

Case Report

Prosthetic management of a patient with an excessive overbite and overjet: A case report

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Abstract

Oral rehabilitation for patients with a Class II deep bite malocclusion is among the most complicated treatments to manage in clinical situations. Although interdisciplinary care should be anticipated for comprehensive treatment, a prosthetic-only approach satisfies most patients and is often chosen for financial considerations. This case report describes a prosthetic reconstruction treatment process combining fixed and removable prostheses for a 66-year-old woman who presented with a severe deep bite. After restorative management, dental appearance and chewing function were improved. The clinical techniques used and their associated prosthodontic principles are discussed.

Key words: deep bite, full-mouth rehabilitation, fixed partial denture, removable partial denture, vertical dimension

Introduction

Deep bite is defined as an excessive vertical overlap of the lower incisors by the upper incisors when the mandible is in centric occlusion¹ and is one of the most commonly encountered malocclusions. Overlap that ranges from 5%–25% is considered ideal, whereas overlap exceeding 40% is defined as deep bite.² According to Proffit and Fields, severe deep bite (overbite $\geq$ 5 mm) occurs in nearly 20% of children and 13% of adults.³ The etiology of deep bite can be multifactorial, and various skeletal and dental components are involved in the development of this type of malocclusion. Increased overbite is often associated with the occurrence of other malocclusions, especially in individuals with Class II incisor relationships and a Class II skeletal pattern.

Moyers and Riolo reported that clinically, deep bite is not defined in terms of the current presentation of overlap but rather in terms of future potential changes to both esthetics and function.⁴ In most cases, deep bite is asymptomatic, and unless the appearance is esthetically unacceptable, patients rarely request treatment. However, some patients may seek treatment to restore function and improve esthetics if deep bite results in periodontal destruction, tooth wear, or missing teeth that require replacement. When combined with a Class II jaw relationship, an excessive overbite and overjet can pose a daunting challenge for restorative dentists. The management options available to address deep bite and associated problems vary with each individual situation and can depend on the patient's main concerns. A

multidisciplinary approach for optimal treatment may include orthodontic therapy, orthognathic surgery, periodontics, and the use of fixed or removable restorations. In most circumstances, patients are unwilling or unable to participate in an optimal treatment approach due to the associated complexity, duration, and costs of procedures. In such cases, compromises must be made; however, certain prosthodontic principles should continue to be followed. The purpose of this clinical report is to describe a prosthetic rehabilitation using fixed and removable partial dentures in a patient with severe deep bite and a Class II malocclusion, with consideration for the associated prosthodontic principles.

Case report

A 66-year-old woman was referred to the Department of Prosthodontics of National Cheng-Kung Hospital during regular periodontal maintenance treatment, with chief complaints regarding the instability and poor esthetics of old dentures, difficulty chewing, and the replacement of missing teeth. The patient's medical and dental histories were recorded, and a diagnostic radiograph was made. No medical or dental history was identified that contraindicated dental treatment, and no temporomandibular joint disorder or pain in the masticatory muscles was identified. Upon clinical examination, the patient presented in a partially

edentulous state of Kennedy Class III, modification 2, in the maxilla, and Class III, modification 1, in the mandible (Fig. 1–3). The overbite and overjet were determined to be 6 mm, measured as the distance between the incisal edges from 12 to 42. Attrition and spacing of the mandibular anterior teeth were also noted. In the maxilla, multiple restorations, including splinted crowns on teeth 11, 12, and 13 and a surveyed crown on tooth 25, were noted. The crowns on teeth 11, 12, and 13 had previously been removed, and tooth 11 was extracted due to extensive structural defects caused by secondary caries. Another practitioner had placed 13–12–X cantilevered temporary restorations to fit the existing denture. During the periodontal examination, pocket charting and radiographs revealed generalized horizontal bone loss without isolated deep probing depth. Without the removable dentures, occlusal contact was observed between teeth 12 and 13 and 42 and 43, and light contact was observed between teeth 27 and 38. No stable vertical occlusal stops were present, resulting in a deformed occlusal scheme, and altered vertical occlusion dimension, and insufficient restorative space in the anterior and bilateral premolar region.

