we can gain enough support from the Academy of Prosthetic Dentistry.

In this issue, four manuscripts featuring new methods and advanced clinical procedures or protocols are reported. One manuscript, which describes a method of ocular prosthetic construction, can hardly be searched in another dentistry journals. The advantages of these new methods compared with previous ones are also highlighted. Readers can take advantage of the new knowledge presented in these manuscripts and are encouraged to provide feedback.

In this modern world where rapid information exchange and knowledge transfer are made possible through the Internet, it is our task to offer advanced techniques and knowledge related to prosthodontics and implant dentistry. We can do this with contributions from authors and reviewers at home and abroad.

The goal is clear in front of us, and yet the route seems full of challenges and obstacles. I strongly believe, however, that through passion and cooperation among our colleagues, the mission can be accomplished in the foreseeable future.

Ming-Lun Hsu
Associate Chief Editor

Case Report

Fixed-Type Restoration for a Post-Traumatic Partially Edentulous Anterior Maxillary Area: A Case report

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Abstract

Management of post-traumatic injury in the anterior maxillary area presents a challenge to surgeons and prosthodontists. This case report presents a 25-year-old female with a severely resorbed partially edentulous anterior maxillary area and previously placed implants. A fixed-type restoration was fabricated for the missing soft and hard tissues. The framework design was divided into crown and gingival portions.

Keywords: Dental implant, esthetic zone, trauma.

Introduction

Trauma of the anterior maxillary region, which is popularly known as the "esthetic zone," presents various and complicated cases. These cases greatly challenge surgeons and prosthodontists, especially when soft and hard tissues are lost following teeth loss. Treatment for these cases is multidisciplinary, requiring surgical, orthodontic, operative, and prosthetic compliance.

The buccal cortical plate of the anterior maxilla is thin and porous. After traumatic injury, the buccal plate always resorbs and migrates to a more palatal position, and may later require augmentation prior to implant placement. In the study of Schwartz, complications (e.g., fistula, inflammation, and swelling hematoma) were observed in 45.3% of trauma patients.[1] There was no difference in complication and postoperative incident rates with regard to implantation technique. When patients were divided into two groups, with and without inflammatory lesions, significantly lower complication and postoperative incident rates were found in the non-inflammatory group.

Screw-type implant restorations are considered to have good retrievability. However, implant placement is not always favorable for this kind of restorations. Sierraalta described the technique of fabricating implant frameworks and single units of crowns separately for solving this situation.[2, 3]

This clinical report demonstrates the use of a one-piece casting framework with four single units of porcelain-fused-to-metal crowns for managing a patient with severe resorption of the hard and soft tissues over the anterior maxilla.

Case report

A 25-year-old female who underwent orthognathic surgery and with trauma history came to our prosthodontic department in August 2010. Her chief complaint was on the esthetics of her missing upper anterior teeth. She suffered from a car accident, and poor prognosis led to the extraction of her teeth 12, 11, 21, and 22. After ridge augmentation over the edentulous area, two 3.25x11.5 mm endosseous implants (Biomet 3i) were placed in the upper right and left lateral incisors in a two-stage procedure. Marginal bone loss to the fourth thread was noted over the mesial side of both implants after six months (Fig1). Other clinical problems, including soft tissue loss over the edentulous area with cover screw exposure, crossbite between the upper and lower canines, buccal gingival recession (Fig2), and periapical radiolucency over the tooth 23 area, were noted. Extraoral findings and esthetic analysis showed insufficient lip support (Fig3a), blunt naso-labial angle, and no gummy smile. A tentative treatment plan was drawn, which included interim removable dentures to meet urgent esthetic demands and endodontic retreatment for tooth 23. In October, the patient became pregnant and treatment was stopped.

In July 2011, the patient returned to finish treatment. After treatment plan discussion, the patient refused to remove existing implants and any augmentation procedure. She further refused orthodontic treatment for crossbite correction and chose a fixed-type restoration for the final prosthesis.

After checking the ISQ value of implants, the fabrication of the prosthesis began with the following procedures:

1. Implant-level impression was conducted with the open tray technique.
2. The definitive cast was fabricated with soft tissue moulage (Gingifast; Zhermack SpA, Badia Polesine, Italy).
3. The maxillomandibular relationship and facebow transfer records were obtained and transferred to a semi-adjustable articulator.
4. Diagnostic waxing was performed over the upper anterior region using a temporary removable denture as guide.
5. Temporary restoration was delivered.
6. The patient was instructed to use super floss for cleaning and maintaining oral hygiene after delivery. Phonation and profile (Fig3b) were checked between appointments.

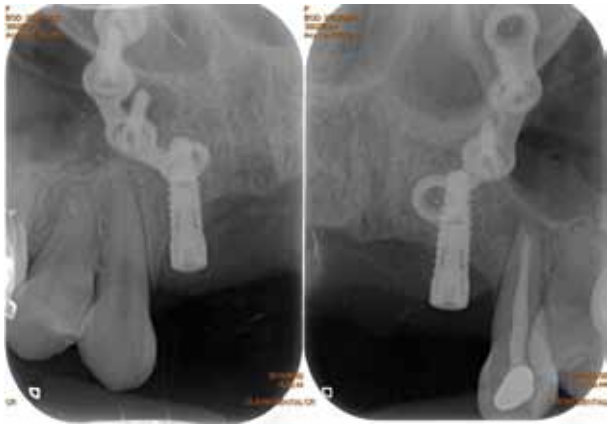

Fig12 Periapical film of after 6-month implants placement. Noted marginal bone loss to the forth thread of both mesial side of implants

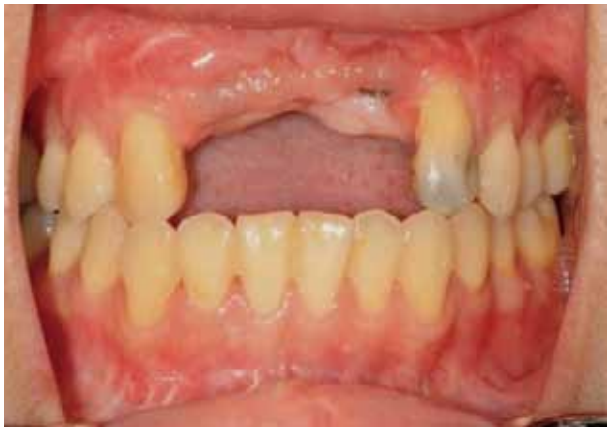

Fig2 Soft tissue loss over edentulous area with cover screw exposure, Crossbite between upper and lower canines and Buccal gingival recession over 23 area are noted

Fig3a Insufficient lip support was noted without wearing prosthesis

Fig3b Soft tissue was improved with temporary fixed restoration

After six months of follow up, the bone level surrounding both implants became stable. Two non-engaged UCLA abutments were used for fabricating the implant-supported framework. The soft tissue profile of the pontic area was copied from the temporary restoration, and the prosthesis design was divided into crown and gingival portions. The laboratory and delivery procedures were as follows:

1. Full wax up was conducted (Fig4).
2. The gingival portion was cut back, and crown space was checked.
3. The gingival portion was cast by lost-wax technique (Fig5), and framework fitness was checked with the one-screw test.
4. The crown portion on the gingival portion of the framework was waxed up.
5. The crown portion was cut back, and porcelain space was checked.
6. Crown copings were tried on the gingival portion of the framework, and veneered porcelain was added.
7. Pink porcelain was added over the gingival portion of the framework.
8. Staining and glazing was conducted. Access holes were marked on the palatal surface of the crown portion (Fig6).
9. The prosthesis was delivered (Fig7-8).

The insertion of the prosthesis involved

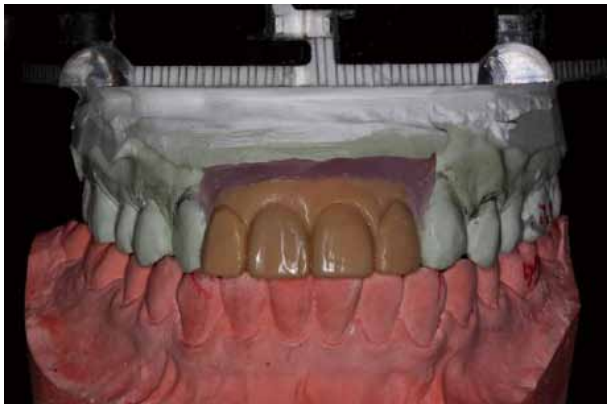

Fig4 Fully wax up

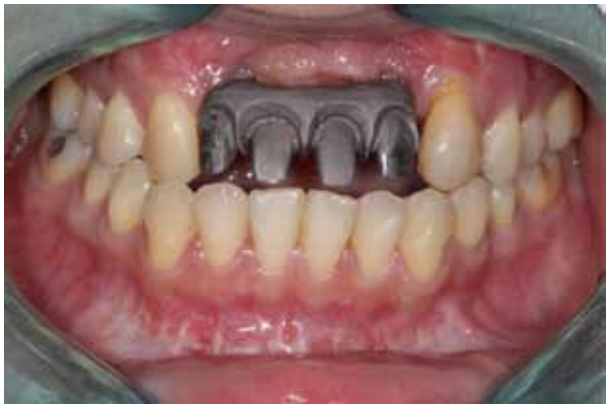

Fig5 Try in of the framework with gingival portion

Fig6 Marking access holes on palatal surfaces of the restorations

Fig7 Frontal view of the pationt after restoration

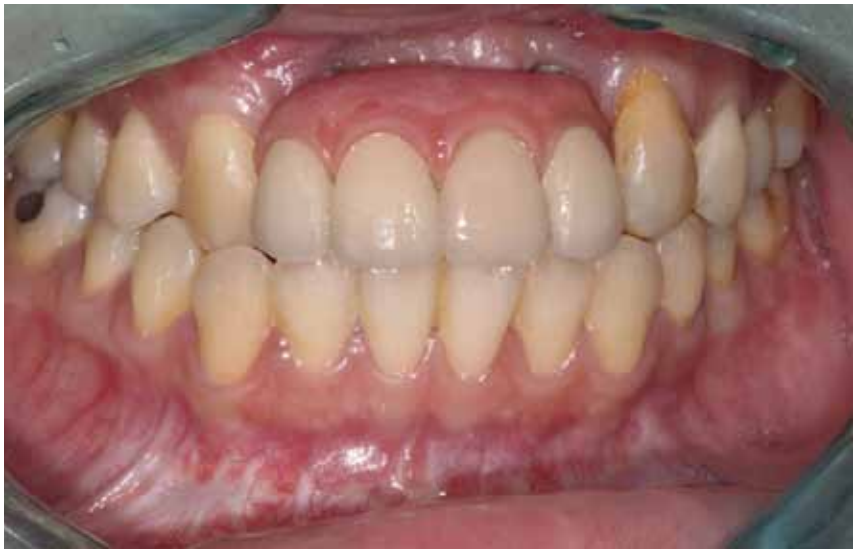

Fig8 Intra oral view with maxillary anterior prosthesis

screwing the framework into place until 25-Ncm torque was achieved and covering the screw-access holes with gutta-purcha and composite resin. The crowns were then placed onto the framework, and the desired occlusal contacts were confirmed. The four crowns were cemented using zinc phosphate cement. Excess cement was removed, and occlusal contacts were once again verified prior to giving the patient postoperative instructions for care and maintenance. The patient was scheduled for recall every three months.

Discussion

Extensive soft and hard tissue loss was found in this case, indicating the complexity of post traumatic complications. The crossbite between the canines may have been caused by orthodontic relapse and loss of proximal contact. Because the patient wanted no more surgical intervention and preferred a fixed-type restoration, a treatment option was presented. There were several challenges to the recommended prosthesis design, including mechanical and esthetic concerns. First, there was possibly insufficient support for pink porcelain, especially in the embrasure area, which may cause porcelain fracture during crown cementation. Second, there were difficulties in mimicking "natural" gingival color by pink porcelain. Retrievability is the design's primary advantage; if there is ever a fracture of the veneering porcelain on the crown portion of the prosthesis, a new crown may be fabricated using conventional fixed prosthodontic techniques. The impression of the crown portion can be made without removing the entire prosthesis, and an interim restoration may be used while the crown is being fabricated.

