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Clinical case

Interdisciplinary Management of Oral Rehabilitation of a Patient with Loss of Vertical Dimension

Luis Leonel Gutiérrez Huízar[1], Laila Araceli Ortega Bernal[2], Jacqueline Adelina Rodríguez-Chávez[3], Hugo M. Flores-Ruiz[4], Karina Magaña-Curiel[3], Ricardo Curiel-Gonzalez[5], Miguel Ángel Carrillo Collado[6], Alfonso Gutiérrez Núñez[3]

1. Egresado de la Especialidad en Prostodoncia. Departamento de Clínicas Odontológicas Integrales. Centro Universitario de Ciencias de la Salud. Universidad de Guadalajara.
2. Alumno de la Especialidad en Prostodoncia. Departamento de Clínicas Odontológicas Integrales. Centro Universitario de Ciencias de la Salud. Universidad de Guadalajara.
3. Profesor de la Especialidad en Prostodoncia. Departamento de Clínicas Odontológicas Integrales. Centro Universitario de Ciencias de la Salud. Universidad de Guadalajara.
4. Profesor de la Especialidad en Prostodoncia. Departamento de Ciencias Naturales y Exactas. Universidad de Guadalajara. CUValles.
5. Coordinador de la Especialidad en Prostodoncia. Departamento de Clínicas Odontológicas Integrales. Centro Universitario de Ciencias de la Salud. Universidad de Guadalajara.
6. Coordinador de la Especialidad en Prostodoncia. Facultad de Odontología Mexicali. Universidad Autónoma de Baja California campus Mexicali.

Corresponding author:
Jacqueline Adelina Rodríguez-Chávez
E-mail: jacqueline.rchavez@academicos.udg.mx

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ABSTRACT

Introduction: Restoration of Vertical dimension of occlusion (VDO), also known as occlusal vertical dimension, or OVD, is one of the most common treatment options when rehabilitating a patient with multiple dental wear. **Objective:** To restore a case of corrected VDO by complete oral rehabilitation with the help of prosthodontics, periodontics and endodontics. **Case presentation:** A 62-year-old female patient is presented, whose reason for consultation was: "my teeth are too small and I can't eat comfortably". Severe generalised wear, missing teeth, and misaligned restorations were diagnosed. The treatment was divided into 4 phases: In phase 1 the necessary diagnostic studies were taken and foci of infection were removed. In phase 2 provisionalisation of the patient was carried out. During phase 3 (surgical phase), crown lengthening was performed in the anterior sector, followed by implant placement. Phase 4: All final restorations were made. Finally, an increase in the vertical dimension (3 mm), occlusal stability with aesthetic, biological and functionally adequate restorations were obtained. **Conclusions:** The diagnosis and interdisciplinary treatment plan are of utmost importance to obtain excellent results in the oral rehabilitation of a patient with generalised severe wear.

Keywords: vertical dimension, bruxism, interdisciplinary management, oral rehabilitation, severe dental wear.

INTRODUCTION

Restoration of the Vertical Dimension of Occlusion (VDO), also known as occlusal vertical dimension, or OVD, is one of the most common treatment options when it is necessary to rehabilitate a patient with multiple loss or wear of teeth, which have generated dental movements that cause an invasion of the prosthetic restoration space[1]. As the population ages, dentists are increasingly likely to rehabilitate patients with advanced levels of wear to keep their teeth in their mouth for longer. Dental wear is considered pathological when an intervention is necessary for aesthetic or functional purposes, caused by endogenous and exogenous factors. Depending on its cause, it is classified as attrition, abrasion, erosion and abfraction[2].