To confirm the diagnosis and define an appropriate treatment plan, dental casts of both jaws were mounted on a semi-adjustable articulator in centric relation. The treatment goal

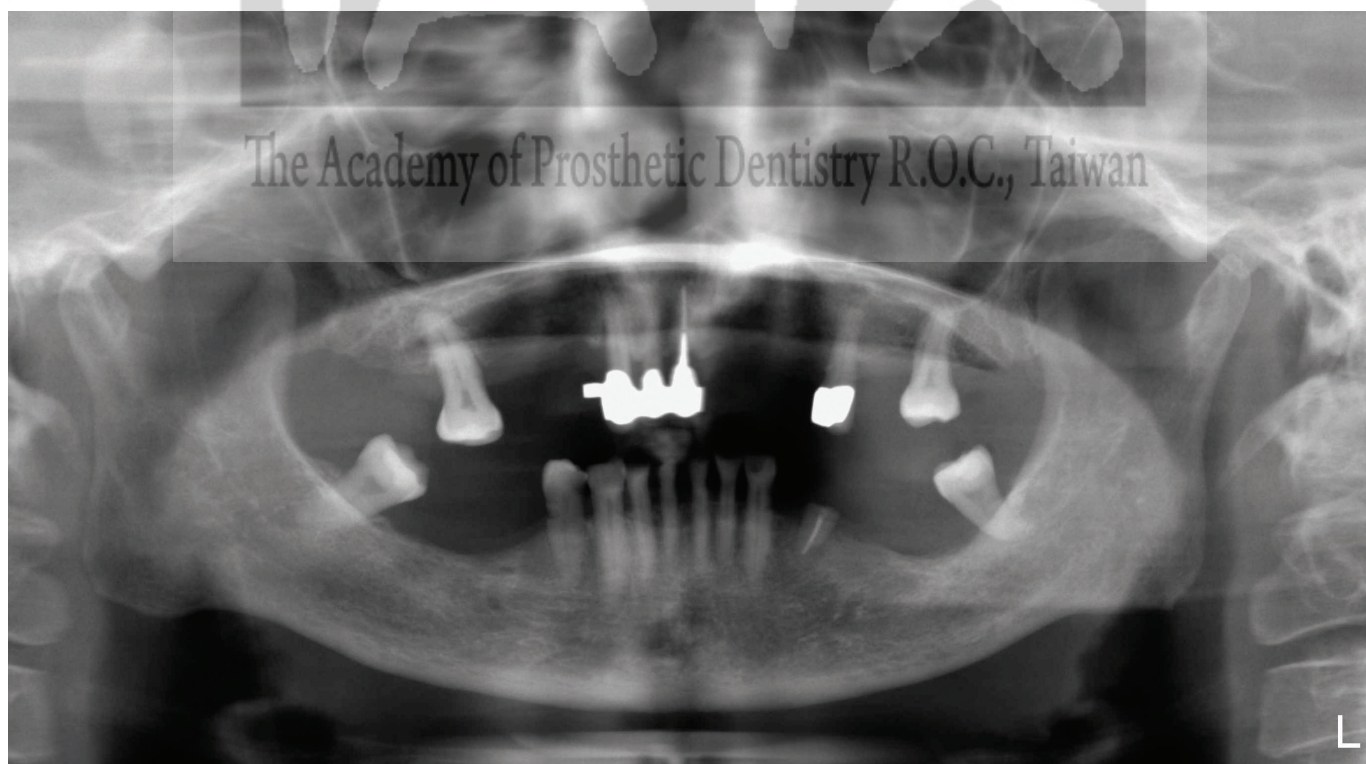


Figure 1. Pre-treatment panoramic film

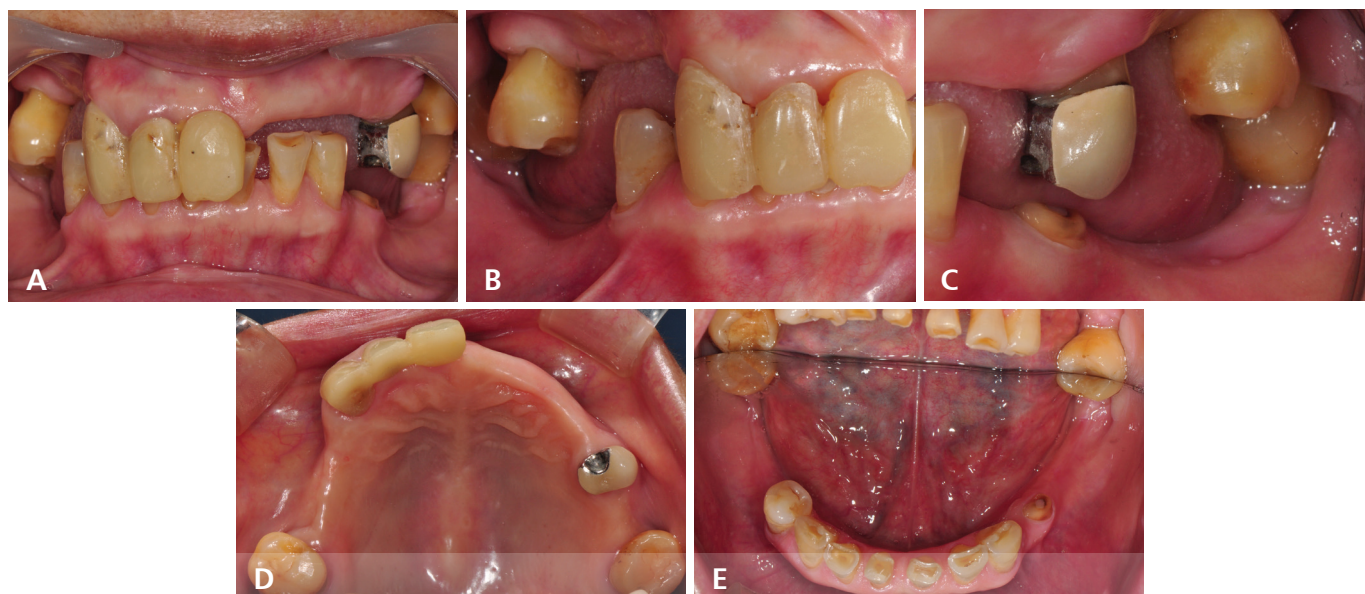


Figure 2. Pre-treatment intra-oral view. (a) Facial aspect. (b) Right side. (c) Left side. (d) Occlusal view of maxillary arch. (e) Occlusal view of mandible arch.



Figure 3. Pre-treatment extra-oral view. (a) Frontal view. (b) Lateral view.

was to restore the vertical height and improve masticatory function and esthetics. Alternative treatment options were discussed with the patient. Orthodontic treatment and surgical therapy were offered to correct the maxillomandibular relationship and restore the edentulous posterior regions using dental implants. She did not accept this option and selected rehabilitation with a prosthodontic approach because this option was less destructive, less time-consuming, and less expensive. According to the treatment plan, the applied prosthetic procedures included the use of provisional prostheses and the fabrication of definitive removable partial dentures (RPDs) and fixed partial dentures (FPDs). The contributions

made by interim restorations to diagnosing and evaluating the functional and occlusal stability of definitive treatments were emphasized; however, the patient refused interim restorations due to financial constraints. The existing dentures were modified to fit a temporary prosthesis for