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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 foramens 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 foramens due to limited keratinized mucosa, short interforaminal distance, and financial reasons. A surgical stent was constructed by transferring the

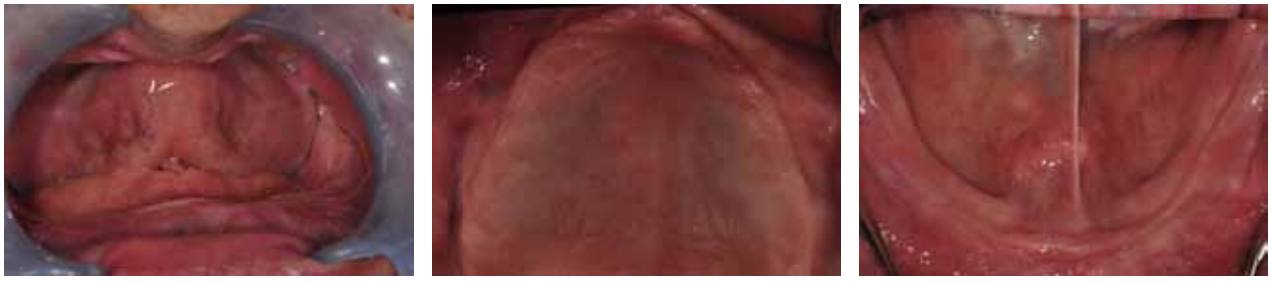

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Fig1 a. Frontal view showing severe ridge resorption of both jaws
b. Occlusal view of maxillary arch.
c. Occlusal view of mandibular arch showing the narrow ridge and lacking of keratinized gingiva

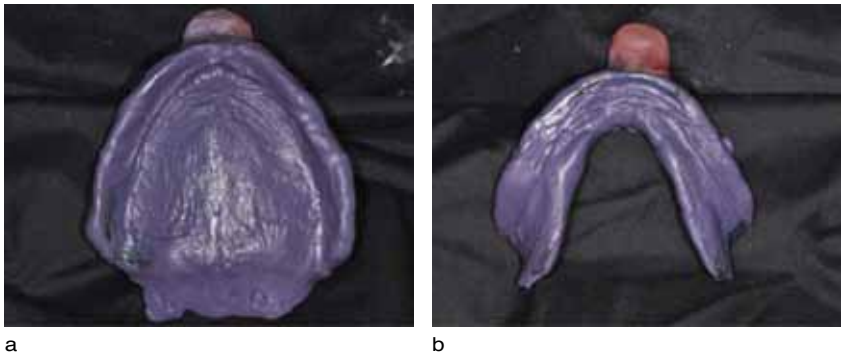

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Fig2 Final impression
a. Maxillary impression
b. Mandibular impression

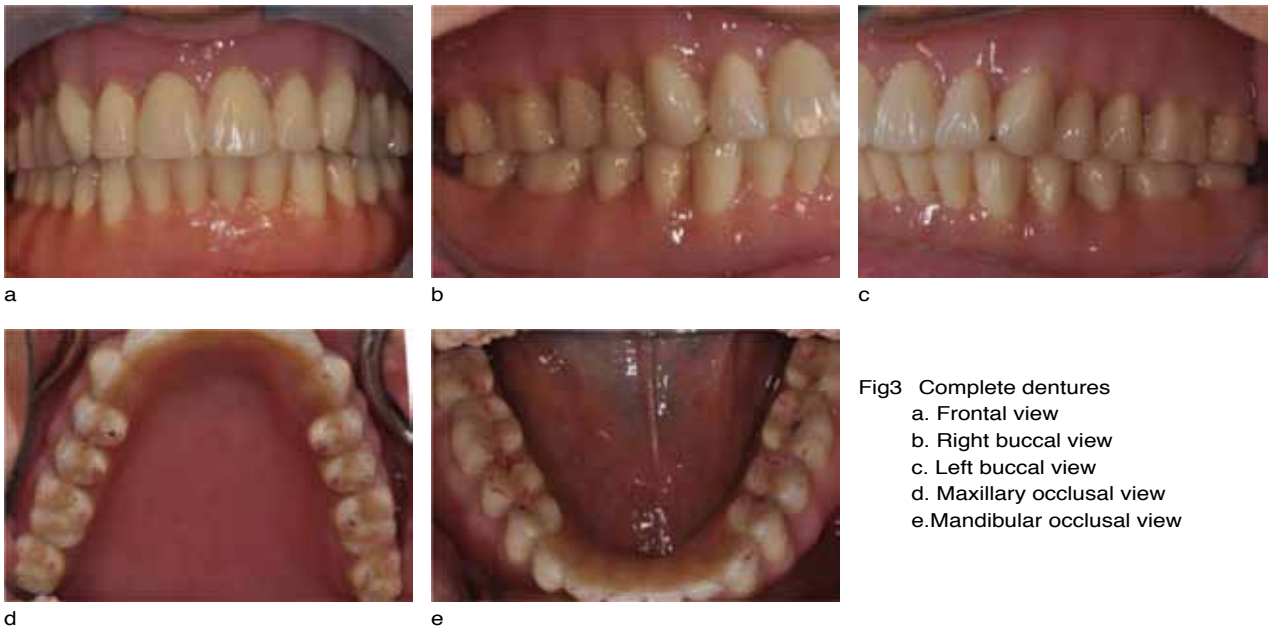


Fig3 Complete dentures
a. Frontal view
b. Right buccal view
c. Left buccal view
d. Maxillary occlusal view
e.Mandibular occlusal view

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

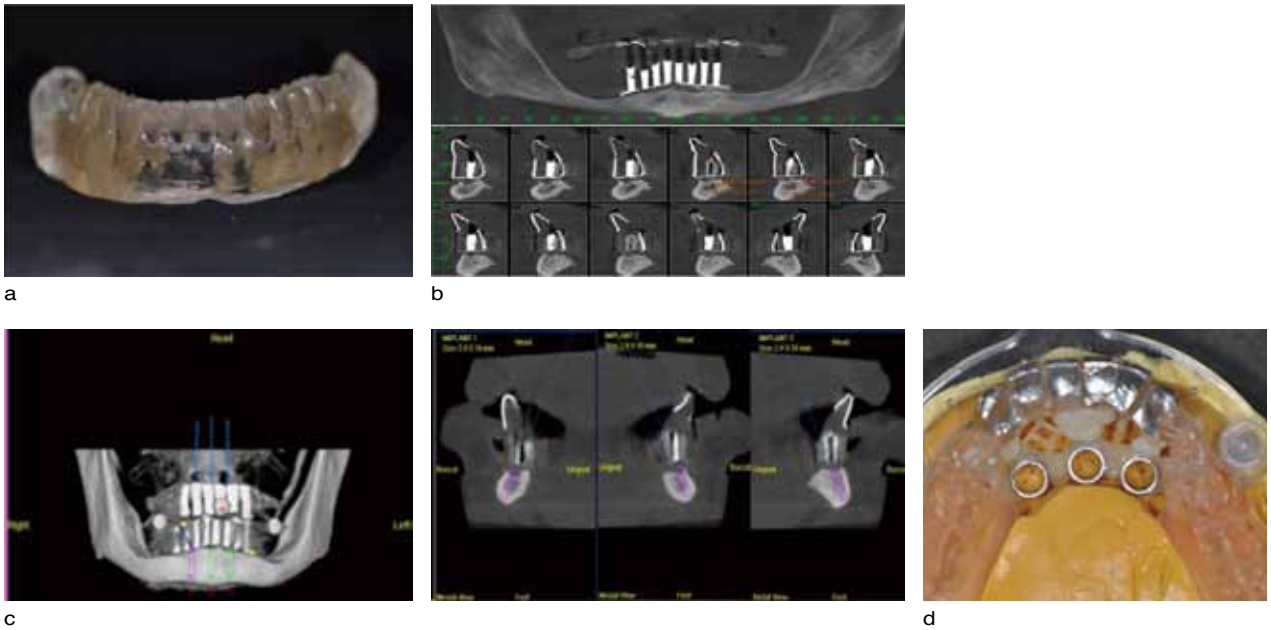
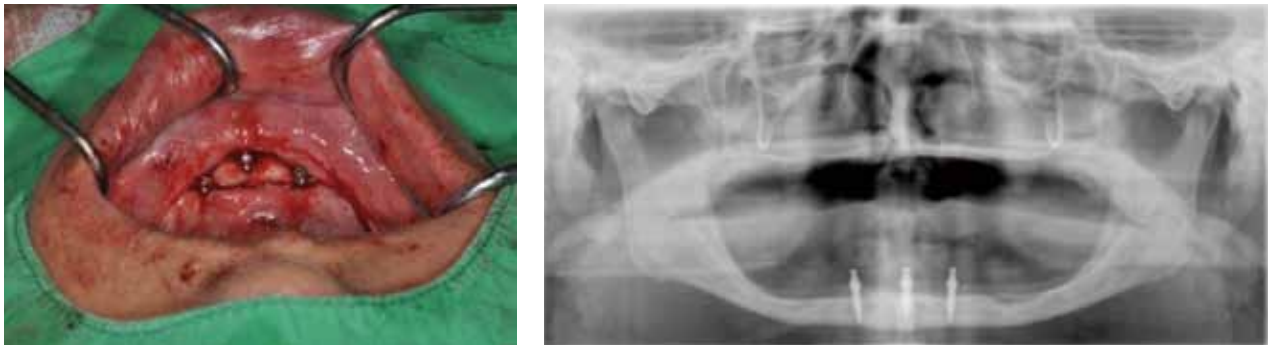


Fig4 a. Duplication of the new mandibular denture as an image-guide
b. Cone beam CT with the image-guide.
c. ImplantMax system to verify the implant position
d. Locate the implant position and convert the image-guide into a surgical stent



a b

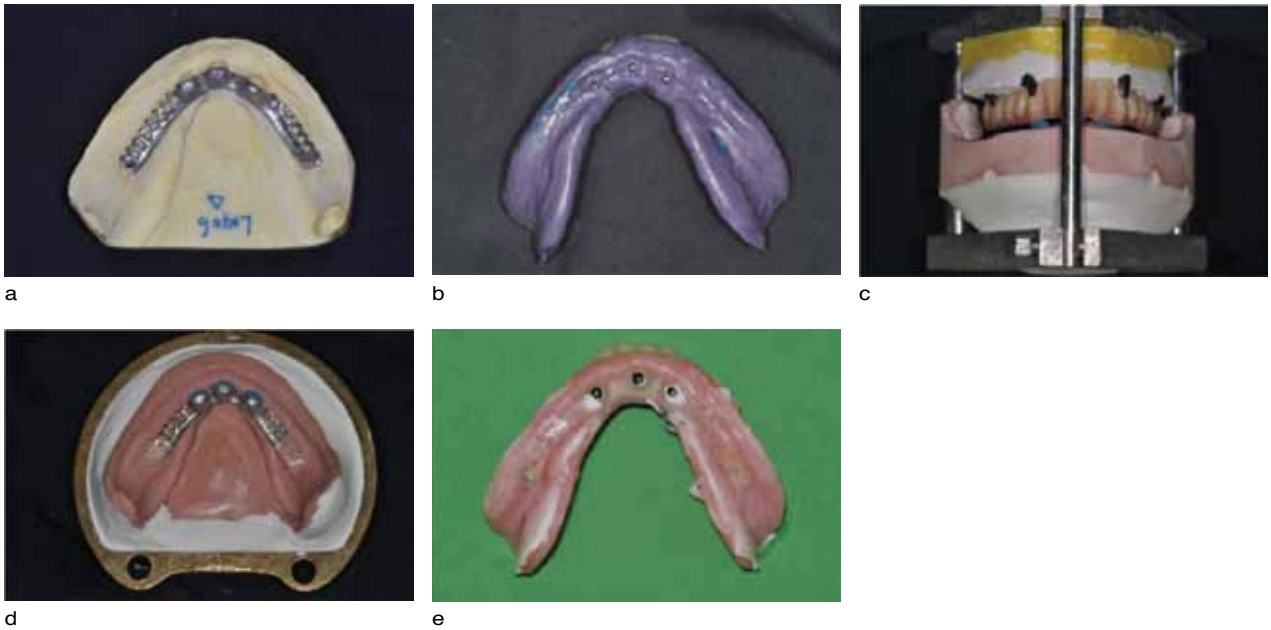
Fig5 a. Three MDIs inserted between mental foramen
b. Panoramic film after the surgery

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 verticulator. 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:



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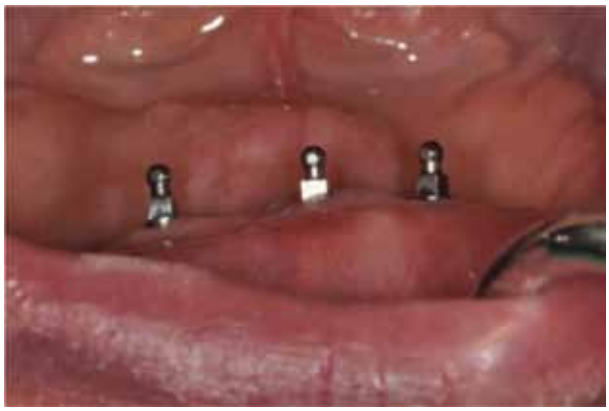
d e

