

Case Report

Mandibular overlay removable partial denture for the restoration of worn dentition: a case report

Hsiao-Ying Yang, DDS^a, Tsung-Chieh Yang, DDS, PhD^b, Tong-Mei Wang, DDS, PhD^c, Li-Deh Lin, DDS, PhD^d

^a Attending doctor, National Taiwan University Hospital Yun-Lin Branch, Taiwan

^b Associate professor, National Taiwan University, School of Dentistry, Taipei, Taiwan

^c Assistant professor, National Taiwan University, School of Dentistry, Taipei, Taiwan

^d Professor, National Taiwan University, School of Dentistry, Taipei, Taiwan

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Corresponding author:

Tsung-Chieh Yang

National Taiwan University, School of Dentistry, No 1, Chang-Te street, Taipei 100, Taiwan.

Tel: +882-2-23123456 ext 66866

E-mail: yangtc@ntu.edu.tw

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Abstract

Within most relational definitions, tooth wear and such treatment may range from simple operative care to full mouth reconstruction. This case report describes and evaluates a method in which fixed dental prostheses and mandibular overlay removable partial denture were used in a patient with severe tooth wear and posterior bite collapse. After evaluation of the remaining tooth structure and usable space needed for the prosthesis, fabrication of the prosthesis aimed at increasing the vertical dimension (VD) was planned. To begin with, the freeway space and facial profile were used to determine new VD, then interim dentures were placed to evaluate the patient's tolerance of a change on VD. As the patient adapted to the new VD during follow-up period, provisional prostheses were used as a guide for the definitive treatment, and maxillary Kennedy Class III removable partial denture and mandibular Kennedy Class I overlay removable partial denture were placed. This overlay denture is a conservative and reversible treatment to provide the patient with improved esthetic appearance and chewing function.

Key words: tooth wear, overlay removable partial denture

Introduction

Tooth wear is found in most dentitions and presents as either localized or generalized loss of tooth substance depending on the number of teeth affected^{1,2}, which may also involve physiological or pathological causes. When tooth wear occurs due to natural physiological processes, the average wear rates on occlusal contact areas are estimated to be 29 µm per year for molars and 15 µm per year for premolars^{1,3}. Pathological wear occurs when the rate of wear is greater than expected for the patient's age.

When teeth are lost from a dentition, fewer teeth are available for mastication and the absorption of occlusal forces⁴. In one cross-sectional study, it was reported that a decrease in the number of occluding teeth was associated with increased occlusal tooth wear, especially in cases where all of the molars were missing⁵. It is therefore reasonable to assume that the remaining teeth will experience excessive occlusal wear compared to teeth in a complete dental arch⁴.

The treatment of tooth wear can range from simple operative care to full mouth reconstruction². The decision to proceed with treatment or not should be guided by the patient's needs, the severity level of the wear and the potential for progression^{2,6}. In addition, economic considerations may also determine the type of prosthesis that a patient may receive⁷.

This case report describes and evaluates a method in which fixed dental prostheses and mandibular overlay removable partial denture were used in a patient with severe tooth wear and posterior bite collapse.

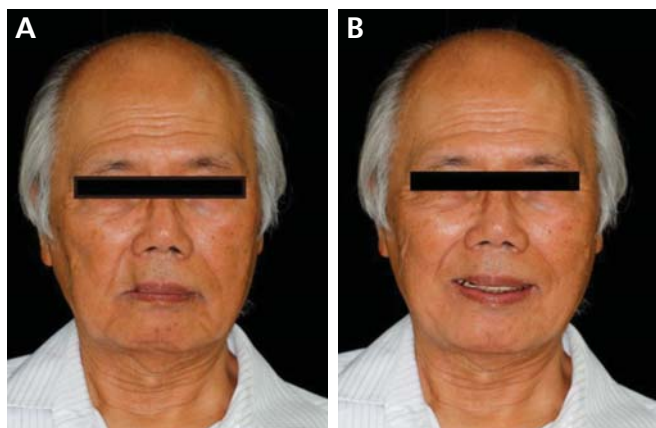


Figure 1. Extra-oral view.
(A): Frontal view. (B): Smiling view.

