

# Full Mouth Rehabilitation of Tooth Wear using Digital and Conventional Technologies

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## CASE REPORT

### Abstract

This case report describes a complete mouth rehabilitation of a senior female patient presenting tooth wear with class I Kennedy partial edentulous maxilla and class III partial edentulous mandible, using both digital and conventional tools.

Because minimally invasive approach is the high-expectation treatment whenever possible, for the present case the mandibular arch was an ideal situation to apply this principle, if the patient rejected implants as a treatment plan for upper arch rehabilitation. CAD/CAM technology was a useful partner, beginning with the optical impression, digital design, milling, and the additive technique- 3 D printing. Combining digital and conventional technology, the full mouth rehabilitation was obtained with predictability, time economy and satisfaction of both patient and medical team.

**Key words:** tooth wear, CAD/CAM technology, minimally invasive treatment.

### I. INTRODUCTION

Nowadays, the dental practitioner has the big opportunity to choose the restoration material that harmonize the needs of each individual case thanks to the recent advances in dental materials and computer technology (CAD/CAM). However, this fact represents a big challenge even for a qualified operator because tooth wear treatment itself requires a rigorous documentation. Solving complex situations may be difficult regarding the decision to opt for a certain material and method because no guidelines are available [1].

Dental wear is a common disease which raises multiple restoration issues. Both the factors that generate this disease and the consequences should be correlated with individual characteristics of the patient for a convenient

treatment approach. From the diagnosis to the tooth wear treatment, digital dentistry stands as a useful partner for the clinician [2]. The final objective of any clinician is to improve facial aesthetics and to restore the shape and anatomy of the worn dentition respecting non-invasive principle, this involving therapeutic strategies to increase vertical dimension of occlusion (VDO) [3].

Prosthetic rehabilitation that increases the occlusal vertical dimension recognize an improvement in facial aesthetics and in the morphological and functional occlusal criterion regarding facial skeleton, concluded a study published in 2013 [4]. There are some important factors that need to be considered when outlining a complete prosthetic rehabilitation: the etiology of tooth wear, the quantity of lost hard tissue, the vertical occlusion dimension, the amount of interocclusal space that needs to be supplemented, the occlusal scheme, the functional activity of the muscles, and the changes in facial aesthetics' [5]. The loss of the enamel and/or dentin appears when a force applied on the occlusal area is high or prolonged, so appears the process of wear on occlusal areas correlated with friction. [6].

The final objective of a complete oral rehabilitation consists in installing greater quality restorations, which fit and operate under favorable occlusal conditions, so the restorations could resist over time. Until setting the final restorations, the provisional treatment can verify the patient adaption to the reestablished vertical dimension [7, 8, 9].

This clinical case rehabilitation aimed to corroborate both traditional and modern digital dentistry to obtain a desirable functional and esthetic tooth wear treatment.

### II. CASE REPORT

A 50-years old female patient has presented to the Prosthodontics Clinic from Faculty of Dentistry of University of Medicine and Pharmacy “Victor Babes” Timisoara, the

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major complaints being esthetics and function. The vertical dimension of occlusion (VDO) has been significantly reduced by ongoing wear, and patient's esthetics have been compromised as well, (Fig. 1) so normalizing the lost occlusal function and recreating the esthetics are both required.

The patient presents worn teeth on both arches, maxillary and mandibular.



**Figure 1.** Preoperative view of worn dentition of 50-year-old woman with decreased occlusal vertical dimension

### Treatment sequences

1. For the oral rehabilitation of worn dentition of maxilla and mandibular arches, a first impression and interocclusal record in centric relation (CR) was made by using a silicone impression and occlusal registration (Variotime easy putty Heraeus Kulzer and Vanilla Bite registration material-DenMat). The casts were mounted on a semi-adjustable articulator (Artex CT; Amann Girrbach) with a facebow (Artex Facebow; Amann Girrbach) transfer and provide an interim removable prosthesis designed and fabricated for restoration at the increased VDO. (Fig. 2).



**Figure 2.** The casts mounted at the increased OVD

2. A maxillary and mandibular wax-up with the increased vertical dimension was fabricated.

3. The wax-up was scanned by an intraoral scanner (PlanScan, Planmeca, Helsinki) and then transferred to a 3D printer (Prusa, Josef Prusa, Czech Republic).

4. The printed mandibular cast (Fig. 3) served to produce a splint, used as guide for direct technique interim

restorations, which will help the patient to adapt with the reestablished VDO.