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



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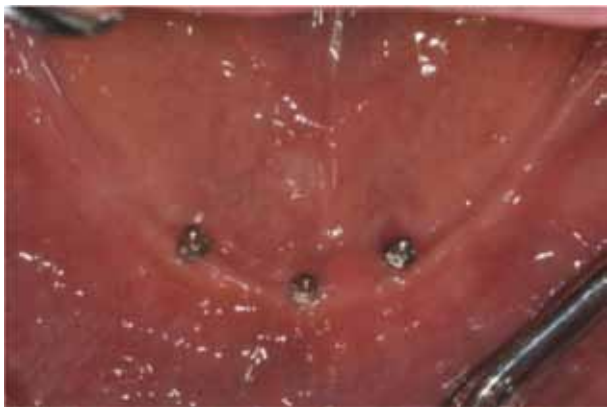

b

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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Case Report

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.[1] 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 (Fig1a). 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

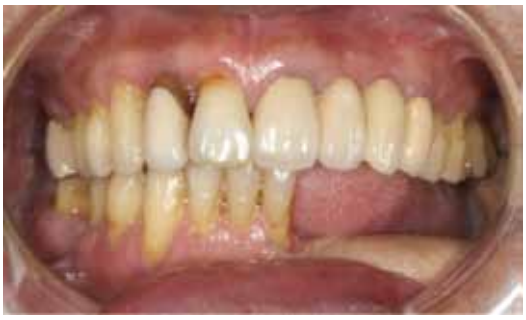


Fig1b Intraoral frontal view

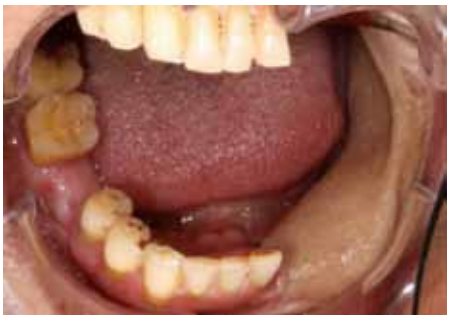


Fig1c Occlusal view of the lower arch

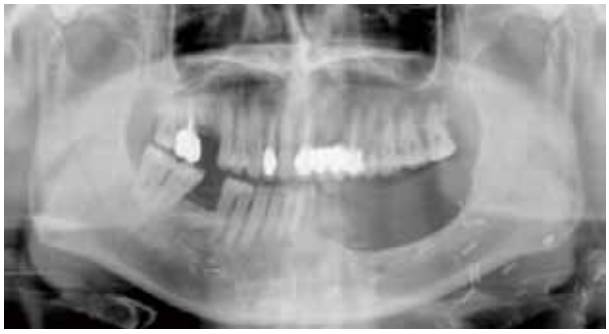


Fig1d Panoramic radiograph before treatment

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 relined with soft liner (Lynal, Dentsply Caulk,

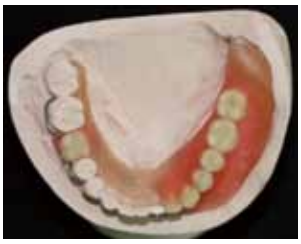


Fig2a Diagnostic wax-up

Fig2b Image guide fabrication

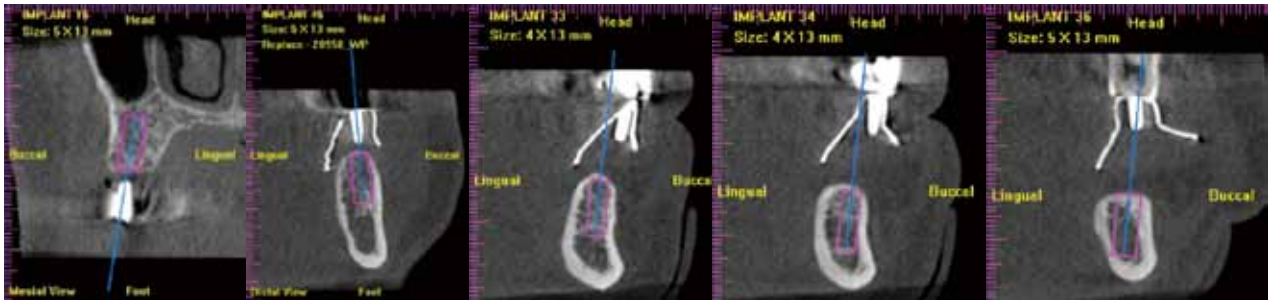


Fig2c Dental CT planning

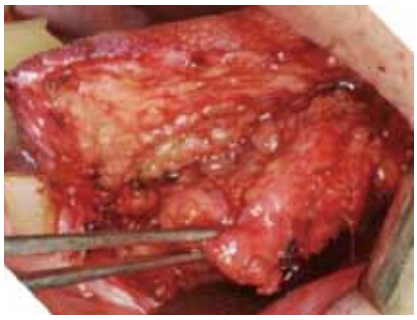


Fig3a Tissue debulking

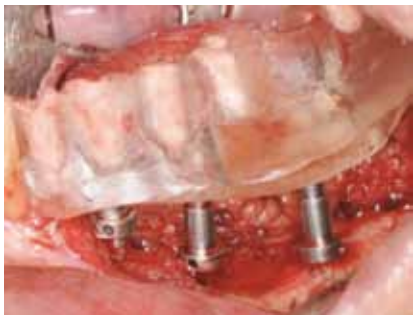


Fig3b Placement of dental implants. A tremendous discrepancy between the tissue surface of the surgical stent and the bone level was noted

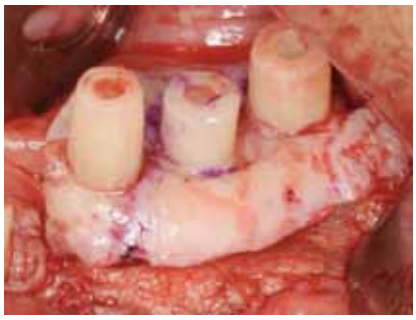


Fig3c Free mucosal graft surrounding implants

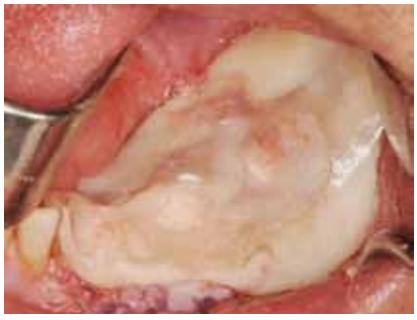


Fig3d The hand-molded surgical stent was relined with soft liner intraorally and attached to the three dental implants by temporary abutments

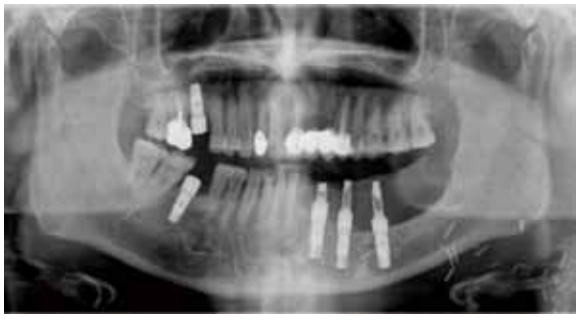


Fig3e Post-operative panoramic radiograph

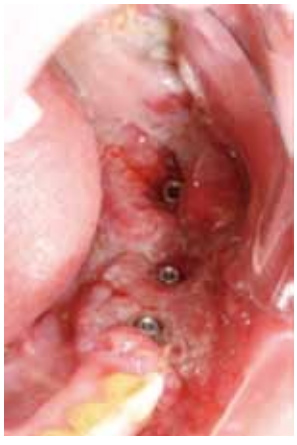


Fig4a The free mucosal graft did not survive after 2.5 months of follow up

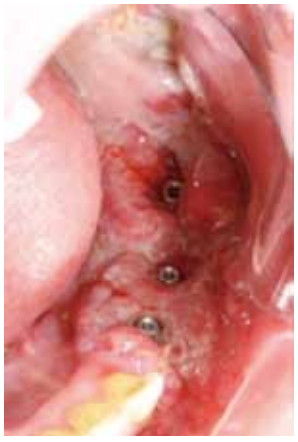


Fig4b Granulation tissue formation around the middle implant was noted after 6 months of follow up

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, Goteborg, Sweden) by temporary abutments (Brånemark, Nobel Biocare AB, Goteborg, 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).[2] 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.

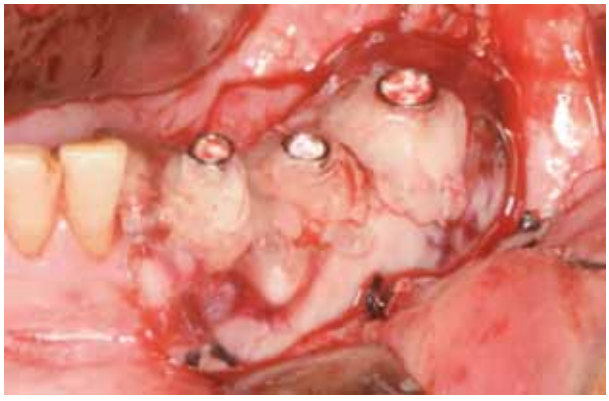


Fig5b The stent was easily adapted to the operation and attached to the implant temporary abutments

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

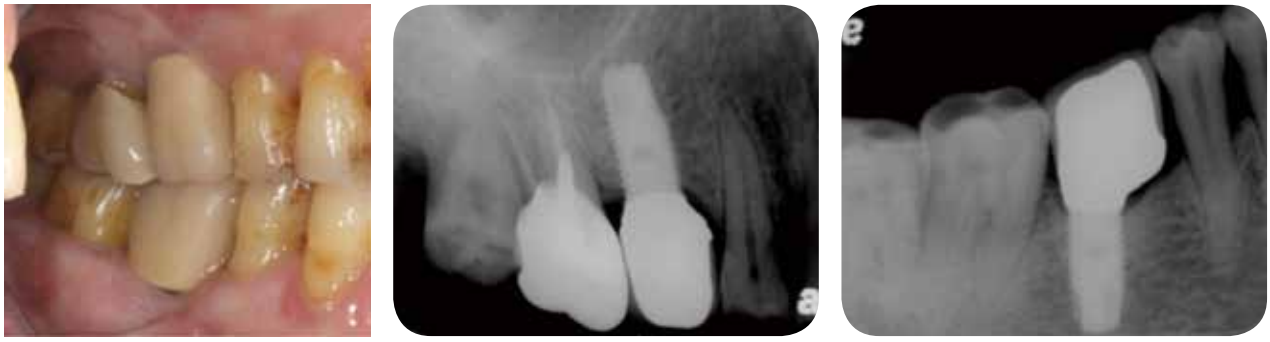


Fig6a Teeth 16 and 46 positions were restored with cement-type single implant crowns

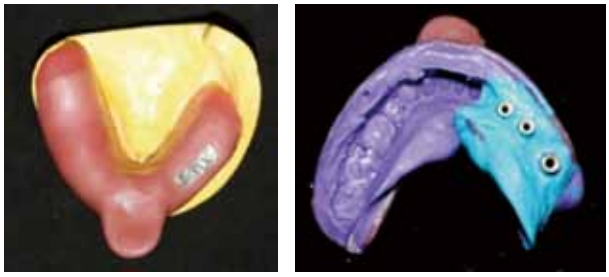


Fig6b Open tray impression technique with additional silicone

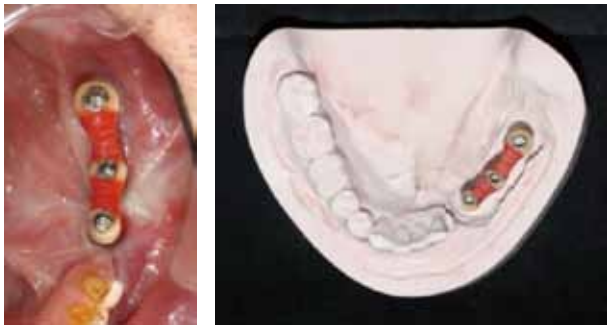


Fig6c The positions of dental implants were verified carefully between the master cast and intraoral conditions using temporary abutments and acrylic resin