Patients usually go to dental consultation when they have lost a large part of their teeth, thus reducing their VDO, being functionally and aesthetically affected. The last point is a factor that generates high expectations in the final results of dental treatment. Dental wear is becoming a topic of great interest in the area of prosthodontics, from both preventive and restorative points of view[3]. It is important to determine the processes that occur and the factors that generate wear to determine treatment protocols. Loss of tooth structure does not necessarily mean loss of VDO[4]. Generally, the physiological wear of the tooth is compensated by continuous tooth eruption. Especially, increasing VDO in patients with bruxism can result in the destruction of teeth and/or restorations[5].

In the literature there are different definitions of VDO, Dawson points out that it is the position of stable relationship between the maxilla and mandible when there is maximum intercuspation, where the determinant of the VDO is the muscles, based on their repetitive length of contraction, which indicates that the closure pattern is extremely constant[6]. The

glossary of terms in Prosthodontics defines it as the distance between two anatomical or selected and marked points, usually one on the tip of the nose and the other on the chin[7]. Most authors agree that VDO is the measurement of the height of the lower third of the face, this being a vertical maxillomandibular relationship. To achieve the patient's oral rehabilitation, an important part of the diagnosis and treatment plan is to determine whether or not the VDO is actually reduced. It is currently a controversial issue in patients with bruxism, but in other situations the decrease in VDO is evident[8]. Generally, the degree of wear of the tooth surfaces leads to a diagnosis that tells us to make changes in the VDO, which may be accompanied by facial signs such as a decrease in the height of the lower third of the face, pseudoprognathism, lip ptosis and/or the appearance of facial wrinkles accentuated in the mental crease, or labiomental folds (angular cheilitis). Another manifestation that we usually find is the lack of prosthetic space, which is one of the most relevant complications[9,10]. To determine VDO there are countless alternatives written in the literature (phonetic, aesthetic, anthropometric, cephalometric, instrument methods, etc.). Yet, to date there is no single method capable of answering with complete accuracy. That is why the use of several methods is recommended to be sure that there is an adequate measure to carry out the rehabilitation. Requirements for a correct VDO are: maintaining an adequate interocclusal distance between the rest position and centric occlusion, the length of the teeth and height of the cusps must be mechanically, aesthetically and phonetically correct. Likewise, the height of the VDO must be corroborated and accepted by the patient, referring to her or his comfort in the use of provisional prostheses, whether fixed or removable.

An important aspect for the successful treatment of these patients is to determine a systematic approach to manage this type of rehabilitation that can lead to a predictable and favourable treatment prognosis[11]. Next, we discuss the case of a female patient with loss of VDO due to severe wear, which was corrected by complete oral rehabilitation with the help of prosthodontics, periodontics and endodontics.

CLINICAL CASE PRESENTATION

A 62-year-old female patient, whose reason for consultation was: "*my teeth are very small and I cannot eat comfortably*". The patient presented a mesocephalic facial biotype with a straight profile, symmetrical facial thirds, the interpupillary line coincides with the intercommissural line, straight forehead, straight nasal bridge projection, good projection of the middle third, thin lips, low smile, no buccal corridors, the incisal edges did not coincide with the smile line, and no gums in the maximum smile (Figure 1. A). Table 1 shows the facial analysis measures according to Fradeani[12]. In the intraoral analysis, the patient had both upper and lower ovoid arches, as well as absence of teeth 18, 14, 25, 26, 28, 35 and 37, root canal treatments of teeth 16 and 15, metal-porcelain crowns on teeth 15, 13, 11, 12, 21, 22, 23, 24, 25, 26 and 28, mismatched restorations on teeth 27 and 38. She also presented generalised attrition (Figure 1. B). Orthopantomography revealed apparently healthy condyles, slightly obstructed airways, and pneumatised maxillary sinuses (Figure 1. C). The dentalveolar radiographic study of both the upper and lower sextants showed all teeth with good bone support, continuity of the lamina dura and normal periapical tissues except for tooth 36, where bone loss and a radiolucent zone at the apex were observed (Figure 1. D).

Table 1.
Fradeani Aesthetic Analysis Measurements.