interim use (Fig. 4a–d). A definitive treatment plan was implemented using a combination of fixed and removable prostheses in both jaws. The fixed prostheses included splinted and surveyed crowns for teeth 12 and 13 and a single surveyed crown for tooth 25. The appropriate occlusal vertical dimension was established by using a baseplate with a wax rim and was verified using a combination of techniques (phonetics, esthetics, swallowing,

physiological rest position, and record of existing dentures). The orientation of the upper occlusal plane was determined using the ala-tragus line and the interpupillary line as reference landmarks. The space distribution was designed to provide an optimal restorative space, a favorable crown–root ratio, and the minimal reduction of the occlusal surface to maintain the pulp vitality of abutment teeth. A diagnostic wax-up was generated for the fixed prostheses created for teeth 12, 13, and 25 and for the composite resin filling that was applied to the lower anterior teeth to close the spacing and repair the area of attrition (Fig. 5a–c). Acrylic teeth were then arranged on the wax rim of the maxillary and mandibular edentulous area. Full wax dentures were clinically tested to re-evaluate the occlusal vertical dimension, occlusion, phonetics, and appearance. The diagnostic wax-up of the lower anterior teeth was transferred to the mouth using the putty index (Fig. 6a and b). The adequate preparation of the selected abutment teeth was performed using preparation guides derived from the diagnostic wax-up.