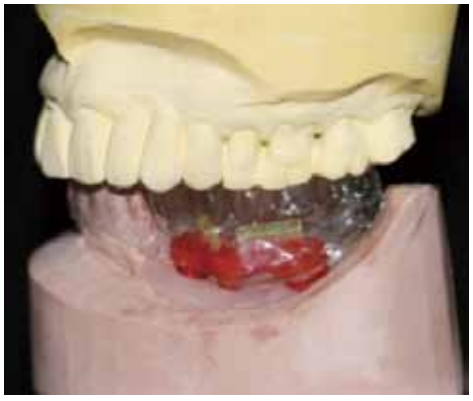


Fig6d Suck-down template for space analysis



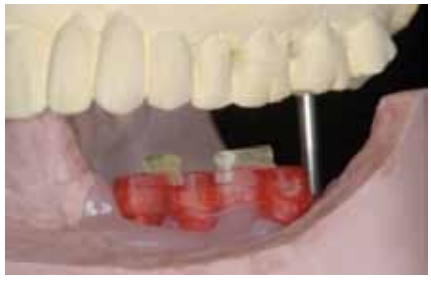
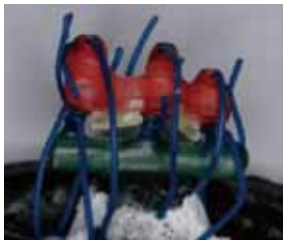


Fig6e The tissue bar consisted of two Hader bars perpendicular to each other



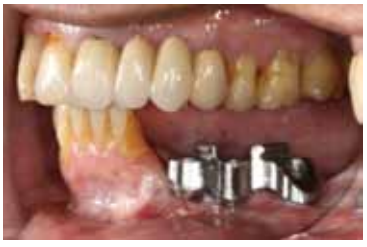
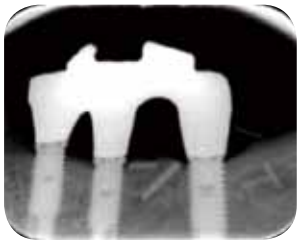



Fig6f The tissue bar was made with casting metal alloy and tried intraorally. Fitness and bone level were checked in the periapical radiograph

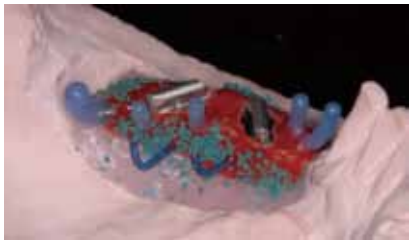
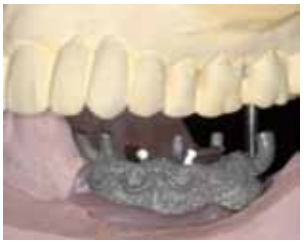
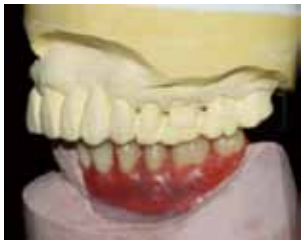




Fig6g The framework for the overdenture totally covered the tissue bar except the two Hader bars and had retention beads on the surface



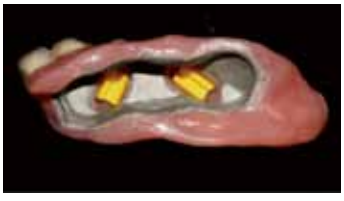



Fig6h Border extension was corrected with impression wax during the wax denture try-in

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.[3] 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.[4] 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.[5] 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.[6] 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

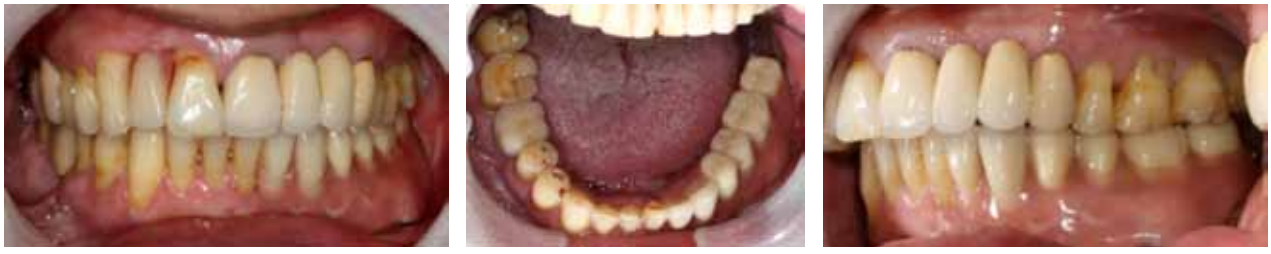


Fig7a Overdenture delivery

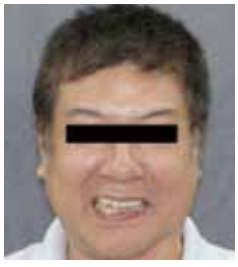


Fig7b Extraoral smile view after restoration

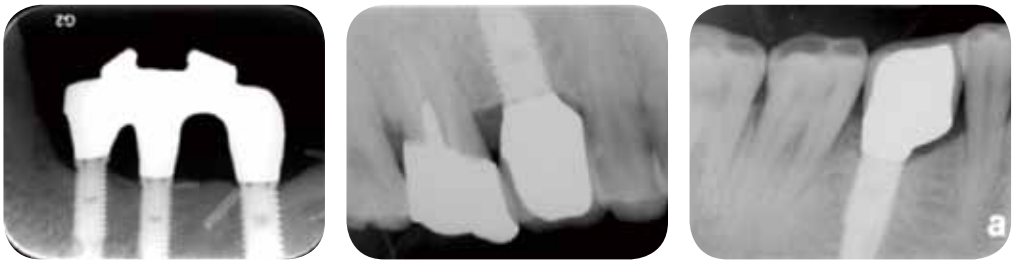


Fig7c After 2 years of follow up, periapical x-ray images show stable peri-implant bone levels

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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Case Report

Alveolar Ridge Augmentation using Subepithelial Connective Tissue Grafts: A Case report

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Abstract

Alveolar ridge deformity occurs frequently after teeth loss, leading to esthetic and functional compromises especially in the anterior maxilla. This case report demonstrates a two-step surgical ridge augmentation procedure using soft tissue grafts. A 42-year-old woman with Seibert Class III ridge deformity in the esthetic zone received plastic surgery using a subepithelial connective tissue graft harvested from the palate. The edentulous ridge healed with adequate buccolingual and apicocoronal contours. Fixed partial dentures were reconstructed with ovate pontic design to improve both functional and esthetic outcomes. Thus, the use of subepithelial connective tissue grafts is helpful in treating Seibert Class III ridge deformities.

Keywords: alveolar ridge augmentation, connective tissue graft, fixed partial denture, ovate pontic.

Introduction

Edentulous areas where fixed prostheses are attached should be carefully evaluated during the treatment planning phase. An ideally shaped ridge has a smooth, regular surface of attached mucosa. Its height and width should allow the placement of a pontic that can emerge from the ridge and mimic the appearance of neighboring teeth. However, there is a high incidence (91%) of residual ridge deformity[1] following anterior tooth loss. Alveolar ridge deformity presumably occurs due to traumatic teeth removal, severe periodontal diseases, endodontic failure, implant failure, traumatic accidents, and developmental defects.[2] An inadequate alveolar ridge can lead to esthetic and functional compromises, especially in the anterior maxillary region of patients with a high lip line.

Siebert classified residual ridge deformities into three categories.[3] Class I is characterized by the faciolingual loss of tissue width with normal ridge height. Class II involves the loss of ridge height with normal ridge width. Class III is marked by a combination of loss in both dimensions. Class I deformities are infrequent and not esthetically challenging, and the surgical augmentation of ridge width is not common. Meanwhile, treatments of Class II and III ridge deformities present more difficulties because of the need to replace a high volume of tissue. Various grafting procedures have been developed for the reconstruction of deformed

edentulous ridges. Soft tissue autografts, such as subepithelial connective tissue grafts,[4] onlay grafts,[5] and hard tissue grafts (e.g., guided bone regeneration, GBR),[6] can be used to augment residual ridges. However, few soft tissue surgical techniques may be used to increase the height of residual ridges with any predictability. Subepithelial connective tissue and onlay grafts are designed to enhance ridge height and width, making them useful for treating Class III deformities. The procedure may have to be repeated several times to reestablish a normal residual ridge because the amount of height augmentation can only be as thick as the graft.

This case report provides an approach to treating moderate apicocoronal and buccolingual ridge deformities. Two-step surgical ridge augmentation by soft tissue grafting was performed.

Case Report

A 42-year-old woman was referred to the Department of Prosthodontics, Taipei Veterans General Hospital in Taiwan with the hope of improving the esthetic appearance of her anterior maxillary fixed prosthesis. Extraoral findings revealed a convex profile with ovoid facial form. The patient had symmetric facial appearance and a gummy smile (Fig1). The dental midline was about 3.5 mm off to the right of the facial midline. Intraoral findings showed teeth loss (11, 12, 16, 17, 25, 27, 37, 46, and 47; Fig2). The six-unit fixed partial denture (FPD) between the bilateral maxillary canines with pontic space on tooth 12 was already more than ten years old. Three weeks earlier, the maxillary right central incisor was extracted due to root fracture and infection. The anterior ridge demonstrated Class III deformity with buccolingual and apicocoronal tissue loss according to Seibert's classification.[3] The space between the tooth 11 pontic of the FPD and edentulous ridge was filled with composite resin by the patient's last dentist. The patient exhibited a gummy smile with uneven gingival line over the teeth 13 and 23 areas. Occlusal findings demonstrated both 1 mm overbite and overjet. In addition, crossbite malocclusion of teeth 23 and 33 was noticed. Other intraoral and radiographic findings included the supra-eruption of tooth 48 with mesial tilting, continuing endodontic retreatment of 36, and dental caries on teeth 15, 21, 23, 26, 41, and 42 (Fig3).

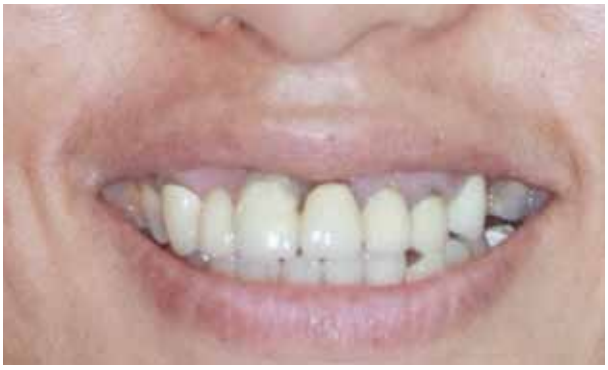


Fig1 Patient with a gummy smile. The dental midline is about 3.5 mm to the right of the facial midline

The patient preferred to have a conventional FPD due to financial reasons and was not concerned with the crossbite malocclusion of teeth 23 and 33. Therefore, neither dental

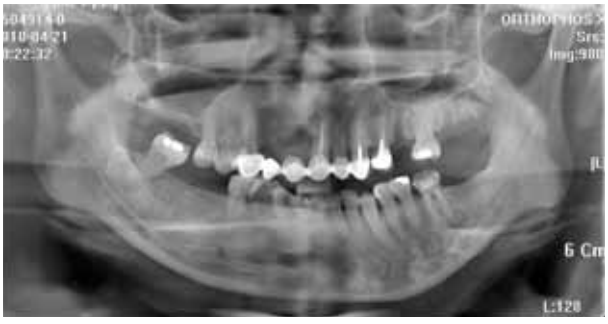


Fig3 Panoramic radiograph before treatment

a b c

Fig2 Intraoral and extraoral findings.
a. Frontal view showing Seibert Class III deformity and uneven gingival line of the maxillary canines.
b. Right-side view revealing the supra-eruption of tooth 48 with mesial tilting
c. Left-side view showing crossbite malocclusion of teeth 23 and 33