5. Because posterior teeth on the maxillary arch were missing (Fig. 4) and the patient refuses implant supported fixed dental prostheses, a hybrid alternative on natural teeth was selected. The fixed partial dental prostheses on frontal teeth with special attachments and a removable partial denture to restore the posterior edentulous area and reestablish the lost vertical dimension was fabricated.



**Figure 3.** 3D printed mandibular cast



**Figure 4 a, b** Maxillary teeth before preparation and dental preparation for fixed dental prostheses with special attachments and a removable partial denture on the posterior area

6. For the mandibular arch, the treatment plan was first a provisional restoration, to test the new VDO acceptance, using a free-hand direct technique (Evetric System Kit, Ivoclar Vivadent) and the splint guide. The period of adaptation with the new VDO before placing the final restorations was three months duration.

7. After the adaptation period, a minimally invasive therapy was the chosen as final rehabilitation method. For this purpose, the teeth were minimally prepared for all ceramic restorations, then for the digital impression it was used an intraoral scanner (Medit i700). The digital design was realized with a laboratory software (Exocad- GmbH Darmstadt Germany) and for the milling was used a four axis milling

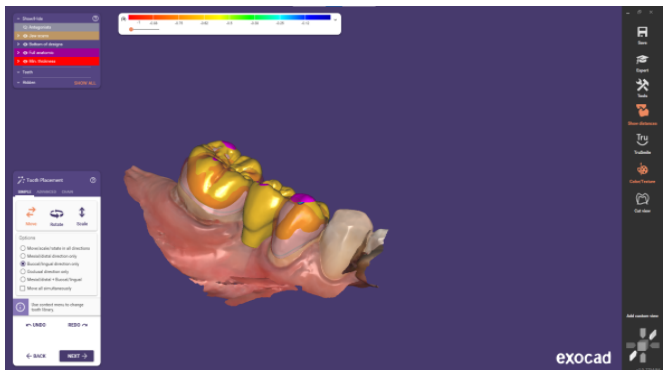
machine (Planmeca PlanMill 40) and lithium disilicate blocks( IPS Emax CAD).



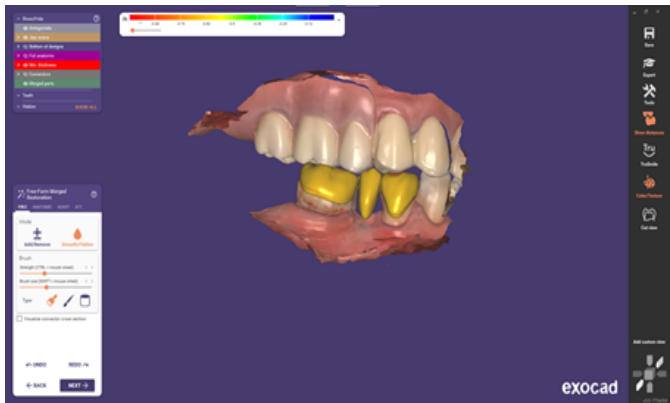
**a**  
**Figure 5. a, b** The rehabilitation of maxillary arch using a fixed dental prostheses with special attachments and a removable partial denture for the posterior area



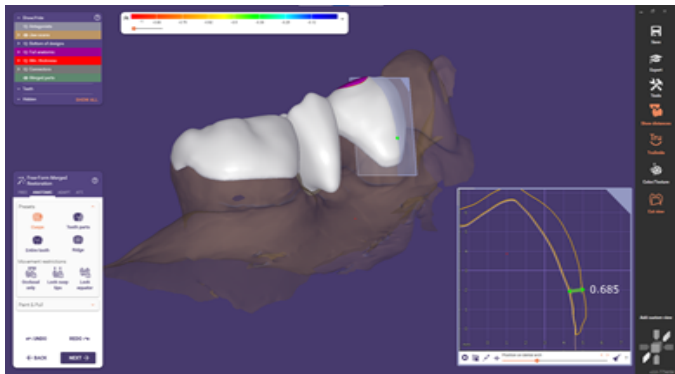
**b**



**a**



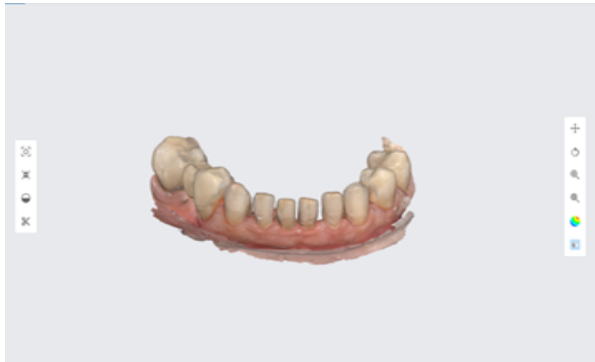
**b**



**c**  
**Figure 6 a, b, c.** Digital design for the minimally invasive fixed dental prostheses in the posterior mandibular area