Final impressions were made using vinylsiloxanether material (Identium; Kettenbach), and master casts were obtained by filling the

impression with Type V dental stone (Die-Keen; Kulzer). Wax patterns of the crowns were surveyed, and contours were corrected to obtain ideal retention. The patterns were then cast, and the metal substructure was tested in the patient's mouth to verify marginal and internal fit. After a satisfactory trial of the metal framework, shade selection was performed for ceramic layering. The contours of the crowns were surveyed again at the bisque stage. The crowns were cemented with RelyX U200 resin cement after glazing was complete. Final impressions of the fabricated maxillary and mandibular RPD frameworks were generated using polyvinylsiloxane impression material. The obtained master casts were placed on a surveyor for the examination and design of the cast framework. Before the construction of the RPD framework began, the master casts and refractory casts were mounted on a semi-adjustable articulator based on the bite record obtained at an increased vertical dimension (Fig. 7a and b). The mandibular anterior teeth were designed to experience light contact with the palatal plate of the maxillary RPD, and the occlusal vertical dimension was increased by 2 mm after wearing the RPD designed for the anterior

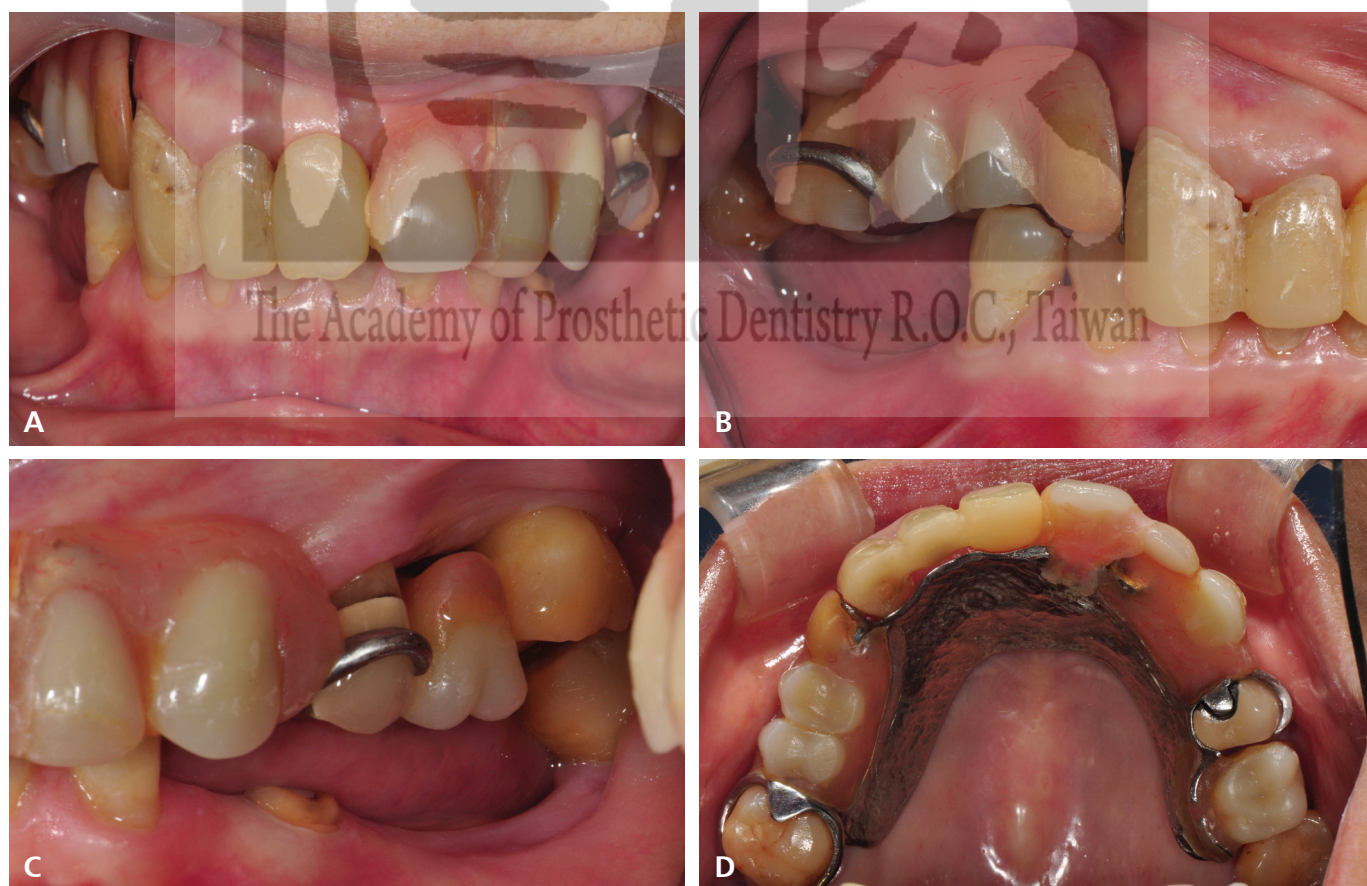


Figure 4. Pre-treatment intra-oral view with the old dentures.