Fradeani Aesthetic Analysis Measurements	
Profile angle	171° (straight profile)
Nasolabial angle	105° (normal)
Interpupillary line	Coincidence with intercommissural line
Aesthetic line (upper lip)	4 mm back
Aesthetic line (lower lip)	1 mm back
Dental midline	2 mm to the right of the facial midline
Dental exposure at rest (maxillary teeth)	No exposure (outside the norm)
Dental exposure at rest (mandibular teeth)	2 mm exposure of 5 teeth (normal)

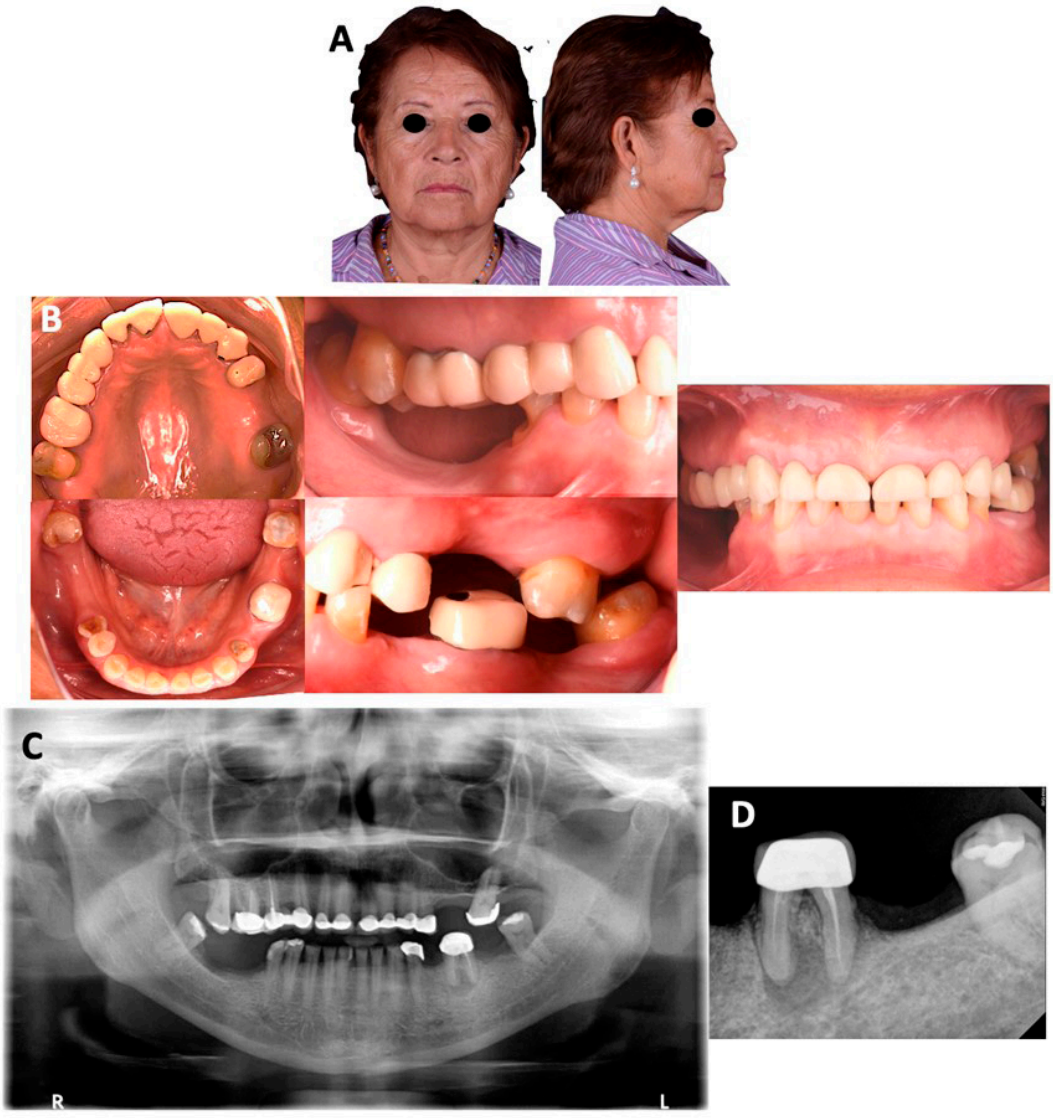

Figure 1. Extraoral and intraoral photographs, and initial radiographs. A. Front and right-side photograph. B. Initial intraoral photographs (upper and lower occlusal view, frontal and lateral view). C. Orthopantomography. D. Dentoalveolar radiograph of tooth 36.

Both the right and left molar classes could not be defined due to the dental absences she had. On both sides, Class I canines were present. The interocclusal clearance is 5mm, the maximum intercuspation and centric relationship coincide. 1mm overbite and 3mm overjet. As treatment objectives, it was decided to do a complete rehabilitation in which dental wear and absences are restored through the placement of individual crowns on teeth 11, 12, 21, 22, 23, 24, 34, 44 and 45, fixed partial dentures on teeth 13, 14 and 15, lithium disilicate veneers on teeth 31, 32, 33, 41, 42 and 43, and implant-supported monolithic zirconia crowns on teeth 16, 26, 35, 36 and 46, increasing the VDO lost in the patient. Likewise, it was necessary to provide organic occlusion characteristics, to eliminate and prevent factors that trigger caries, pulpal and periodontal problems, and to attain acceptable aesthetic results, thus achieving a better long-term prognosis.

The treatment plan was divided into four phases, Phase 1: Photographs, x-rays, study models were taken and a wax-up was performed to determine diagnosis, prognosis and treatment plan (Figure 2. A). In addition, periodontal phase 1 was performed to remove foci of infection. In Phase 2, all the porcelain fused to metal crowns present in the mouth were removed and acrylic temporary crowns of the same shape and height that the patient had were placed, in order to observe the status of the remaining teeth. Subsequently, the root canal treatment of tooth 15 was performed. Then, the digital smile design planning proposed by Coachman *et al*.,[13] was followed up, through which parameters were obtained to perform a diagnostic wax-up by performing a test mock-up to determine the patient's new VDO, projecting a 3 mm increase (Figure 3. A).