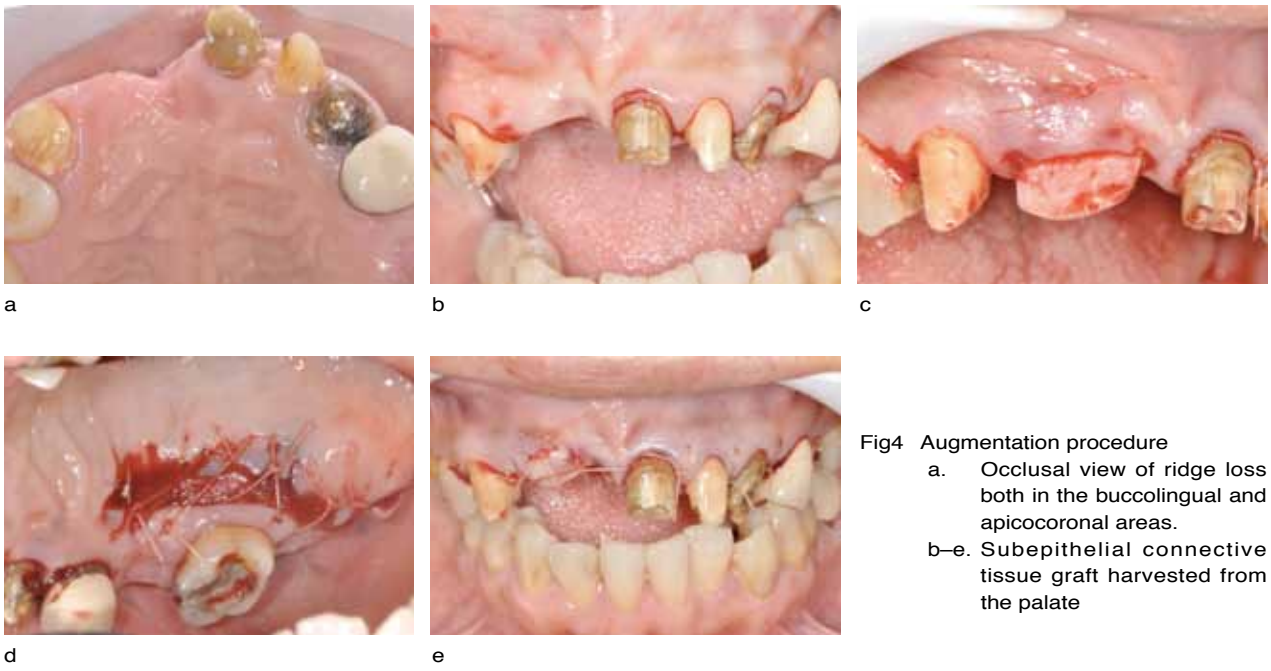


Fig4 Augmentation procedure
a. Occlusal view of ridge loss both in the buccolingual and apicocoronal areas.
b–e. Subepithelial connective tissue graft harvested from the palate

implant placement nor orthodontic treatment was taken into consideration. Surgical ridge augmentation was discussed with the surgeon, and decision was made to augment the ridge with a subepithelial connective tissue graft harvested from the palate. Two consecutive grafting procedures were planned because the deformity was too large. The surgical protocol was adopted from the method of Langer and Calagna who described the placement of a connective tissue graft between the facial pedicle flap and edentulous ridge.[4] Crown lengthening was planned for tooth 23 to correct the uneven gum line.

The augmentation procedure is illustrated in Fig4. A partial-thickness pedicle facial flap was prepared on the recipient site. The subepithelial connective tissue graft was then harvested from the palate mesial to the left first premolar and extending to the distal of the first molar. Care was taken to avoid damage to the palatine artery. The soft tissue graft was positioned and light compressed to shape the edentulous ridge. The pontic of the provisional bridge was then adjusted to fit the augmented ridge with minimal pressure before suturing (Fig5). Crown lengthening for tooth 23 was performed in the same surgery. The wounds both on the donor and recipient sites were sutured using 4-0 EU-TEK (PGA) sutures (Unik Surgical Sutures Mfg. Co., Taiwan). The wound on the donor site was protected using

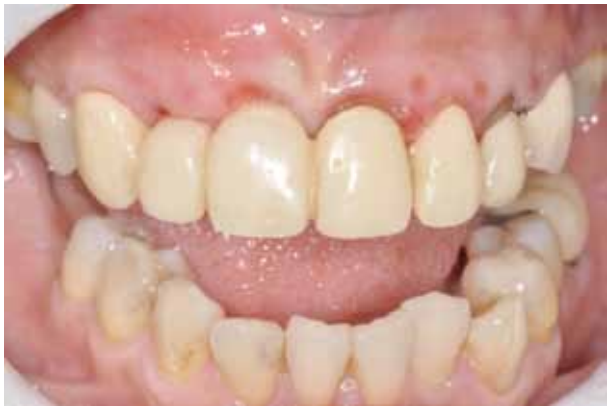


Fig5 Ovate pontic of the provisional bridge. It was adjusted with minimal pressure to fit the augmented ridge

a non-eugenol-based dressing (Coe-Pak, GC America). The sutures were removed after 14 days of wound healing.

Post-operative instructions included daily chlorhexidine mouth rinsing and the use of prescribed analgesics. The sutures were removed ten days after surgery, and good soft tissue healing was observed. The ovate pontics were adjusted at regular post-surgery follow-up appointments to achieve optimal cervical contour. Significant ridge improvement was realized, but minor ridge deformity still existed. An identical procedure of soft tissue grafting was performed six months later. Six months

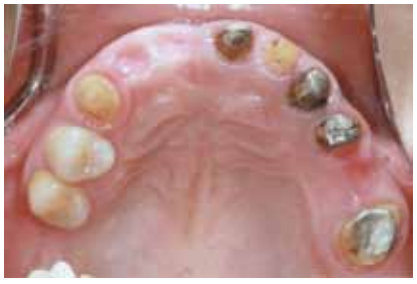


Fig6 Six months after the second surgical ridge augmentation, the edentulous ridge healed with adequate (a) buccolingual and (b) apicocoronal contours

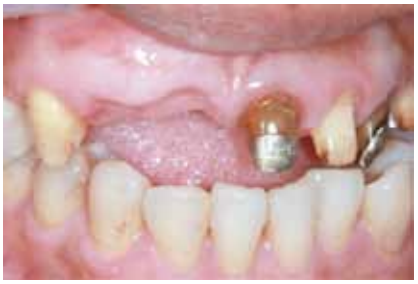
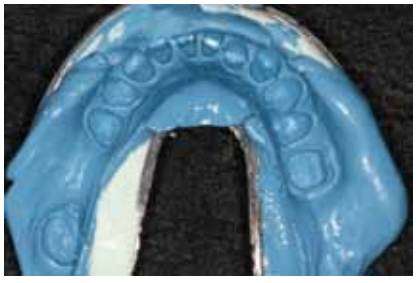


Fig7 Provisional fixed partial dentures with improvement in both functional and esthetic outcomes six months after the second surgery

after the second surgery, the edentulous ridge healed with adequate buccolingual and apicocoronal contours (Fig6). No visible change was observed in the shape of the soft tissue, and the patient was satisfied with the appearance of her provisional FPD (Fig7). Thus, the final impression was taken, and the final fixed prosthesis was fabricated (Fig8) and cemented (Fig9 and 10). The final fixed prosthesis design included a four-unit porcelain-fused-to metal (PFM) FPD (teeth 13 to 21), three-unit PFM FPD (teeth 24 to 26), and three single PFM FPDs (teeth 22, 23, and 36). Follow-up examinations for ten months confirmed a stable outcome (Fig11).

a



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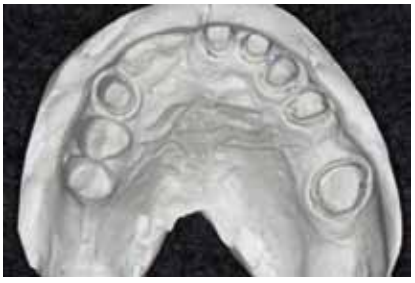

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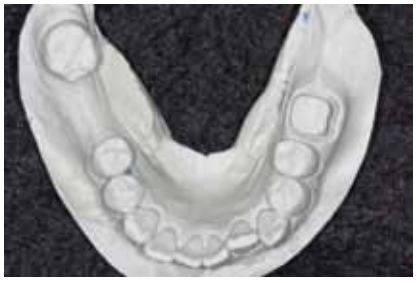

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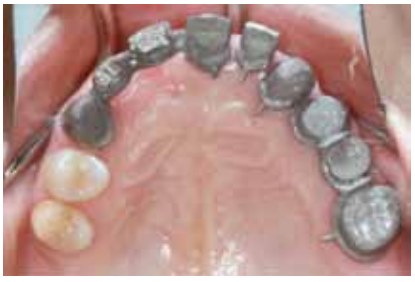

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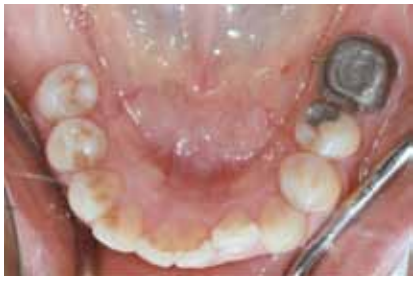
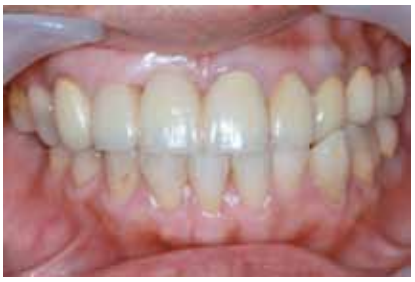


f

Fig8
- a, b Final impression with condensation-type silicone.
- c, d Upper and lower master casts.
- e, f Metal framework try-in of the fixed partial dentures



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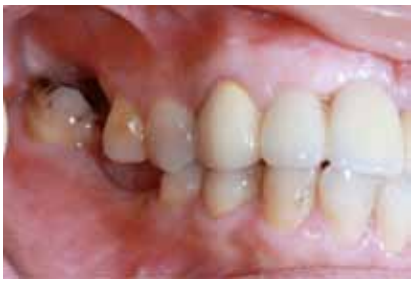

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Fig9 a-d Satisfactory final restoration

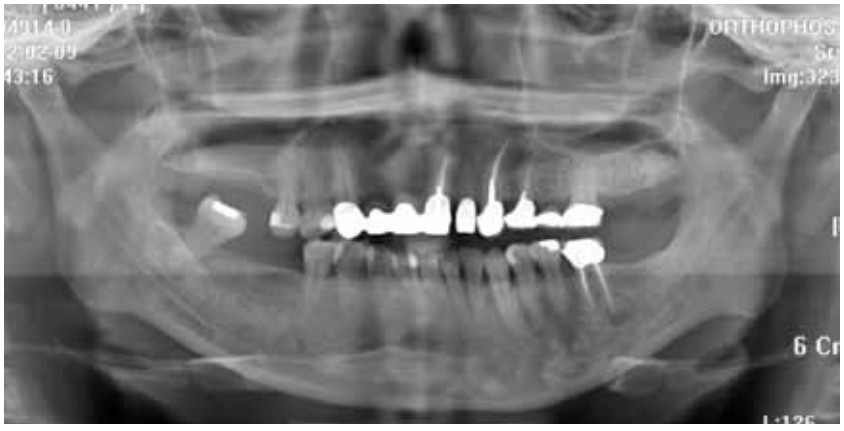

Fig10 Panoramic radiograph of the final prosthesis

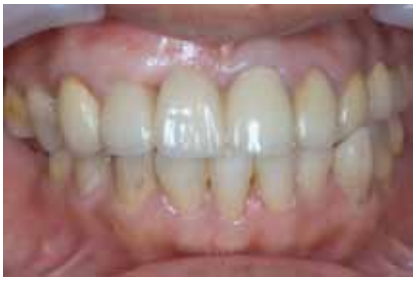

Fig11 Prosthesis after ten months of follow-up

Discussion

Various augmentation procedures are available for the improvement of alveolar ridge deformities. Seibert described the use of a thick free gingival onlay graft to enhance ridge height and replace disfigured or traumatized tissue.[7] However, the use of onlay grafts has some disadvantages, including post-operative necrosis in case of inadequate blood supply,[8] unpredictable shrinkage of grafts,[9,10] and the generally pale tissue color resulting in unaesthetic appearance.[3] The subepithelial connective tissue graft described by Langer and Calagna[4] was used in this case to preserve tissue color and the texture of the underlying mucosa, resulting in better esthetics. A review by Thoma illustrated that subepithelial connective tissue grafts provide greater soft tissue volume than free gingival grafts,[11] although further research is needed. Moreover, subepithelial connective tissue grafts receive more vascular nourishment, thus decreasing the possibility of post-surgery necrosis.

The major disadvantage of using connective tissue grafts is the need for a second surgical site. However, grafting does not appear to be technique sensitive compared with augmentation, which uses bone-substitute materials or GBR. Ridges augmented with connective tissue grafts have demonstrated stability for 7 to 12 years.[9,12] Nevertheless, patients must be informed that because

wound healing is a long-term process,[13] the shrinkage of augmented soft tissues is in part unpredictable.

