

## Oral Rehabilitation with Combined Prosthesis of Partial Edentulism Associated with Tooth Wear and Loss of Vertical Occlusal Dimension: A Case Report

Emna Abid<sup>1</sup>, Amel Labidi<sup>1</sup>, Sana Bekri<sup>1\*</sup>, Sameh Rzigui<sup>1</sup>, Lamia Mansour<sup>1</sup>

<sup>1</sup> Department of Removable Prosthodontics, Faculty of Dental Medicine, University of Monastir, Tunisia  
ABCDF Laboratory of Biological, Clinical and Dento-Facial Approach (LR12ES10), University of Monastir,  
Tunisia

\*Correspondent email : sanabekri2015@gmail.com

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### Abstract

The treatment of partial edentulism associated with severe tooth wear constitutes a real challenge for the dentist. The combined prosthesis remains a preferred solution to harmonize occlusion curves and restore oral functions. The use of attachments as a means of retention optimizes the aesthetic result and guarantees the psychological integration of the prosthesis. This therapeutic approach requires knowledge and skills on the part of the prosthodontist and the dental technician as well as a rigorous prosthetic study.

This type of prosthesis is an effective solution to the biomechanical problems related to bilateral terminal edentulism, restoring occlusal functions and ensuring an aesthetic appearance that is often appreciated by patients as the clasp are replaced with invisible attachments and the morphology of the teeth is improved by the fixed prosthesis.

This article presents the treatment steps with combined prostheses in a bruxism patient with generalized dental wear.

**Keywords:** Occlusal vertical dimension, tooth wear, combined prosthesis, denture Precision Attachment, millings.

### Introduction

The gradual wear of the occlusal surfaces of teeth is a normal process during the lifetime of a patient[1]. However, severe dental wear can affect the well-being of patients because of its disturbing and sometimes crippling consequences. Three main types of tooth wear have been described: attrition, erosion and abrasion, occurring from distinct etiology, however, they can coexist in the same patient[2, 3].

The outcomes of this non-carious loss of tooth substance can be expressed through dentine sensitivity, unsightly short teeth, occlusal disharmony, impaired function, or even temporomandibular disorder following the loss of the occlusal vertical dimension (OVD)[4].

When severely worn dentition is associated with partial edentulism, the situation becomes more complicated. It is one of the most intellectually and technically demanding tasks faced by the practitioner. For these cases, the prosthetic treatment choice depends on the clinical situation, while ensuring effectiveness and longevity[5, 6].

The combined prosthesis still seems to be a good alternative, especially when implants are contraindicated for one reason or another. This type of oral rehabilitation requires advanced expertise and a good partnership between the clinician and the dental technician.

This clinical report aimed to describe the full mouth rehabilitation with combined prostheses of a bruxism patient with severely worn



dentition, loss of occlusal vertical dimension and missing posterior teeth.

### General Presentation

A 65-year-old patient consulted the Department of Prosthodontics of the dental clinic in Monastir (Tunisia). The patient's chief complaint was the restoration of the worn teeth, in addition to the replacement of missing teeth.

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An initial evaluation of the patient indicated a history of depression and parafunctional habits of bruxism. The medical history showed that the patient was hypertensive and controlled diabetic. Clinical examination revealed that the patient was carbocalcic and presented a collapsed lower face. Intraoral examination revealed bilateral extended maxillary edentulism associated with intercalated edentulism in the lower arch. In the maxilla the persistent teeth were 13, 12, 21, 22, 23, 24 and 25, the missing teeth in the mandible were 48, 41, 31, 35, 36 and 38. Tooth 46 was highly mobile, with a 6mm periodontal pocket. All teeth had abrasion veneers targeting their coronal thirds, especially in the bimaxillary incisors and canines. The periodontal phenotype was thick. The smile line was average (Liébart class 3). The bone ridges were moderately high and broad, with a moderately deep palate. The fibro-mucosa was thick and adherent (Figure 1).



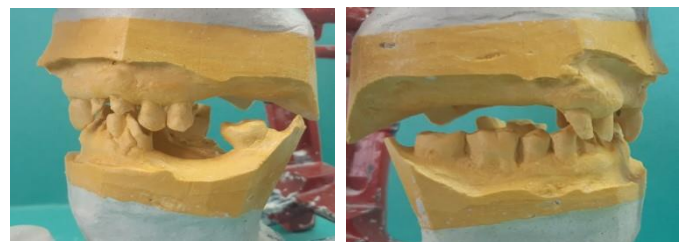
**Figure 1: The initial dental condition**

Radiological examination visualized the inclusion of mandibular wisdom teeth, mandibular angle exostosis and inadequate endodontic treatment on 22, 23 and 24. The radiological crown / radiological root ratio was over 1 for 47, 46, 37, 32 and 42 while it was less than or equal to 1 for the other teeth (Figure 2).