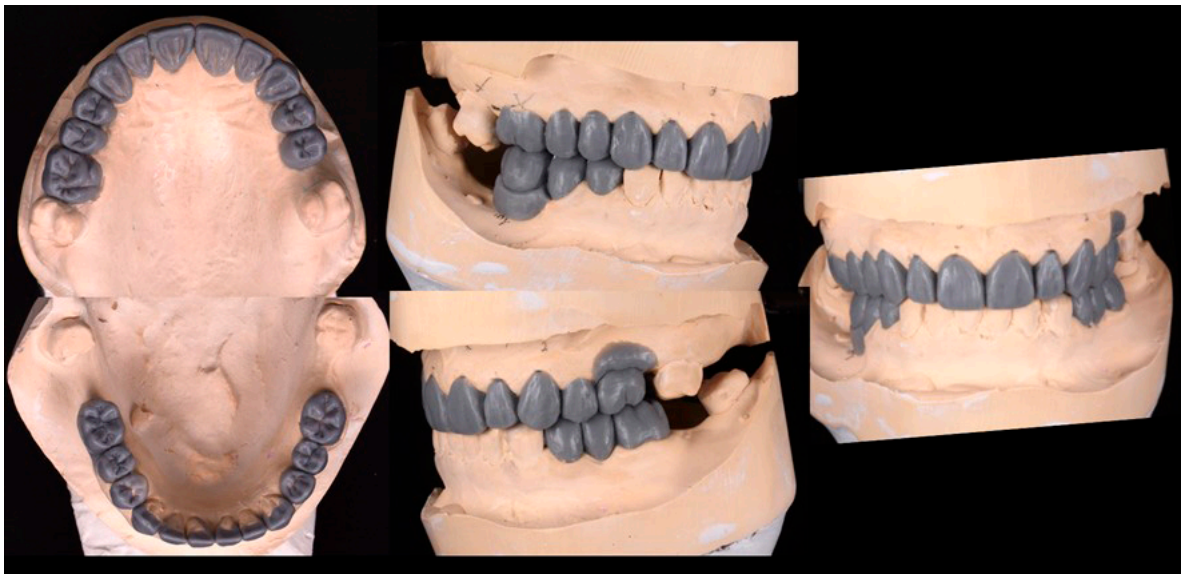

Figure 2. Diagnostic wax-up.

Phase 3. The surgical phase was executed in which the crown lengthening of the anterior sector was performed based on the mock-up accepted by the patient. While waiting for the healing time of the surgery, composite resin restorations (3M™ Filtek™ Z350 XT Universal Restorative, 3M ESPE Deutschland GmbH, Germany) were accomplished with the resin injection technique described by Terry[14] on the mandibular anterior teeth temporarily to maintain the determined height (Figure 3. B). Cement (Rebilda® DC, VOCO GmbH, Germany) was then used to reconstruct the stump in the maxillary arch of teeth 15, 13, 12, 11, 21, 22, 23 and 24 and in

the mandibular arch in teeth 34, 44 and 45. A new set of provisionals adjusted to the stump reconstruction was made, preserving the determined VDO. Subsequently, surgeries divided into three were carried out, in which teeth 16, 17, 36, 38 and 48 were extracted: in the first, implants were placed in teeth 16 and 26, in the second in teeth 35 and 36, and in the third, the implant of tooth 46 was placed, establishing a reduced arch in the patient (Figure 3. C).

Phase 4. The final restorations were placed, fixed partial denture on teeth 13, 14 and 15, and individual lithium disilicate crowns (IPS e.max® Press, Ivoclar Vivadent AG, Liechtenstein) on teeth 11, 12, 21, 22, 23, 24, 34, 44 and 45 were done. Subsequently, the temporary resins were removed from the anteromandibular teeth 11, 12, 13, 21, 22 and 23, and replaced by lithium disilicate veneers (IPS e.max® Press, Ivoclar Vivadent AG, Liechtenstein), implant-supported monolithic zirconia crowns were placed on teeth 16, 26, 35, 36, and 46, and then an occlusal guard was placed. At the end of the treatment, aesthetic, biological and functional rehabilitation was achieved, together with the increase in VDO (3 mm), which offers better masticatory stability to the patient (Figure 4).