FPD pontics have to fulfill esthetic, functional, and hygienic requirements. The ovate pontic design used in this case was intended for the fabrication of a concave soft tissue outline in the edentulous ridge to mimic the natural emergency profile.[14] The major advantage of the ovate pontic is its ability to achieve maximum esthetics. However, sufficient faciolingual width and apicocoronal thickness are required for housing the ovate pontic. Hence, additional surgical procedures are frequently required to augment the edentulous ridge. The ovate pontic of the provisional FPD should be adjusted in light contact with underlying soft tissue following surgical augmentation.[15,16] Regular follow-up appointments must be scheduled to adjust the interim FPD and guide the soft tissue to an ideal contour. Furthermore, plaque control by patients eliminates periodontal inflammation and plays a major role in the stability of plastic surgery.

Conclusion

This case report illustrates the esthetic reconstruction of a Siebert Class III ridge deformity. A two-step approach using subepithelial connective tissue grafts can be employed to achieve an ideal gingival contour and is helpful in treating patients like the one in this case. The apicocoronal and buccolingual augmentation of the edentulous ridge improves both functional and esthetic outcomes. Long-term processes for augmented soft tissue remodeling are required. About six months is needed before the final prosthesis can be constructed.

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Effect of Veneering Techniques on Ceramic Fracture of Zirconia Restoration

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Abstract

All-ceramic prostheses are increasingly being fabricated along with advancement in dental material science, the demand for non-metal prostheses, and the introduction of zirconia. However, problems have occurred following the prevalence of zirconia application. Although zirconia fracture is rarely seen, the risk of veneer ceramic fracture is rather high. Reducing this risk has therefore become an important issue for manufacturers. Given that the conventional hand-layering technique may partly account for veneer ceramic fracture, new techniques have been developed: press-on technique, CAD/CAM veneering technique, and use of full zirconia restorations. However, all of these techniques require further examination through long-term studies.

Keywords: CAD/CAM, fracture, pressed ceramics, veneer ceramics, zirconia.

With advancement in dental material science and the development of zirconia, all-ceramic restorations are increasingly being used clinically. Zirconia has good mechanical properties, making it suitable as material not only for anterior crowns but also for posterior crowns and bridges. However, problems have occurred because of the prevalence of zirconia application. Although zirconia fracture is rarely seen, the risk of veneer ceramic fracture is rather high. Reducing such risk has therefore become an important issue for manufacturers. This article presents a review of related studies on methods of preventing veneer ceramic fracture.

The history of zirconia dental application is not quite long, especially for bridge fabrication. Hence, most zirconia-related clinical reports are limited to short-term follow-up results. In addition, significant variation exists in reports on veneer ceramic fracture, with some reports revealing no veneer ceramic fracture at all and others showing fracture rates more than 50%. The variation also indicates that the fabrication of zirconia restorations might be very technique sensitive.[1–3] There are many factors causing veneer fracture, such as insufficient veneer strength, inexperience with new ceramics, mismatch in the coefficient of thermal expansion, insufficient framework support, near-surface damage, and sliding contact fatigue.[4–12]

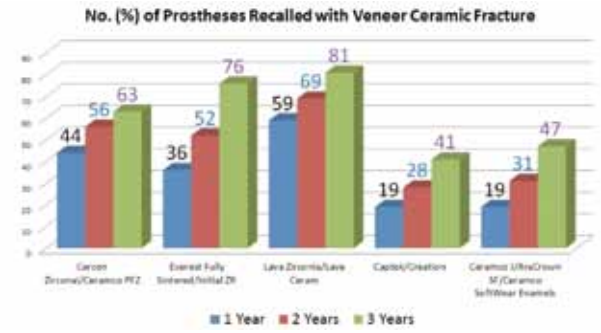

Fig1 Veneer ceramic fracture rate of 3-unit bridge with hand-layering technique: All of the products were zirconia except Captek and Caramco UltraCrown SF. These two exceptions are metal alloy. （Data from Christensen et al., 2010）

In the past few decades, the use of porcelain-fused-to-metal (PFM) restorations was considered to have predictable results. The mean veneer fracture rate is higher for zirconia restorations than for conventional PFM restorations,[13,14] but studies of direct comparison between zirconia and PFM restorations are rare.[15,16] According to Christensen, although the risk of veneer ceramic fracture is higher for zirconia restorations, the fracture rate for PFM restorations after three years of use is greater than 41% (Fig1).[15] During the processing of zirconia-based all-ceramic restorations, veneer ceramics is usually fabricated by hand-layering technique, which demands high technical expertise. In addition, the possibility of inducing porosity during layering may account for veneer fracture.

To reduce the possibility of veneer ceramic fracture, three different ways of fabricating zirconia-based all-ceramic restorations have been developed: press-on technique, CAD/CAM veneering technique, and the elimination of veneer ceramics.

1. Press-on technique

This technique is basically similar with the conventional heat-pressed technique, except for the zirconia framework. The protocol includes waxing up, forming the mold by lost-wax process, melting ceramic ingots at high temperature, and injecting the melted ceramics into the mold by pressure, followed by divesting, staining, and glazing (Fig2~7).

The press-on technique is primarily used to improve veneer ceramic fracture resistance by reducing bubble formation and multiple firing. However, according to in vitro[17,18] and in vivo experiments, the press-on technique does not result in greater fracture reduction compared with the hand-layering technique. Christensen found that the effect of the press-on technique varies with different systems.[15] Improvement in fracture resistance was not ideal in Christensen's IPS e.max ZirPress group

Fig2 Completely prepared zirconia framework on the model

Fig3 Bottom view of wax pattern and spruing

Fig4 Occlusal view of wax pattern and spruing

Fig5 After pressing, the restoration was ready for staining and glazing.

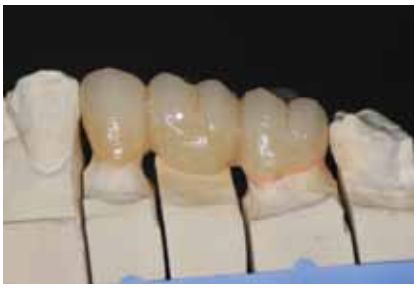

Fig6 Complete the restoration with staining and glazing

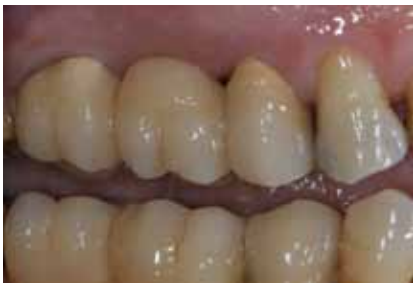

Fig7 Intraoral view of the restoration

Fig8 Veneer ceramic fracture rate of 3-unit bridge with hand-layering technique and pressed-on technique. All of the products were fabricated with hand-layering technique except Zirpress and CZR, which was made by Press-on technique。（data from Christensen et al., 2010）

but was significant in the Noritake CZR Press group (leucite-containing system), suggesting that the ingredients of pressed ingots possibly play a role in fracture behavior (Fig8). Choi JE also proved that leucite-containing systems, such as CZR Press and Vita PM9, exhibit better physical properties than other systems for the press-on technique.[19,20]

2. CAD/CAM veneering technique

Veneer ceramics can be fabricated by CAD/CAM technique, through which porosity and time of firing are reduced and materials with improved strength can be used. Vita Rapid Layer Technology (RLT) and IPS e.max CAD-on technique are usually employed for bridge fabrication. In RLT, veneer ceramics is fabricated with feldspathic TriLuxe forte (flexural strength of about 150 MPa). The veneer ceramics is sintered then attached to the sintered zirconia framework by resin cement. Meanwhile, e.max CAD (flexural strength of about 360 MPa) made primarily with lithium disilicate is used in the CAD-on technique. After milling, the veneer porcelain is not sintered immediately. A special fusing glass ceramics is added between the two layers; the two layers are joined together after fusion firing (Figures 9–11).

According to Schmitter, higher fracture resistance is achieved with the CAD-on technique than with the hand-layering technique.[21] In another study comparing restorations made with the RLT and CAD-on techniques, CAD-on products revealed higher strength than RLT products with the same thickness (3534±602 N versus 1833±460 N).[22] Because of the high strength of ceramics reinforced by lithium disilicate, manufacturers suggest a minimum veneer ceramic thickness of 0.7 mm for CAD-on and 1 mm for RLT.

The two techniques described above have been developed in recent years, so relevant scientific information is scarce. We found only one short-term follow up report on the CAD-on technique. In Watzke's clinical report on the CAD-on technique,[20] single crowns and 5 three-unit bridges were included.[23] There was no veneer fracture observed after one year of use. Beuer also favored this technique over the hand-layering method.[24]

3. Eliminating veneer ceramics

What causes veneer ceramic fracture is still under debate, so another way to prevent it is to avoid completely the use of veneer ceramics. Without veneer ceramics, there can be no veneer fracture. Initially, veneer ceramics was used to improve the esthetic properties of zirconia, particularly its poor translucency. Following the development of dental material science, the translucency of zirconia has been improved. By internal and external stain techniques, full-contour zirconia restorations can now be used. However, the clinical indication of full zirconia restorations is limited to posterior regions with little esthetic demand (Fig12–16), and excess wear of the opposing teeth has become a concern because of the high strength and hardness of zirconia. Nevertheless, with proper polishing protocol, opposing enamel attrition can be avoided.[25, 26] In case of opposing teeth with intact enamel, full zirconia restorations can be used without concerns for excessive wear. Additionally, in cases where proper polishing cannot be achieved, full zirconia restorations can still be used in regions opposite that of teeth with restorations.

With the widespread use of zirconia ceramics in the dental field, veneer ceramic fracture has become a major concern. Many reasons have been identified, and among them

Fig9 Veneer ceramic with CAD/CAM technique and zirconia framework

Fig10 Zirconia framework and veneer ceramic before fusion process

Fig11 After fusing and staining/glazing

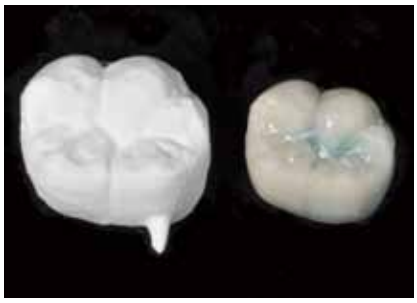

Fig12 Wax pattern and milled zirconia (before strengthening)

Fig13 Shading zirconia with colouring agent before strengthening

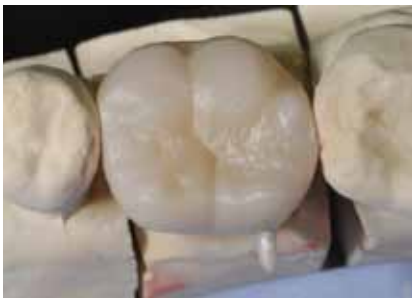

Fig14 After strengthening

Fig15 After staining and glazing

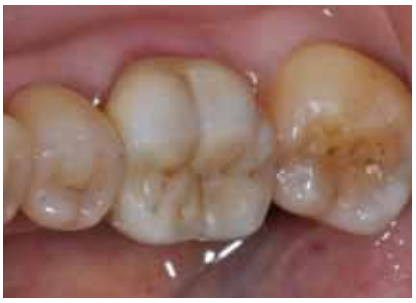

Fig16 Intraoral view of the restoration

is the use of the hand-layering technique. The press-on and CAD/CAM veneering techniques were both developed to reduce fracture rates. Single crowns made with the CAD-on or press-on technique exhibit higher fracture strength than those made with the hand-layering technique.[24] The simple processing procedure is another advantage. However, in cases of multiple units of fixed prosthesis made with the CAD-on technique, the frameworks must be designed with care. In addition, to prevent problems with veneer cap placement due to undercut, the use of the conventional framework design with anatomic morphology should be avoided. The modified framework design of the CAD-on technique must therefore be evaluated further. Given new zirconia with high translucency, the use of full-contour zirconia restorations has become another way to avoid veneer ceramic fracture. All of these techniques require further examination after long-term use.

Acknowledgment

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Technical Report

義眼球之製作
A technique of fabrication for ocular prosthesis

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摘要
義眼球的製作過程和製作全口義齒義齒基底的過程相類似，其不同之處在於將上色之虹膜及鞏膜埋入不同顏色的丙烯酸樹脂內。本文的主要目的是敘述利用義眼印模托印模法及金屬虹膜鈕作虹膜及瞳孔之定位，製作義眼球。

關鍵詞： 眼球印模托, 鞏膜丙烯酸樹脂, 虹膜片, 虹膜鈕, 單複體溶液

Abstract
The procedures of fabrication an ocular prosthesis is similar to the procedures of fabrication of denture base of the complete denture. The difference is to embed the scleral and iris painting in different colors of the acrylic resin. The aim of this article is to describe the entire procedures to fabricate an ocular prosthesis. by using the ocular tray impression technique and metal ocular button to position the iris and pupil.