Case report

A 72-year-old man requested restorative treatment to improve his esthetic appearance and chewing function. Clinical examination revealed facial asymmetry (Fig. 1), a large overbite of 11 mm, severe tooth wear on the mandibular anterior teeth and maxillary central incisors (score of 3 in the Smith & Knight tooth wear index)⁸, multiple missing teeth (13, 14, 15, 35, 36, 37, 46, and 47 in the FDI numbering system), and ill-fitting prostheses (16, 34, 45). In addition, posterior bite collapse and an irregular occlusal plane were noted due to the long-term loss of occlusal support units (Fig. 2).

The evaluation indicated that the conditions of the remaining tooth structures and the space for a potential prosthesis were insufficient. Therefore, a treatment consisting of fixed dental prostheses and overlay denture aimed at increasing the vertical dimension (VD) was proceed upon.



Figure 2. Intra-oral view.
(A): Frontal view.
(B): Lower occlusal view.
(C): Right buccal view.
(D): Left buccal view



Figure 3. Interim denture.

(A): Upper interim denture.

(B): Lower overlay interim denture.

Figure 4. Frontal view with

temporary crowns and

interim denture denture.



Figure 5. (A): Lower overlay denture with metal beading.

(B): Light-curing micro hybrid composite build-up.

The prosthetic treatment began with the fabrication of fixed provisional prostheses (11, 16, 21, 34, and 45) with the original occlusal relationship, followed by, the space available for removable partial prostheses evaluated to determine the necessary increase in the VD.

Moreover, the necessary increase in the VD was determined based on physiological factors of the patient such as his facial profile and freeway space. As drooping commissures around the mouth were observed and for the reason that the freeway space was 7 mm larger than normal, the new VD were determined to require a 4 mm increase in the posterior dentition for the improvement of the posterior bite collapse.

According to the new VD, maxillary Kennedy Class III interim denture and mandibular Kennedy Class I overlay interim denture were fabricated, with the overlay portion being processed with heat-curing acrylic resin (Fig. 3). After the interim dentures were placed, the patient was asked for follow-up visits to evaluate the occlusion, chewing function, and acceptability of the facial profile. During the follow-up period up to 12 months, additional problems were not found such as temporomandibular disorder, difficulty in chewing, or unstable occlusion (Fig. 4). The patient adapted to the new VD that would be required

for further prosthetic treatment. Based on these clinical findings, the provisional prostheses were used as a guide for the definitive treatment.

Porcelain-fused-to-metal prostheses (11, 16, 21, 34, and 45) were made, and the next step was to fabricate the denture metal framework. Regarding the metal framework design, metal beading was applied on the overlay portion and then built up with light-curing micro hybrid composite resin (CERAMAGE®, ShoFu, Japan) (Fig. 5), and the artificial teeth were arranged in the edentulous areas. After laboratory remounting and polishing, the dentures were adjusted and placed (Fig. 6).

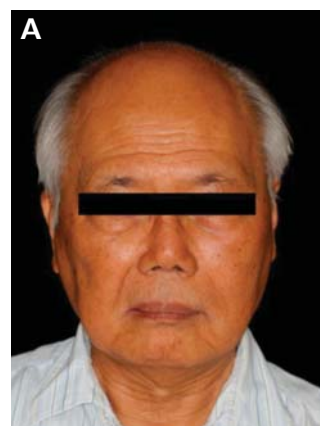


Figure 6. Extra-oral view with definitive prostheses.

(A): Frontal view. (B): Smiling view.