(a) Facial aspect. (b) Right side. (c) Left side. (d) Occlusal view of maxillary arch.



Figure 5. Diagnostic wax-up made at an increased vertical dimension.
(a) Frontal view. (b) Right side. (c) Left side.

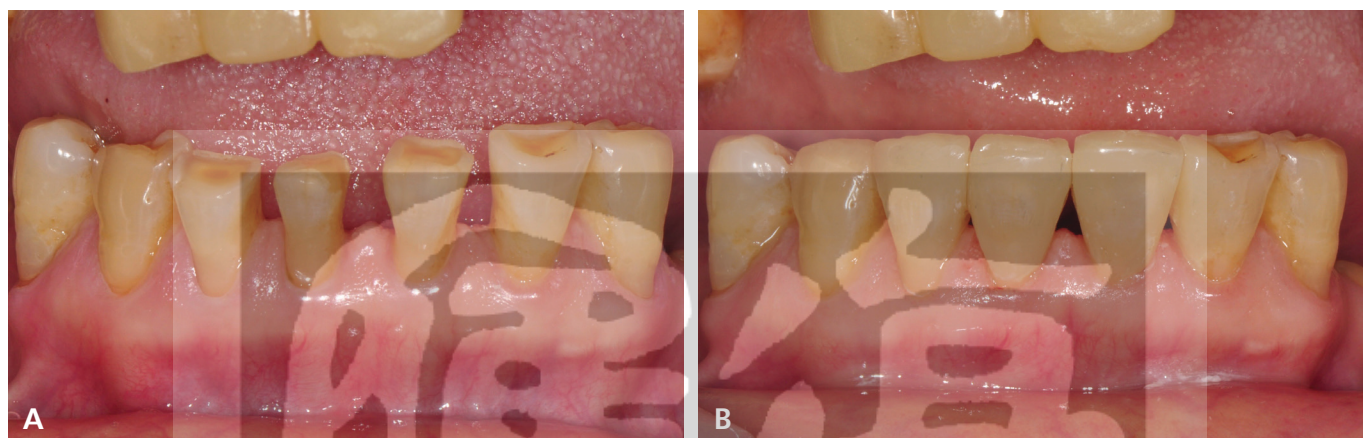


Figure 6. Direct composite restoration application at lower anterior teeth.
(a) Pre-treatment. (b) Post-treatment.