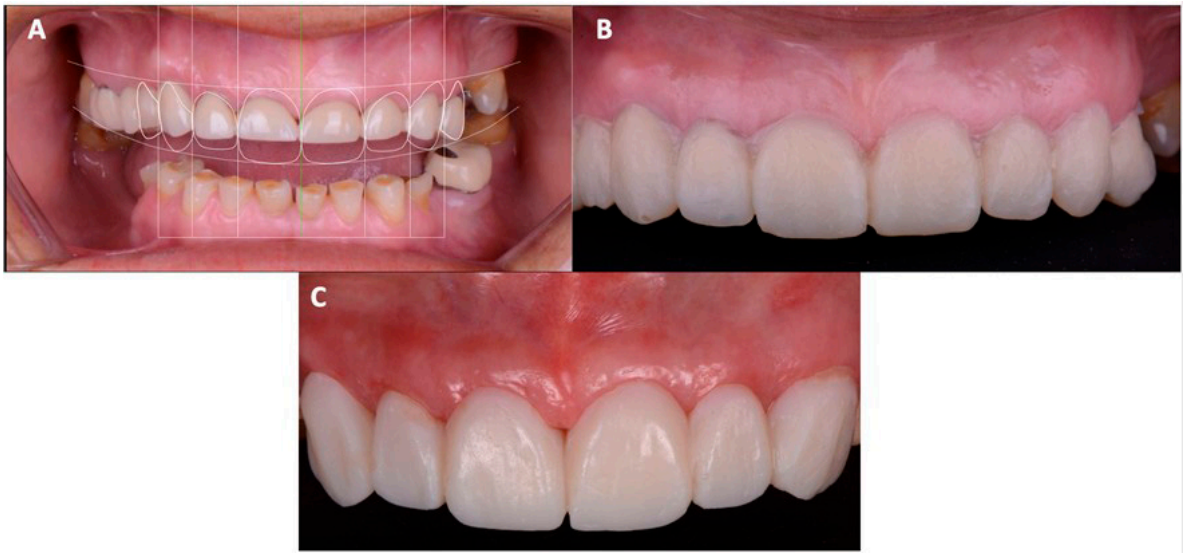

Figure 3. Smile design and provisionalisation with mock-up. A. Digital smile design. B. Test mock-up. C. Provisionalisation, 5 weeks after crown lengthening.

DISCUSSION

The clinical case describes the treatment of a patient with severe generalised wear, missing teeth and mismatched prostheses, in which the decision was made to perform a complete rehabilitation treatment that consisted of an increase in VDO with interdisciplinary management between the specialties of prosthodontics, periodontics and endodontics.

Diagnosis is the necessary clinical procedure prior to carrying out any type of treatment, which must be implemented together with auxiliary examinations (radiographs, study models, diagnostic wax-up, photographs, etc.). It is essential to define the cause of wear before any intervention for the effectiveness of any preventive and restorative care[15]. The wear aetiology of our patient is not entirely clear. However, it can be hypothesised that the patient had a parafunctional occlusal habit, causing generalised wear, losing the occlusal scheme that in turn