The prostheses were designed with an anterior overlay portion of mandibular denture which made contact with the palatal plate of the maxillary denture (Fig. 7). The occlusion was adjusted to group function during lateral movement with anterior contact at the overlay portion of the maxillary denture during protrusion. Oral hygiene instruction was provided and regular follow-ups were conducted (Fig. 8).

Porcelain chipping over 16 prosthesis mesial-buccal area was found at 1 year follow-up appointment. Smoothing the chipping area was performed due to minor chipping effect on retention and stability of denture.

The patient did not complain about his esthetic appearance or chewing function during the 2.5 years follow-up period.

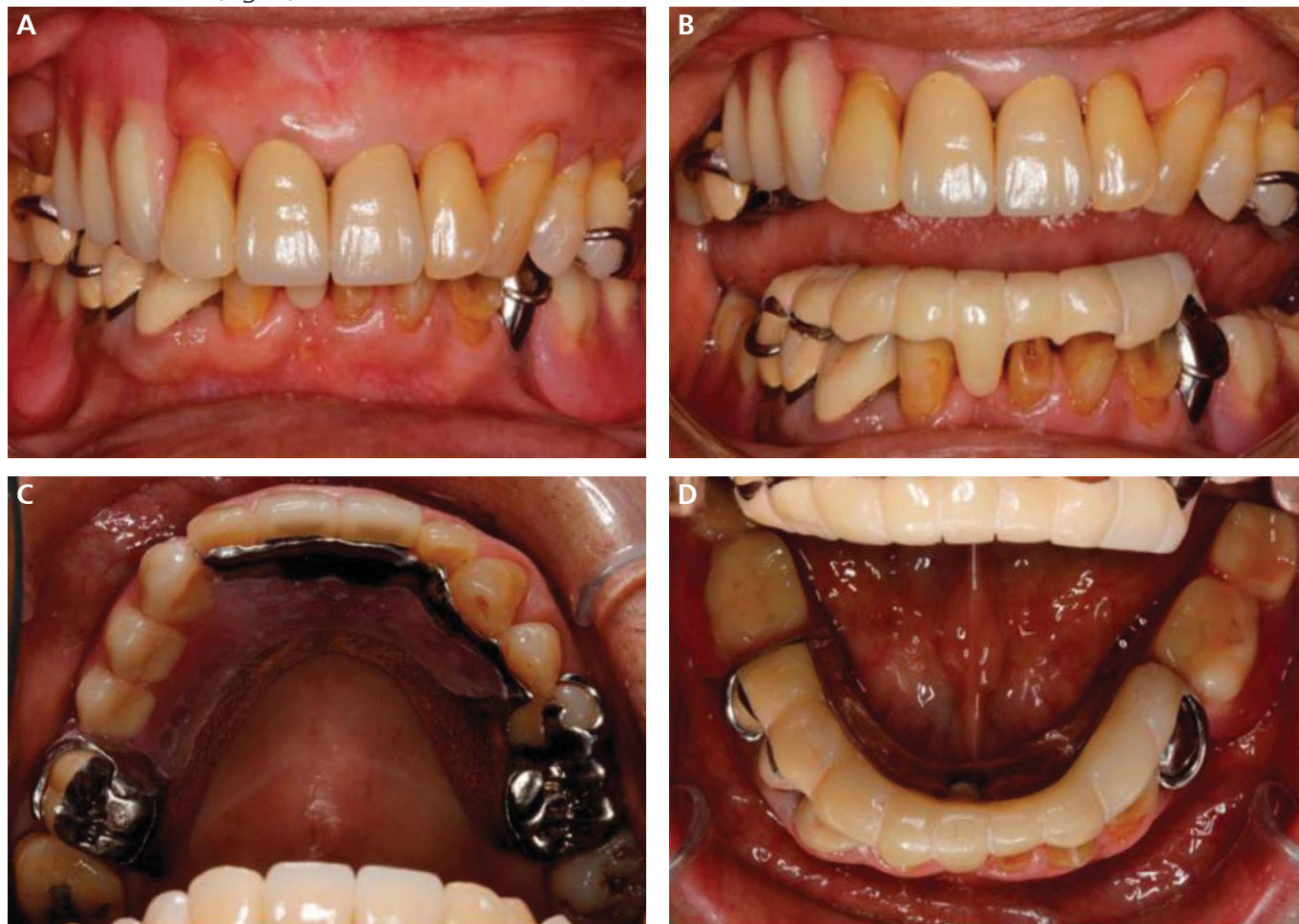


Figure 7. Intra-oral view with definitive prostheses.