**Figure 2: Orthopantomograph**

Occlusal examination showed excessive teeth wear with loss of OVD (Turner's Category n°1) [7]. The anterior guide was dysfunctional. Examination of the articulator casts showed a disrupted occlusal plane with egression at the 21, 24, 25, 46 and mesial version at the 47 and 37. The available prosthetic space was reduced concerning the overerupted teeth (Figure 3).



**Figure 3: Occlusion recording in the study phase**

The pre-prosthetic phase began with dental scaling and extraction of non-restorable teeth (46, 32, 42). Endodontic treatments were carried out, as well as the necessary endodontic retreatments with coronoradicular reconstructions on 22, 23, 24 and 13.

After oral cavity sanitation procedures, the periodontal factor was considered favorable, except the 37 and 47, where it was moderately favorable.

The prosthodontic decision was discussed with the patient, who expressed economic constraints for the implant treatment option. Given the patient's aesthetic requirements, tooth wear and the extent of the maxillary edentulism, a combined prosthesis retained with attachments was proposed. This decision consisted in an 8-unit metal-ceramic bridge in the maxilla replacing the 11, combined with a metal removable framework with extracoronally articulated attachments on 13 and 25.

For the lower arch, the decision was a simple combined prosthesis consisting of a 9-unit metal-ceramic bridge from 45 to 34 replacing the 42, 41, 31 and the 32 with a metal removable partial framework. Given the guarded prognosis of the two mandibular second molars (37 and 47), for an evolutionary design for the mandibular framework was opted, with 2 Nally Martinet clasps on the 34 and the 45 (instead of 2 Acker clasps) and 2 Acker clasps on 37 and 47.

A study wax-up and a guiding assembly were created in the correct OVD, to visualise the prosthetic project and to optimise communication with the patient and the dental technician (Figure 4).

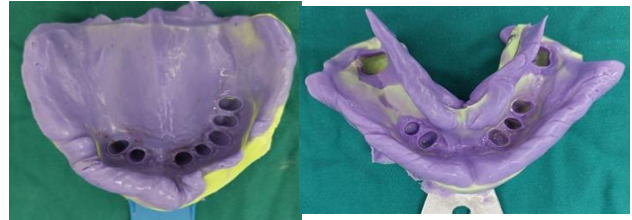


**Figure 4: The guiding assembly**

Prosthetic treatment began with peripheral preparation of the teeth on which fixed provisional prostheses were made, two provisional removable dentures were obtained from polymerisation of the guiding assembly. These prostheses were kept in the mouth for two

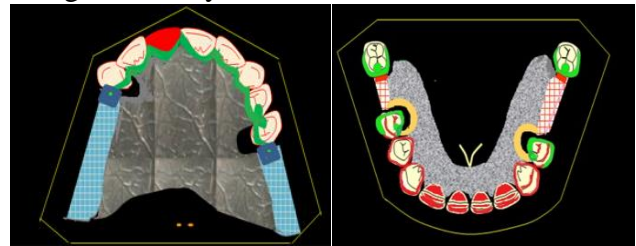
months to validate the chosen therapeutic position.

After this period, global impressions were taken using the wash technique with high and low-viscosity silicones (Figure 5).



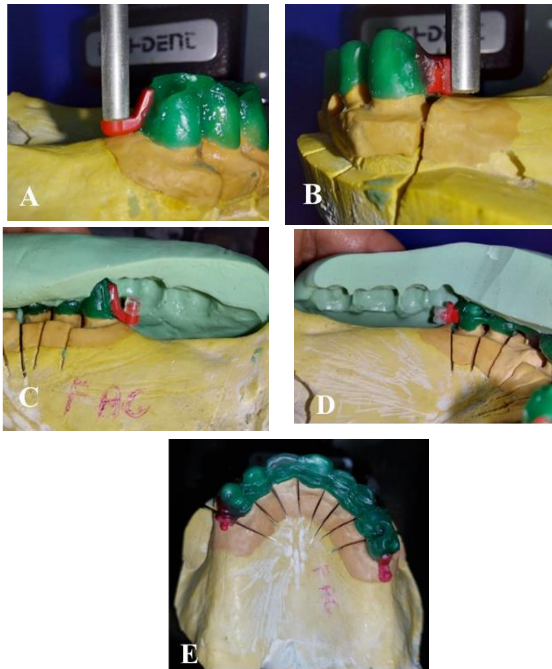
**Figure 5: Global impressions**

The occlusion was then recorded in the correct OVD, using the centric relation as the transversal mandibular reference position. This occlusion record enabled the laboratory technician to begin waxing prosthetic models, the sculpture of primary and secondary milling dictated by the framework design (Figure 6), and placing the castable male part of the extracoronally articulated attachments on the maxillary prosthetic model using the surveyor.