**a**



**b**

**Figure 7 a, b .** Digital model with the veneer preparation for the frontal mandibular teeth



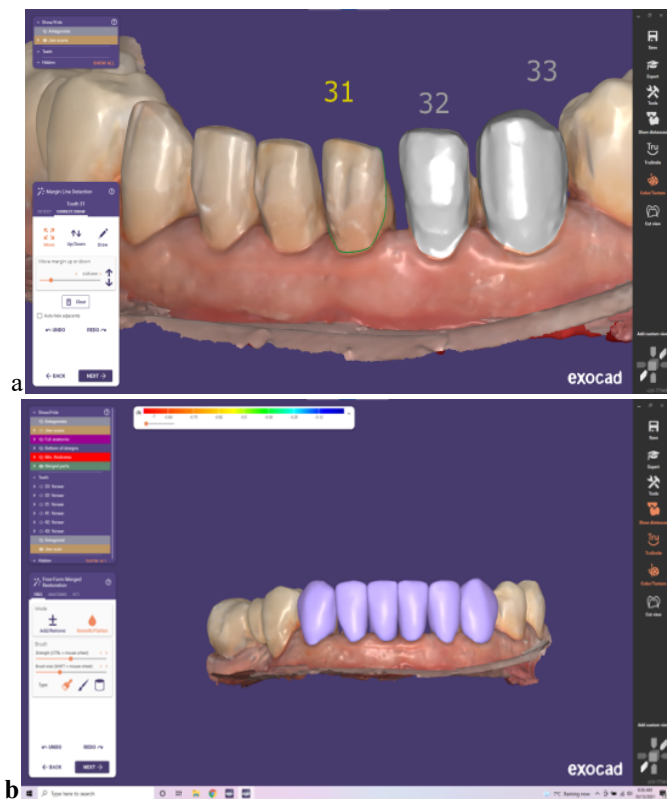


Figure 8 a, b. Digital design for frontal mandibular veneers



Figure 9. The final restorations on the mandible.

### III. DISCUSSION

The general agreement when restorative treatment is necessary to overcome tooth wear is minimally invasive procedures whenever possible, although there are no long-term based evidence using different methods and materials.

CAD/CAM veneers can be manufactured from different blocks of resin composite glass ceramics and hybrid materials for the milling machine[ 11]. CAD/CAM composite resins are recommended for the treatment with ultra-thin veneers because of their better fatigue resistance compared to ceramics[12]. Several advantages of composite resins in the treatment of tooth wear are: more accurate margins, better flexural strength, lower margin roughness, great surface smoothness, and intraoral adjustment and polishing are simplified because there is no need for sintering [13,14,15 ].



a



b

Figure 10. The patient's smile before treatment(a) and three months after cementation(b).

Other studies [16, 17] described a success rate of 90% over a period of five years, for the management of tooth wear with ceramic restorations.

The choice of a particular material and its respective method of application will depend on various factors such as the preference of the dentist, the relative skills of the operator, the mechanical demands required of the restorative material and undoubtedly the presence of any financial constraints.

Mehta and collaborators revealed that after an evaluation period of approximately five years, most of the materials provide relatively high (90%) prognostic outcomes for tooth wear treatment. Also whenever is possible, a reversible, adhesive, additive approach should be applied [18].

Studies regarding practitioners dealing with severe tooth wear in daily routine cases had demonstrated that this are related with age [19]. In all the cases, the VDO suffers a considerable reduction, which should be reestablished by preserving the remaining tooth substance.

Another recent study concluded that even regarding patients suffering of type 2 diabetes the results of the two methods (digital and conventional) in the tooth wear treatment, showed esthetic and functional outcome with an optimal hygiene allowed by the design of the restorations. [20].

#### IV. CONCLUSION

The present case report revealed the advantages of utilizing digital technologies combined with conventional methods for minimally invasive tooth wear treatment and oral rehabilitation. Advances in chairside CAD/CAM technologies and materials provide predictable and successful treatment outcome.

**Conflict of interest.** None to declare.

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