- (A): Frontal view. (B): Frontal view with mouth opening
(C): Upper occlusal view. (D): Lower occlusal view



Figure 8. Panoramic film after treatment.

Discussion

Tooth wear inevitably occurs during the lifetime for a patient. The etiology of tooth wear is multifactorial and includes factors such as bruxism or diet. Because of its multifactorial etiology, tooth wear may result in a combination of processes, making it difficult to determine its diagnosis and the appropriate treatment required^{2,9}.

Even in cases of extreme tooth wear, the lower facial height may not be significantly reduced. As the teeth being damaged for successive days, tooth eruption usually takes place and the alveolar bone undergoes an adaptive process, such that they can together compensate for the loss of tooth structure to maintain the VD^{10,11,12}. However, if the rate of the tooth wear exceeds the compensatory process, even resulting in tooth fracture or tooth loss, the symptom of posterior bite collapse is usually found. Moreover, posterior bite collapse might combine with a change in the VD.

The aims of prosthetic management for worn dentition are restoring the appearance and chewing function while conserving the remaining tooth structure². With respect to the diagnosis and treatment procedures, casts mounted on an articulator by face-bow transfer can be used to evaluate the dentition, occlusal relationship, contacts and interferences, and available restorative spaces. Such mounted casts can also be used to prepare a diagnostic wax-up and provide helpful information for the evaluation of treatment options^{2,10}.

When a patient presents with a reduced lower facial height due to a loss of the VD and space will be needed for further restoration, the amount of space required can be examined by assessing the freeway space and facial profile in conjunction with phonetic assessments². In this case, the freeway space and facial profile were used to determine the VD. The tolerance of changes in VD is usually confirmed through the clinical evaluation of the patient with a diagnostic splint or provisional prosthesis applied during a trial period¹³. In the current case, interim dentures were placed to evaluate the clinical outcome of an overlay denture. These applications not only can be used to evaluate the changes in VD, esthetics, phonetics and performances, but also to observe the patient's capacity to adapt to removable appliances. The design of any prostheses can be reconsidered or adjusted prior to making the definitive prostheses^{1,2}. With regard

to definitive treatment, a fixed restorative method or removable restorative method can also apply to relative patients. Removable prostheses can be used alone or in combination with fixed prostheses.

An overlay denture consists of a prosthesis that covers the worn teeth, and the remaining coronal tooth structure can be used to support, retain, and stabilize the denture². However, it should be noted that several disadvantages are associated with overlay dentures, such as complaints about oral discomfort and compromised esthetics when the dentures are removed. In addition, the abutments may carry a high risk of caries and periodontal disease owing to poor plaque control^{2,14,15}. Other risks of treatment with overlay dentures include mechanical failures such as fractures of major or minor connectors, as well as occlusal rests, deformation, or fracture of retentive clasps^{1,16}. The patient needs to understand the limitations of removable appliances, especially with respect to strong biting force and bruxism. A patient's cooperation and adaptation might also be considered to be significant factors related to the clinical results².

Conclusion

This report describes and evaluates the use of fixed dental prostheses and overlay denture to rehabilitate a patient with critical tooth wear and posterior bite collapse. In this case, the overlay denture was a viable, conservative and reversible treatment for the patient, who expressed concerns over the treatment cost, treatment longevity, and long-term maintenance.

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