**Figure 6: Metal removable frameworks design**

Silicone keys were made beforehand on the guiding assembly to optimise the three-dimensional placement of the attachments (Figure 7 A,B,C,D,E).



**Figure 7: The primary and secondary milling and placing the castable male part of the extracoronal attachments with the dental surveyor**

**7A: Placing a RHEIN OT cap micro attachment in the distal surface of 25.**

**7B: placing a RHEIN OT strategy attachment in the distal surface of 23**

**7C, 7D: Controlling the three-dimensional placement of the attachments with silicone keys**

**7E: Final placing of the castable male part**

The fixed metal frameworks were tried and then the second trial of the metal-ceramic bridges allowed occlusal assessment according to the chosen therapeutic position (Figure 8).



**Figure 8: Fixed metal frameworks trial and metal-ceramic bridges trial**

Functional pick-up impressions were made using an individual impression tray and a polyether elastomer to create metal removable frameworks, which were used as a support for recording the occlusion (Figure 9).



**Figure 9: Functional pick-up impressions**

The shape and colour of the prosthetic teeth were then chosen and a wax trial denture evaluation was performed to validate the final aesthetic of the smile with the patient before moving on to the polymerisation stage (Figure 10).

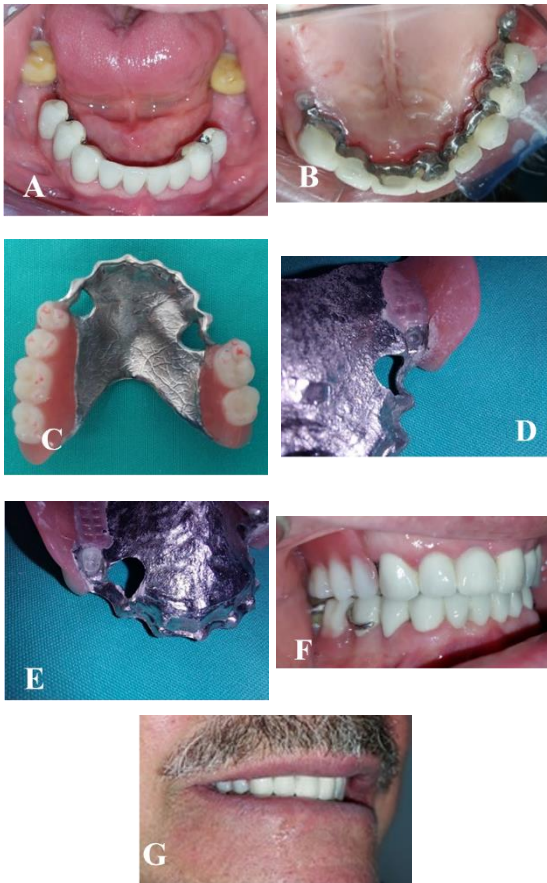


**Figure 10: Wax trial denture evaluation**

The denture insertion stage was particular in this case. We began by placing the uncemented bridge and then adjusting the removable prosthesis according to the chosen occlusal concept. The bridge was then cemented and the female part of the attachment was integrated into the intrados of the maxillary prosthesis (Figure 11 A,B,C,D,E,F,G).

This work presented several pre-prosthetic and prosthetic stages, which took us 7 months to deliver this prosthesis.

The patient was very satisfied with the result, he was taught how to insert and remove the prosthesis. Advice on maintenance and hygiene was also given to the patient, and follow-up sessions were planned.



**Figure 11 (A,B,C,D,E,F,G) : denture insertion stage**

**11A, 11B : placing the uncemented bridges**

**11C : balancing the RPD**

**11D 11E: integration of the female part of the attachment into the intrados of the maxillary prosthesis 11F : cementation of the fixed prosthesis and placing the RPD**

**11G : final smile**

## Discussion

The management of tooth wear, especially attrition, is becoming a subject of increasing interest in the prosthodontics literature, from both preventive and restorative points of view [3, 8].