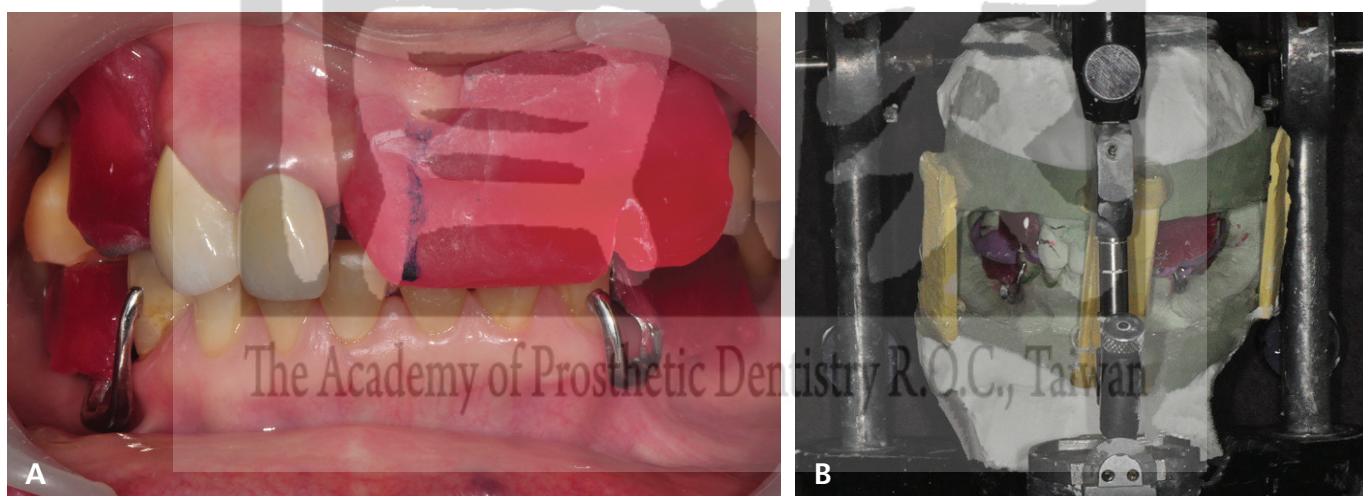


Figure 7. (a) Bite record registration at an increased vertical dimension.
(b) Master cast mounted on a semi-adjustable articulator before maxillary removable partial denture (RPD) framework fabrication.

region. The completed framework was clinically examined, and both acceptable and passive fit were verified. Subsequently, teeth were arranged, and the occlusion was verified intra-orally. The prosthesis was then delivered to the patient, and denture care instructions were provided (Fig. 8a–e). The patient was advised to wear the maxillary and mandibular removable dentures on alternate days while sleeping to allow for better occlusal load distribution at night. Soft splints for both

jaws were also provided to protect the abutment teeth for those circumstances during which the patient opts not to wear the dentures. The patient was then scheduled for regular follow-up and maintenance. During the follow-up visits, the patient reported satisfaction with the esthetics, function, and comfort of the dentures. Frontal and profile views showed improved appearance after the insertion of the new dentures (Fig. 9a and b). Postoperative periapical films revealed the

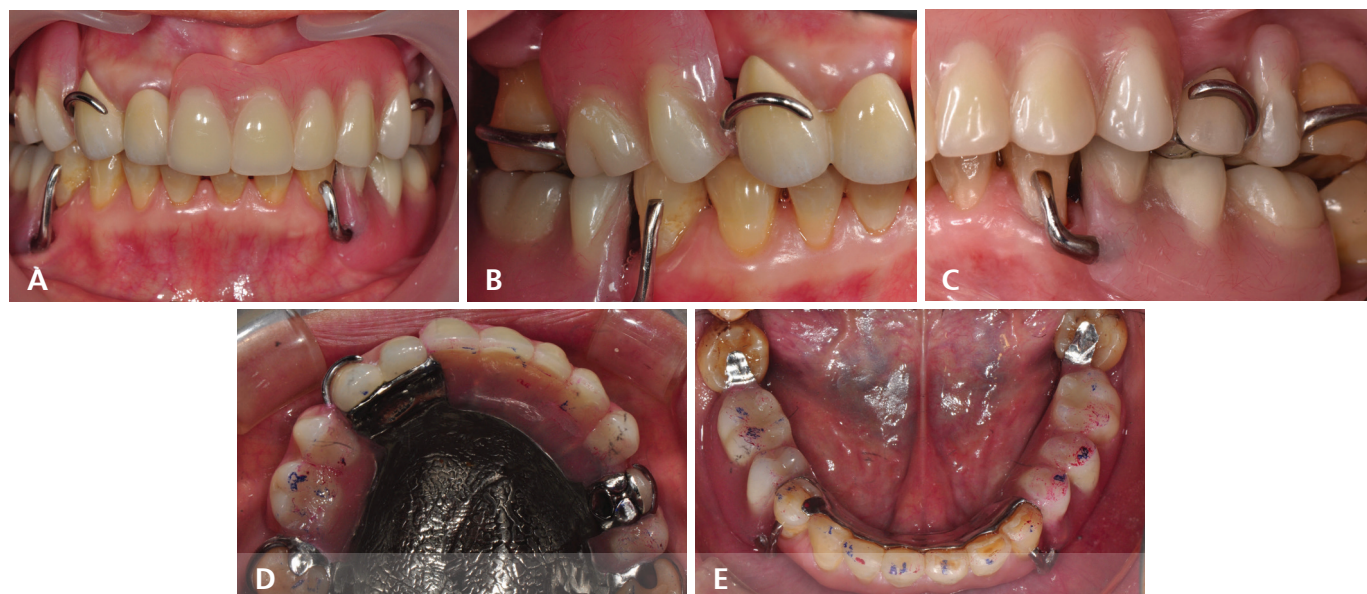


Figure 8. Delivery of maxillary and mandibular removable partial denture (RPD). (a) Frontal view. (b) Right side. (c) Left side. (d) Maxillary arch. (e) Mandibular arch.