Key words: Ocular tray, scleral acrylic resin, ocular disc, ocular button, mono-poly syrup

前言：

眼睛為靈魂之窗，一但病人失去了眼睛立刻影響其顏面外觀，應立即配戴義眼以恢復其外觀。眼球之喪失的主要原因為疾病或外傷所致，而造成眼球萎縮或整顆眼球須被摘除。在手術方面可分成三種：

一為剜（evisceration），是去除眼球的內含物，留下完整的鞏膜殼和眼外肌。二為眼球摘除術（enucleation），為摘除整顆眼球，但保存眼外肌及視神經，三為臟器切除術（ exenteration），為嚴重外傷或腫瘤須摘除整個眼球及切除眼窩[1] 在第一及第二手術造成眼球的喪失，我們為病人所製作之贋復體稱之為義眼球（ ocular prosthesis）。而第三類型則稱為眼眶義眼（ orbital prosthesis）。然而製作眼眶義眼也須先製作義眼球。義眼放置在眼窩內是利用眼窩的上、下眼皮穹窿（eyelid Fornix ）所形成之倒凹，將其固定在眼窩內.眼皮的形態可影響義眼的固位性。因比眼科醫師在進行第一及第二類型手術時，可在其眼窩底軟組織植入植體[2-6] ，造成眼底軟組織表面形成凸點，而義眼球底面形成凹點和其配合，當眼外肌在運動時，義眼球也可作部份的轉動。然而手術後

經六星期傷口才會完全癒合。而癒合的過程中軟組織的收縮易造成上眼皮下垂（ptosis）及下眼皮外翻（ectropic lower lid）[6]，上眼皮下垂因有足夠的眼皮穹窿倒凹存在，可在製作義齒蠟模時作向上及向外延伸以增加眼球上端的高度及厚度而完成。而下眼皮外翻，則缺乏下眼皮穹窿倒凹，雖可延伸義眼下緣壓迫出眼皮穹窿倒凹，但效果不佳，義眼容易脫落。因此眼科醫師在作眼球摘除時，可在眼窩內放置conformer以維持上、下眼皮穹窿[1,8]。而conformer 可分成四種類型。第一類型為熱凝丙烯酸樹脂自製而成[9]，第二類型為立即製作臨時的義眼球[6]第三類利用軟組織包埋conformer而製成[10]，第四類型為預製含有虹膜顏色[11]，而以第四類型為佳，不但操作簡易可立刻恢復病人之外觀，且又可維持下眼及穹窿倒凹的深度，以利永久性義眼球之製作。因此眼科醫師和口腔顏面贋復牙醫師必須在治療比類病人前先進行溝通。

本文主要是敘述製作義眼球的臨床操作過程：包括取模、鞏膜蠟模製作、瞳孔之定位、義眼鞏膜之製作、虹膜之上色、義眼鞏膜之處理及上色、瞳孔之上色及虹膜片之置位、角膜層之製作等步驟。

方法

一、取模

選取修磨大小適合之義眼印模托（stock acrylic resin impression trays）*放入病人眼眶內（圖1-3），讓患者坐在治療椅上，身體和地面呈45度。依照廠商指示調拌不可逆藻膠，壓入塑膠注射筒內，連接上義眼印模托，將不可逆藻膠注入眼眶內，直到有回壓的感覺為止（圖4）。等不可逆藻膠硬化後，取出義眼印模托，即完成取模之工作（圖5）。

二、鞏膜蠟模之製作

以包埋印模托的方式灌製主模型。調伴硬石膏，將義眼印模托的底部放在硬石膏上，在岸緣作出二個凹槽（index）（圖6），等底座硬石膏硬化後，在義齒印模托的中空連接部位及岸緣處塗上分離劑，再灌製上層硬石膏至義眼印模托的中空連接部二分之一處。等上層硬石膏硬化後，將上、下層硬石膏分開，取出義眼印模托即完成主模型之製作。將上、下層主模型塗上分離劑，等其乾後，合併上、下層硬石膏。再將熱熔之石蠟質蠟（paraffin wax），從上層硬石膏的孔洞中

圖1　預製眼球印模托

圖2　調整預製眼球印模托邊緣之大小

圖3　將調整之眼球印模托置入病人眼窩內試戴

圖4　利用大型塑膠注射筒注入不可逆藻膠於眼窩內

圖5　完成印模之眼球印模托

圖6　完成印模之眼球印模托之底座利用硬石膏作包埋的情形

圖7　灌注熱熔之石蠟質蠟入眼球印模托之包埋內

圖8　義眼球之蠟型初模

圖9　在病人眼窩內調整完之義眼球蠟模

圖10　金屬及透明虹膜鈕

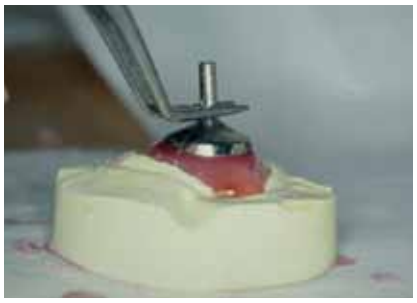

圖11　利用加熱之金屬虹膜鈕定出虹膜的位置

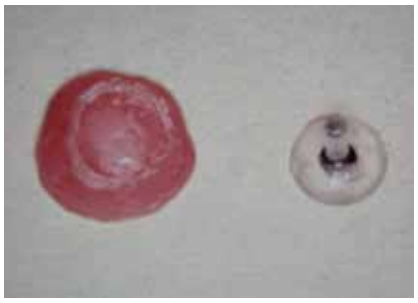

圖12　義眼蠟模上虹膜之定位及透明虹膜鈕

圖13　將透明虹膜鈕置位入義眼蠟模上

圖14　瞳孔之定位略低於真眼

圖15　瞳孔重新定位和真眼平行

倒入至滿溢為止，等蠟冷却後，分開上、下層硬石膏，取出蠟模，即完成鞏膜蠟模之製作（圖7-8）。

三、瞳孔之定位

首先雕刻蠟模，去除尖銳邊緣呈平滑，放入患者眼窩內，檢視上、下眼臉的豐隆度，雕除蠟模的厚度，使其和病人真眼處上、下眼臉的豐隆度相等為止（圖9）。測量虹膜（iris）的直徑，選取相同大小直徑相同之金屬虹膜鈕鑄造體（圖10），將之燙熱，然後在蠟模眼球表面的中央燙出一凹陷（圖11），放上一直徑大小相同之透明虹膜鈕*（圖12-13）。用蠟將之固定住。將蠟模放入病人眼窩內，讓患者在視線略低於平視，察看義眼瞳孔之定位和真眼是否在同一平面上，若不在同一平面，再重覆上述的方法，將瞳孔之位置作上、下、左、右定位，直到其和病人的真眼在同一平面上（圖14-15）。

四、義眼球鞏膜之製作

將上述之蠟模從病人眼窩內拿出，移除虹膜鈕（圖16）。若要製作多顆義眼球，可用不可逆藻膠作上下層包理，再利用熱熔的石蠟質蠟，作為複製，一般可複製三顆義眼球蠟模，利用煮盒同時包埋三顆義眼球蠟模，首先在在煮盒的底層置入調拌完成之硬

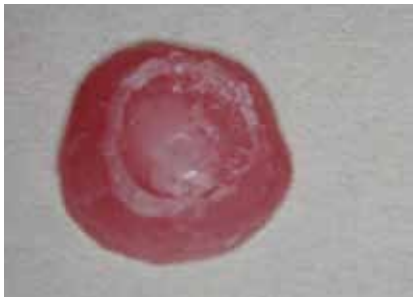

圖16　取出透明虹膜鈕之鞏膜蠟模

圖17　煮驟完成之鞏膜丙烯酸樹脂

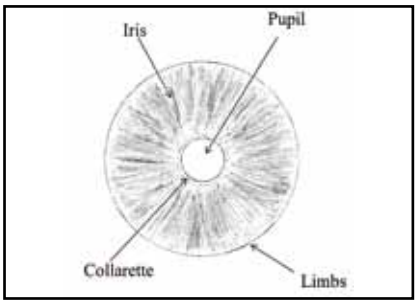

圖18　虹膜片上色之解剖圖

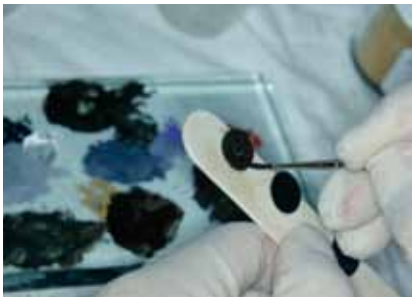

圖19　虹膜片之上色

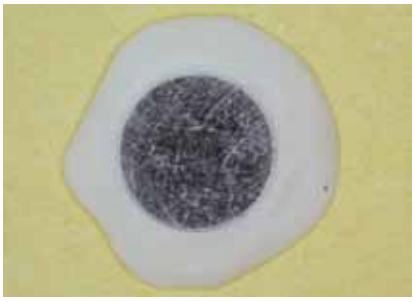

圖20　修磨完成之鞏膜體

圖21　鞏膜體之上色

石膏，在振動器上去除空氣泡，再將三顆義眼球蠟模的底部刷上調拌好之硬石膏，小心放置在下層煮盒的硬石膏上，且使其邊緣和下層煮盒內的硬石膏同一平面。等到煮盒下層的硬石膏硬化後，在其表面上塗上兩層分離劑，然後再放置上層的煮盒,調拌完成的硬石膏，先在義眼球蠟模的虹膜凹隙處刷上一層硬石膏，再灌入硬石膏在振勳器上去除空氣泡後，再放上煮盒之頂蓋。等到上層煮盒硬石膏硬化後，打開煮盒，用熱水冲除義眼球蠟模，然後再在硬石膏表面塗上兩層分離劑，調拌鞏膜丙烯酸樹脂（Scleral Acrylic Resin）*依廠商所指示之水粉比作調拌，等至糰狀期時，將之壓入煮盒下層義眼球的主模型中，上放置一張玻璃紙，蓋上上層煮盒，在油壓機上壓出多餘之樹脂，打開煮盒切除多餘的樹脂後，再在油壓機上壓至100 Bar，再放入煮鍋內，在華氏150度進行9小時後升至華氏212度進行2小時的煮聚作用，完成後打開煮盒即完成丙烯酸樹脂眼球鞏膜之製作（圖17）。

* ROBERT B. SCOTT OCULARISTS OF FLORIDA INC. or Factor II, Incorporated

五、虹膜之上色

虹膜之上色可分為四部位：（一）虹膜最外圈（limbus）（二）虹彩（iris）（三）collarette 為瞳孔之外圈呈不規則散射狀（四）瞳孔（pupil）（圖18）。所須之工具為：玻璃調板，兩隻玻璃或塑膠調杯，一隻小紅貂毛筆、吸管一支。兩杯調杯、一杯放置單複體溶液（mono-poly syrup）*一杯放置熱凝丙烯酸單體。單複體溶液是用來調拌粉狀染料，畫在虹膜片（ocular disc）*上，而熱凝丙烯酸單體是用於減緩單複體溶液調拌粉狀染料變乾的速度及清洗紅貂毛筆（red sable brush）*上染料的顏色之用，首先在自然光下觀察病人正常眼睛虹膜的最深層顏色，稱之為基底色（base colour）然後再細看其上的斑點色（detail），選用上述已測量到直徑之虹腹片（ocular disc）*，利用裂溝磨針配合慢速直機在其正中車一和病人正常眼睛瞳孔大小相同之小圓洞，滴兩滴單複體溶液將虹膜片沾黏在壓舌板上，滴一至二滴單複體溶液於玻璃調板上，選用棕色配合一些黑色粉狀染料調拌至和病人正常眼的虹膜最深層色相同，再用紅貂毛筆沾上染劑在虹膜片上由瞳孔邊緣作直線往虹膜外圍（limbus）上色。再上斑點色，然後再上collarette的顏色，最後上Limbus的顏色，虹膜外圍（limbus）的顏色為深藍