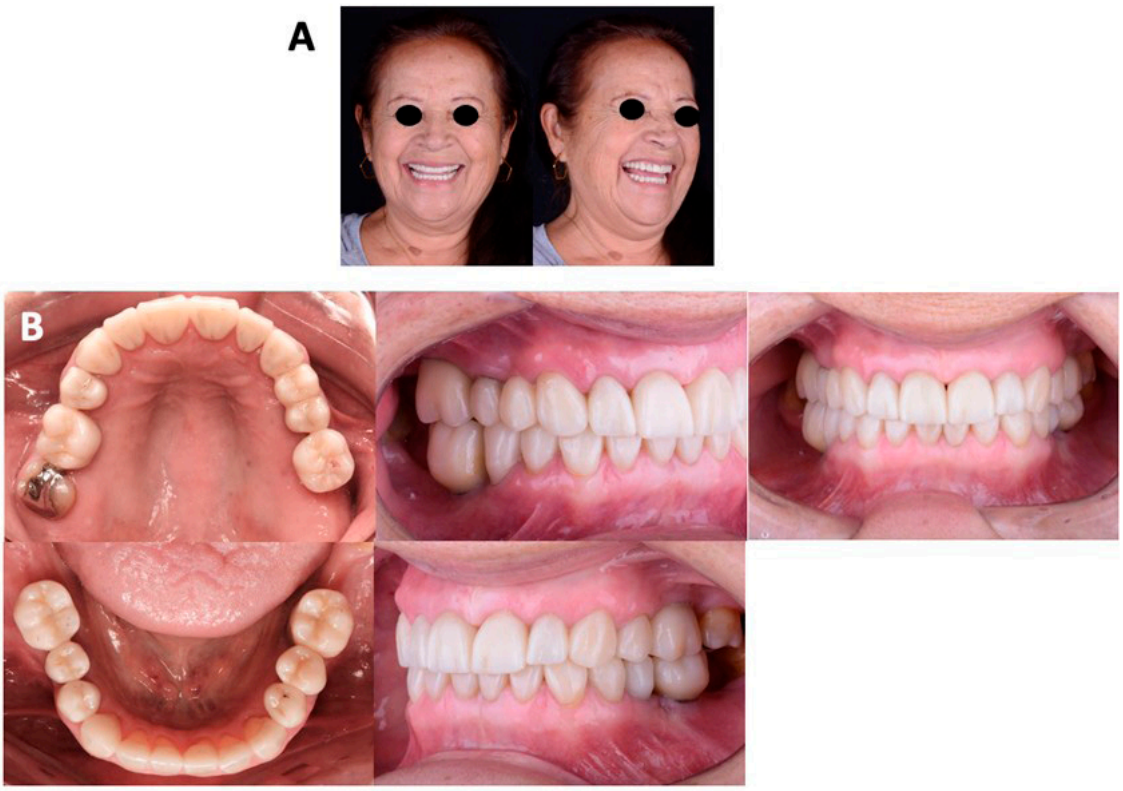

Figure 4. Final extraoral and intraoral photographs. A. Final extraoral photographs from the front and ¾. B. Intraoral photographs.

activated the masticatory muscles in all mandibular excursions, and therefore, more force is aggressively generated on the teeth, causing disturbances in the VDO[16,17]. Harper[18] describes the clinical management for alteration of the VDO, where it reveals its relationship with the temporomandibular joint (TMJ); mainly, the reconstruction of the VDO must be with the condyles in centric relation. Subsequently, the reconstruction must be within the range of neuromuscular adaptation for each patient[19]. In this case, the aforementioned criteria were maintained, because the patient was given time for neuromuscular adaptation before definitive treatment was performed. In the literature, there are various techniques to determine the VDO and obtain neuromuscular adaptation[20]. It was decided, though, to follow the recommendations proposed by Colombo & Delgado[21], who propose managing the VDO with provisionals. This technique allows the patient to adapt to a new VDO and facilitates the transfer from that position to the final treatment. The waiting time with provisionalisation for our patient was 6 months.

Toolson *et al*.,[22] show the choice of the best VDO recording techniques, considering the following criteria: precision, repeatability of the measurement, adaptability of the technique, complexity of the equipment needed, and the amount of time required to ensure the measurement. On the other hand, Abduo *et al*.,[23] suggest taking into account extraoral and intraoral factors prior to making clinical decisions to modify the VDO. Among the extraoral factors are the magnitude of the VDO alteration, facial aesthetics, and the state of the TMJ, while intraoral considerations refer to the dental remnant and occlusion. We took these guidelines into account with our patient.

On the other hand, while muscle tone decreases with age, the mandible tends to gravitate below the resting level, so that the interocclusal distance increases with advancing age[24,25], like our patient's, so we decided to consider this increased VDO accordingly. Determining VDO is an empirical procedure based mainly on clinical experience, and our case was no exception; we had to perform several prior tests in order to stabilise and standardise the correct recording of this dimension[26].

Provisionalisation was the best option during the adaptation process, both for the patient who achieved greater comfort, and for us by ensuring that we could perform the final treatment at that height and achieve adequate occlusion[27,28]. On the other hand, zirconia crowns have the highest resistance to fracture than any other material, in addition to being aesthetic. The effects of wear on opposing teeth can be minimised by correctly polishing and maintaining adequate occlusion[29].

CONCLUSION

The success of the treatment in a patient with severe wear and loss of VDO begins with the correct diagnosis of the alteration, facial aesthetics, TMJ status, dental remnant and occlusion. The placement of fixed provisionals for an adequate time depends on the mechanism of adaptation and individual neuromuscular compensation of each patient, which allows functionality. In our case, it helped us to satisfactorily achieve the proposed goal of providing complete rehabilitation with increased VDO to obtain harmonization of the profile, organic occlusion and dental aesthetics. Likewise, the results contributed to a positive perception of the patient.

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