Figure 9. Postoperative extra-oral view. (a) Frontal view. (b) Lateral view.

stable periodontal and periapical status of the remaining teeth (Fig. 10). At the 2-year follow-up visit, mild marginal discoloration and wear on the lower anterior composite restorations were noted. The finishing and polishing procedures were repeated to improve the marginal integrity.

Discussion

The reconstruction of mutilated dentition that features missing teeth and excessive overbites using fixed or removable prostheses is challenging for prosthodontists. A deep bite combined with a Class II malocclusion is often difficult to correct due to the dominance of the skeletal morphology.⁴ The treatment goal not only includes the replacement

of the missing teeth but also involves correcting the improper bite position and restoring the reduced vertical dimension. The causative factors that underlie excessive overbites include both inherent factors and acquired factors. A developmental deep bite can be caused by skeletal and dental discrepancies, such as variations in the growth patterns of both arches, the overeruption of incisors, or the infra-eruption of posterior teeth. An acquired deep bite can develop due to habits, such as tongue thrust, or the wear or early loss of the posterior teeth.⁵ Therefore, the provision of stable occlusion with established posterior support is crucial when performing reconstruction in cases of deep bite. Restorative treatment using both

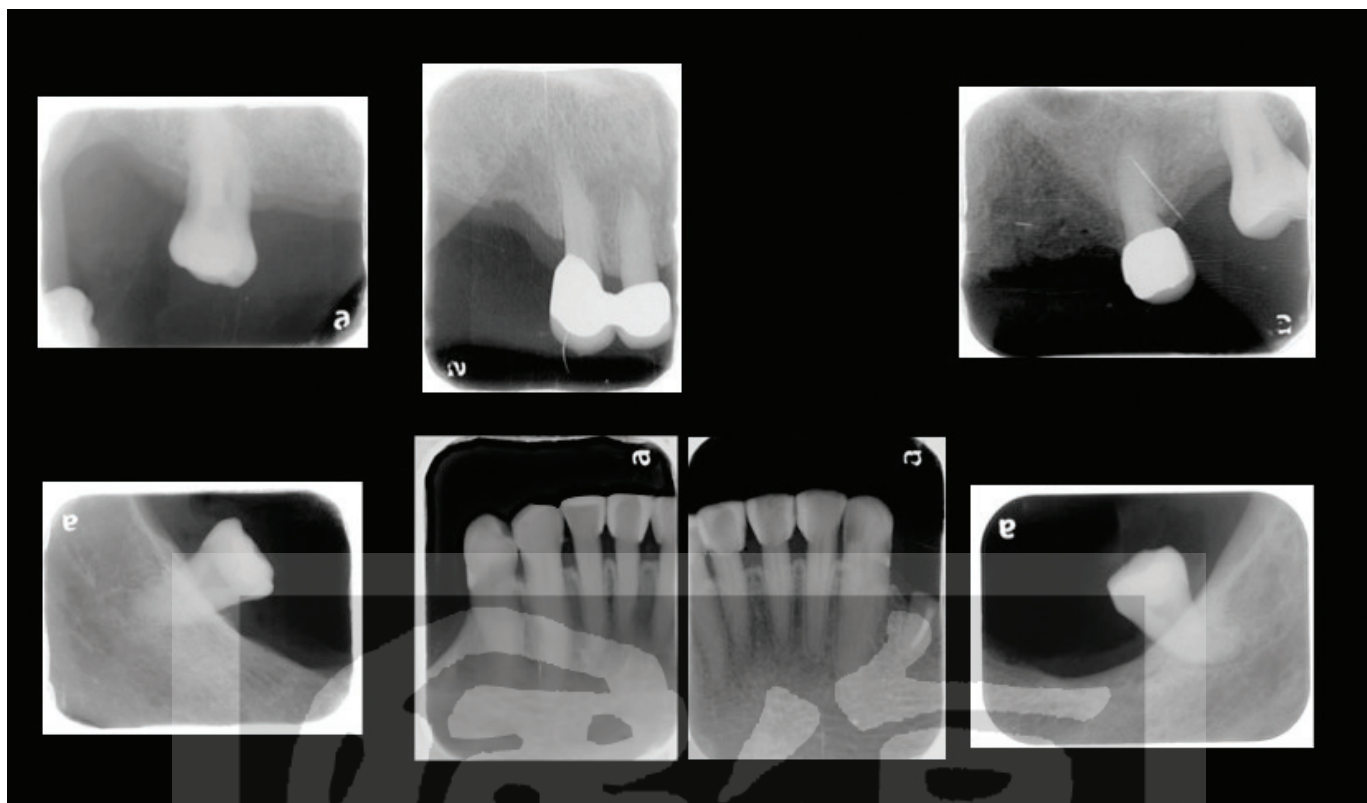


Figure 10. Postoperative periapical film.