The wear seen in this patient was the result of attrition due essentially to a prior bruxism, the mandibular angle exostosis visible on the x-ray is a revealing sign of teeth clenching[9, 10]. The

topography of the edentulism favours mastication on the anterior teeth, which consequently undergo considerable occlusal overload, aggravating the dental wear on the anterior teeth. In the case of extensive prosthetic rehabilitation, it is essential to consider the dentoalveolar compensations associated with this wear, which are manifested by tooth eruption and rotation of the anterior teeth[11]. Dental egression or continuous eruption reported by Gottlieb in 1927 takes time to develop. Depending on the kinetic of occlusal wear and the manifestation of this compensation, three cases can be described:

- Low wear: the OVD rises moderately over time when posterior wedging is preserved, while the freeway space remains unchanged. No increase in OVD is required.

- Compensated major wear: when occlusal wear is significant but tooth eruption compensates for tissue loss, the OVD and the freeway space do not vary significantly. The OVD is thus preserved, but there is a risk of the appearance of a gummy smile combined with unsightly short teeth. Coronal elongation surgery is therefore crucial[12]. An increase in the vertical dimension of the occlusion may be essential, particularly if a gingival smile does not occur. Care must be taken when choosing a therapeutic OVD to avoid certain contraindications, such as osteoarthritis of the temporomandibular joints, poor neuromuscular adaptability (elderly, neuropathy, psychopathy), facial hyper divergence, skeletal class II or important overjet [13]. Raising the OVD increases the prosthetic space, but care must be taken not to compromise the crown/root ratio.

- Major uncompensated wear, which applies to the present clinical case: when occlusal wear is excessive and rapid, tooth eruption sets in but is unable to follow the wear pace. The OVD decreases while the freeway space increases. Rehabilitation requires the correct OVD to be determined.

Tooth wear, when associated with maxillary posterior edentulism, further complicates

rehabilitation and engages the practitioner in an aesthetic and biomechanical challenge. The therapeutic objectives will be to restore teeth morphology, to create a functional and protective anterior guide, a centred and stable posterior setting at a physiological OVD and to restore oral functions.

From an aesthetic point of view, the visibility of the clasps is a major drawback with this type of maxillary edentulism. For this reason, a combined prosthesis including articulated extra-coronal attachments has been indicated in the present case. This prosthetic solution seems attractive for rehabilitating patients with tooth wear and partial edentulism. The use of attachments meets the aesthetic demand of the patient compared to visible clasps with their vestibular retentive arms. Combined prosthesis provides arch stabilisation and maintain denture-supporting structures, hence improving the quality of life of the patient.

Previous studies were demonstrated that the attachment survival rates of 83.35% at 5 years, 67.3% at 15 years, and 50% at 20 years; this prosthetic solution seems attractive in this clinical situation[14-16]. Attachment-retained partials offer patients greater long-term security and satisfaction compared to clasp-retained partial dentures [17].

The dimensions of this retention system were chosen with reference to the silicone keys made on the guiding assembly during the study phase. From a biomechanical point of view, a difference in compressibility between the dento-periodontal and osteo-fibro-mucosal structures causes a rotational movement in the sagittal plane around the axis passing through the teeth bordering the edentulous sectors. This tissue duality is counteracted by pick-up functional impression technique using a precise and suitable material (polyether) which enables the osteo-mucosal surfaces to be recorded in a dynamic functional state. The rigidity of this impression material guarantees the stability of the fixed prostheses taken in this impression.

The RPD framework was designed to maximise the support and stability, retention by the use of millings. The primary millings correspond to this design approach applied to the bilateral posterior edentulism shown in the prospective tracing of the metal frameworks (fig 6). These preparations are made at the level of the fixed prosthesis, along the axis of insertion of the future removable prosthesis, to provide support and stabilisation, as well as retention through frictional forces. The retention effect of the attachments associated with milling is much better than that of cast clasps [18, 19].

Periodic follow-up is essential to avoid damage to the support structures and guarantee adequate long-term function and esthetics[20]. Attachment retention can be monitored and upgraded over the time just by replacing retentive caps into the framework of dentures for patients' comfort and satisfaction.

## Conclusions

Certainly, using dental implants remains the dentist's first consideration, but this therapeutic may be limited by financial or medical constraints. This case report clarifies according to a didactic approach, the interest of the combined prosthesis retained with attachments, as an ideal alternative to dental implants. With proper case selection, diagnosis and adequate treatment plan, the aesthetic and biomechanical advantages are improved using this prosthetic rehabilitation. It is very important to highlight that those attachments require well-trained lab technicians

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