圖22　瞳孔之上色

圖23　上完色之虹膜片置位於鞏膜體上，鞏膜體上色及黏上紅色纖維絲

圖24　完成上色之虹膜及鞏膜重置位於先前煮盒之下層

圖25　先前相對煮盒上層右邊磨除二毫米硬石膏

圖26　完成之義眼球

圖27　病人未配戴義眼球，右眼眼球萎縮

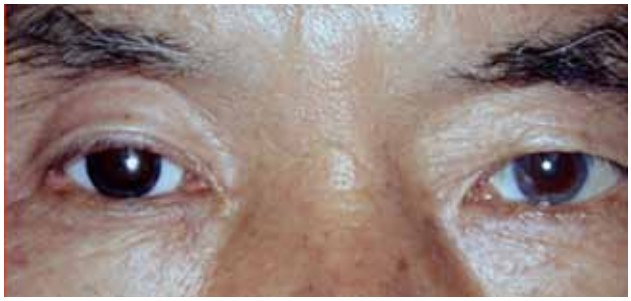

圖28　病人配戴右義眼球

色 虹膜片上色完畢後，可在虹膜片上滴上水滴，可清楚觀看虹膜片上色的結果和病人的正常眼睛相比較。若顏色不對可用熱凝丙烯酸單體將其去色，再重新上色。即完成虹膜片之上色（圖19）。

六、義眼鞏膜之處理及上色

將一直徑相同，未上色之虹膜片放置在煮聚完成之義眼的虹膜凹隙處。如果放不進去，可用圓柱形之綠磨石（green stone）將其凹隙底部磨平且加寬至虹膜片可完全放置在虹膜凹陷內。然後再輕磨鞏膜義眼凹陷處之邊緣，使其和虹膜片呈一平面。（圖20）取出虹膜片，將鞏膜義眼的虹膜凹陷邊緣至鞏膜義眼的邊緣用鎢鋼針配合慢速直機車磨掉約一毫米。然後再用布輪配合滑石粉（pumice powder）將之修磨處及底部磨平拋光。再利用單複體溶液沾上土黃色之染劑，調之略為淡土黃色後刷上除虹膜凹陷外之整個鞏膜義眼，再沾幾條紅色纖維絲於鞏膜處，模擬眼白處之血絲，即完成鞏膜之上色（圖21）。

七、瞳孔之上色及虹膜片之置位

在完成上色義眼鞏膜的虹膜凹陷的正中央處。利用mono-poly調拌黑色染劑。塗於其上（圖22），然後將虹膜片放置鞏膜義眼凹陷後，在虹膜片上刷上一層薄薄的mono-poly至超過鞏膜義眼交接處。然後放置在檯燈下讓其自然乾後，再重複一次，即完成虹膜片之置位及瞳孔之上色（圖23）。

八、角膜之製作

將第七步驟完成的鞏膜義眼放置回煮盒的下層（圖24），將煮盒上層鞏膜凹陷處相對凸出之硬石膏磨除至二毫米深（圖25）。依廠商指示的水粉比，調拌透明熱凝丙烯酸樹脂*，調拌完後可放置在抽真空或硬石膏調拌抽真空機中抽除氣泡。填塞及煮聚的方法和鞏膜義眼製作法相同，即完成角膜之製作。

九、試戴及完成

將完成之義眼，利用吸管後緣橡皮管吸住義眼，放置於病人的眼窩內，觀察其豐隆度，再度利用鎢鋼鑽針修磨過度凸出之角膜，再拋光，即完成義眼之製作（圖26-28）。

討論

義眼球之製作過程和全口義義齒義齒基底之製作過程相同。其不同之處在於如何將上色之虹膜及鞏膜置入於不同顏色之丙烯酸樹脂內。其製作有多種不同的方法。主要之差別在於取模方法、虹膜片大小之選用，瞳孔之定位及虹膜上色的方式，而其它步驟都相同。在取模方法大約可分成四種方法，一為直接利用不可逆藻膠,調拌後填入大型塑膠注射筒直接注入病人眼窩內印取模型。[2,12,13] 二為本選用預製丙烯酸眼窩印模托[14]，調整其大小，利用不可逆藻膠，調拌後填入大型塑膠注射筒，連接上義眼印模托，直接注入病人眼窩內印取模，但預製丙烯酸眼窩印模托為拋棄式，成本較高。因而可用不同大小之預製丙烯酸眼窩印模托，用鈷鉻合金鑄造而成，可消毒後重複使用[15]。三為改良式現成義眼球印模法，選用已製作完成之虹膜及瞳孔顏色相同義眼（stock eye），將其邊緣稍微磨短，利用橡皮吸管吸住該眼球，然後一齊置入眼窩內，再利用不可逆藻膠、蠟或組織調理材等印取邊緣模型後，再將邊緣之印模材轉換成透明熱凝丙烯酸樹脂。雖可減少鞏膜之製作，但瞳孔的定點難度較高。[16-19] 四、利用先前手術中之comfomer ，利用聚乙烯基印模材包埋製成蠟模[20,21]。而本方法是利用預製眼窩印模托印模法，可印取不論是眼窩內眼球全失、眼球萎縮或完整的模型，比較精準。

虹膜片之選擇：在製作虹膜之選擇上，可分成虹膜片及虹膜鈕兩種。虹膜片為一圓型片直徑為11毫米，以每0.5毫米直徑增加至13毫米，厚度為0.015吋，顏色可分成黑色及透明兩種，型態可分為全圓盤型及全圓盤型但中央有一圓形中空，而直徑分別為3、3.5、4毫米作為瞳孔大小之用。在選擇上選用黑色具有中空之虹膜片為佳，因為不須在其中央車磨一圓形的瞳孔型狀。另一種為虹膜鈕，其為透明而底部直徑大小和虹膜片相同而中央有一黑色圓形瞳孔，直徑大小可分為2及3毫米，其外型為圓弧型，在相對瞳孔中央處有一圓柱形握把。瞳孔鈕的用途可作為瞳孔的定位器及虹膜之上色，虹膜片大小之選擇及瞳孔之定位：虹膜片大小之選擇可利用瞳孔測量計（pupillometer） 直接測量病人真眼虹膜之大小，或利用眼球定位器（ ocular locator） 或游標尺量度虹膜的大小及在病人的缺眼的眼眶四周作定位等方法[22-26]。本文所述方法為利用瞳孔測量計量取病人自然眼虹膜大小後，利用自製的金屬虹膜鈕作虹膜及瞳孔之定位，其方法為將不同直徑的瞳孔鈕，用石蠟質蠟加厚其底部，包埋、去蠟、利用鈷鉻合金鑄造而成不同直徑大小金屬虹膜鈕，再選用測量出之虹膜大小後，利用相同直徑金屬虹膜鈕加熱後，在蠟模上燙出一虹膜凹陷，再置入虹膜鈕後，置入病人眼窩內和病人的真眼作瞳孔之定位。此方法不但簡單而且可以作重覆做定位，且因虹膜鈕有握把存在，容易置入病人的眼窩內及取出。

在虹膜上色方面：虹膜片之上色方法有很多種，其決定因素在於虹膜片本身的材質。上述的虹膜片的材質為乙基纖維素複合材（ ethyl cellulose ocular disc）。無法使用水彩作上色，因此必須使用油彩或乾粉顏料配合單複體溶液才可以在虹膜片上上色[24,27,28]，單複體溶液的調配方法有兩種：一為依重量比，十份的熱凝性透明丙烯酸樹脂複合體和一份的自凝性丙烯酸樹脂單體調製而成，此種是用於平滑軟性底墊、矽膠表面及丙烯酸樹脂表面[29]。而用於虹膜上色之單複體溶液則是為依重量比，十份的熱凝性透明丙烯酸樹脂複合體和一份的熱凝性透明丙烯酸樹脂單體調製而成[30]。本篇所述採用單複體溶液配合乾粉顏料在虹膜片上上色，因單複體溶液可減緩乾粉顏料變乾的時間、調配顏色的深淺度及從虹膜片上拭去不適合之顏色，重新上色，在操作上比較方便。

義眼球可成功地固位在病人的眼窩裏，主要的決定因素在於病人的眼窩形態。病人的眼窩必須有足夠上、下眼皮穹窿（eyelid fornix）倒凹，才能將義眼球固定在病人眼窩內。因此眼科醫師和口腔顏面贋復牙醫師必須在治療此類病人前須先進行溝通。利用上述適合的confomer製作方法，維持上、下眼皮穹窿（eyelid fornix）倒凹。至於製作義眼球的方法，可依製作人員擁有的材料而定。本篇所述採用眼球印模托印模為最基本及簡單之方法。可同時製作三顆義眼球，一顆讓病人裝戴，其餘兩顆由醫師保留作為常備義眼球（stock ocular prosthesis）。萬一病人遺失裝戴之義眼球時，可立刻為其裝戴另一新的義眼球。或可利用這些已製作完成之義眼球為其他病人作上述第三類改良式現成義眼球印模法（ocular prosthesis modification）。

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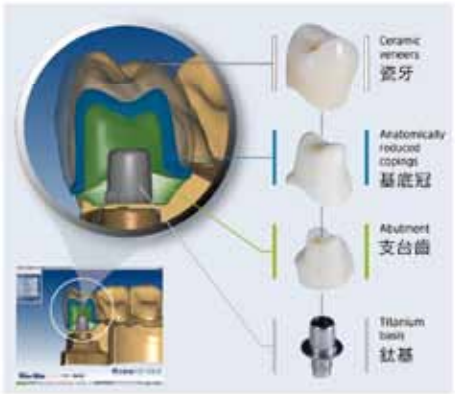

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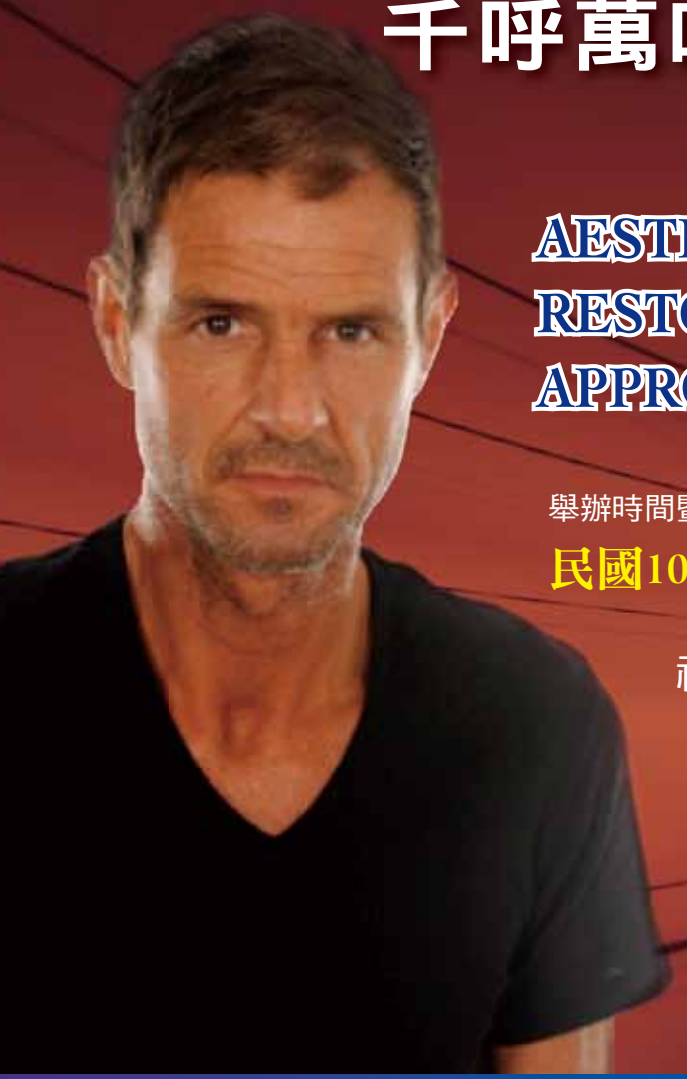
中華民國贋復牙科學會第十三屆
第一次會員大會暨第六十九次學術研討會

牙科陶瓷技藝與藝術的傳奇人物
Mr. Michel Magne
千呼萬喚　首度來台



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11/24(星期六)		11/25(星期日)	
09:00-12:30	研究生貼示報告展示 專題演講 蘇建賓醫師(0900-0940) 陳柏均醫師(0950-1030) 鄭智文醫師(1050-1130) 許月閔醫師(1140-1220)	09:00-12:00	外賓演講：Michel Magne
午休暨貼示口頭報告		午休	
13:30-15:30	特別演講：林錦榮醫師	13:30-17:00	外賓演講： Michel Magne
15:50-17:30	會員大會暨選舉		
18:30	大會聚餐 (限本會會員) 晚宴時間：11月24日(星期六)晚上六點卅分 地點：仁愛路福華大飯店3樓江南春(台北市仁愛路三段160號)		

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