fixed and removable dentures is the preferred approach for many patients.^{6,7} However, implants represent a better intervention because they can provide superior support and stability to the dentures. When performing restorations using removable dentures, periodic maintenance is likely to be necessary, especially in free-end cases. The development of wear on resin teeth and the failure to provide denture stability may worsen a deep bite. The patient in our case did not accept the use of interim dentures due to financial constraints; however, the role of interim prostheses during the complete treatment process should be emphasized in these types of cases. Interim prostheses not only enhance esthetics and function but also serve as diagnostic tools for identifying occlusal stability, abutment prognosis, and the patient's tolerance for the alternating vertical dimension with and without the dentures.

The most common problems encountered when performing restorations in patients with deep bite include trauma to the soft tissue, a lack of inter-occlusal space, and tooth wear.⁵ An increased overbite can create excessive stress, wedging plaque and food debris into the gingival sulcus and aggravating periodontal destruction, especially when combined with poor oral hygiene.⁸ When replacing missing teeth, limited inter-arch space can make the provision of restorations with

adequate thickness impossible, particularly if no consideration is given to increasing the occlusal vertical dimension or interfering with the guidance patterns. Increasing the vertical dimension is often necessary to gain restorative space and establish proper anterior tooth relationships and can be accomplished using fixed and removable prostheses, such as posterior occlusal onlays, crowns, and overlay RPDs. Raising the vertical dimension reduces overbite; however, overjet can be increased by the downward and backward rotation of the mandible, which is undesirable in patients with Class II malocclusions. Excessive overjet is a limiting factor when determining the magnitude of an increased vertical dimension.⁹ Minimizing the increase in the occlusal vertical dimension has been suggested to reduce the complexity of treatment, and an increase greater than 5 mm is rarely indicated.¹⁰ The labial positions of the lower anterior incisors or the palatal positions of the maxillary incisors require alteration to maintain the coupling of the anterior teeth and prevent the overeruption of the lower incisors. In this case, the anterior bite plane was incorporated into the maxillary denture to provide contact with the mandibular anterior teeth, which may compromise the stability of the dentures, causing the dentures to flip during use. To avoid this outcome, clasp should be provided as far as possible from the

edentulous ridge.¹¹ Fortunately, this case presented with bilateral terminal abutments, and the stability of the maxillary dentures was not significantly affected.

Tooth wear is frequently observed in deep bite patients. If extra-coronal restorations are required at an existing vertical dimension, selective endodontic treatment and surgical crown lengthening may be indicated to provide adequate space, proper retention, and resistance form.⁶ The application of direct composite restoration for the management of localized anterior tooth wear has been demonstrated to be a viable and conservative treatment option. According to Poyser et al.¹², direct resin composite materials are recommended, placed at a minimal increment thickness of 1.5 to 2.0 mm in areas of functional loading, to ensure appropriate longevity. Milosevic reported a low annual failure rate of 5.4% for the use of composite restorative materials in the worn dentition. In addition, composite failure was not associated with an increased vertical dimension or bruxism but was significantly associated with older patients and a lack of posterior support.¹³ Previous studies indicate that the survival rate of composite restoration used to treat localized anterior tooth wear ranges from 50% to 83% during 5 to 7 years of follow-up. When only major failures were considered, the survival rate increased.¹³⁻¹⁵ The placement of resin composite restorations for localized anterior tooth wear has a favorable short-to medium-term survival rate. This technique is relatively easy to maintain and does not preclude the use of other options in the future. In this case, resin restorations at the mandibular anterior teeth remained functional at the 2-year follow-up visit, with only slight marginal discoloration and wear.

Conclusion

This case report describes a full-mouth rehabilitation treatment using a prosthetic-only approach in a patient with excessive overbite and overjet. By combining fixed and removable prostheses, masticatory function and esthetics were restored, using a cost-effective approach. However, comprehensive assessments and careful treatment planning remain essential, and regular maintenance to verify stability and the wear on the dentures over time is also crucial to ensure a durable and satisfactory result.

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