

Oral rehabilitation of a patient with reduced vertical occlusal dimension

Reabilitação oral em paciente com dimensão vertical de oclusão reduzida.

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Abstract

Reduction of the vertical occlusal dimension (VOD) can present similar characteristics to those verified in the aging process, therefore it determines alterations in the patient's face and alters temporomandibular joints positioning, because of muscular alterations. **Objectives:** This clinical report aimed to present the results of increasing vertical dimension with a full-mouth rehabilitation treatment procedure for a 54-year-old male patient. **Case description:** Tooth wear accelerated with age, so increased vertical dimension was done by installing provisional restorations for one 1-month period to evaluate functional, esthetic and phonetic adaptation to the new vertical dimension. It was not reported any symptom during this period. Once the compatibility of the new vertical dimension was confirmed, provisional fixed restoration and permanent reconstruction initiated with dental crowns, overlays and veneers by all-ceramic and restorations made of silicate and oxide ceramics (IPS e.max). It was possible to obtain the recovery of the height of 1/3 inferior of the face and at the end of the treatment, signals and symptoms caused by reduced vertical dimension disappeared, in addition to obtaining facial harmonization. **Conclusions:** A correct diagnostic and articulated study casts can provide key information to achieve predictability of the treatment. The patient has been clinically monitored for one-year follow-up.

Keywords: Vertical Dimension; mouth rehabilitation; dental prosthesis.

Resumo

A redução da dimensão vertical de oclusão (DVO) pode apresentar características semelhantes às verificadas no envelhecimento, pois determina alterações na face do paciente e altera o posicionamento das articulações temporomandibulares, como consequência de alterações musculares. **Objetivo:** Este relato clínico teve como objetivo apresentar os resultados do aumento da dimensão vertical com um procedimento de tratamento de reabilitação oral completa para um paciente do sexo masculino de 54 anos de idade. **Descrição do caso:** O desgaste dentário foi acelerado pela idade, então o aumento da dimensão vertical foi feito através da instalação de restaurações provisórias por um período de 1 mês para avaliar a adaptação funcional, estética e fonética à nova dimensão vertical. Não foi relatado nenhum sintoma durante este período. Uma vez confirmada a compatibilidade da nova dimensão vertical, foi iniciada a restauração provisória fixa e a reconstrução permanente com coroas dentárias, além de revestimentos com lâminas de cerâmica pura e restaurações com cerâmicas a base de dissilicato de lítio (IPS e.max). Obteve-se a recuperação da altura de 1/3 inferior da face. Ao final do tratamento os sinais e sintomas causados pela redução da dimensão vertical desapareceram, além de obter a harmonização facial. **Conclusões:** Um diagnóstico correto e modelos de estudos articulados podem fornecer informações importantes para a repercussão clínica e para alcançar a previsibilidade do tratamento. O paciente foi clinicamente monitorado por um ano de acompanhamento.

Palavras-chave: Dimensão Vertical, reabilitação bucal, prótese dentária.

Introduction

Oral rehabilitation of severe cases of dental wear is one of the most complex treatment modalities in dentistry, and patient cooperation is critical for treatment success. For this reason, it is crucial that the diagnosis is understood by the dentist as a key to the entire rehabilitation process.

A number of studies have shown that both, the diagnosis and treatment of Temporomandibular Disorder (TMD), are integrated within a model of biopsychosocial disease¹⁻³, in which one of its most frequent consequences is the alteration or loss of Vertical Occlusal Dimension (VOD)². Among the factors related to VOD loss, emotional stress and intense bruxism are highlighted: loss of posterior tooth support, and parafunctional habits may result in

the overall set of TMD symptoms^{4,5}.

When dental wear is severe, a VOD test is essential to determine if there is need to increase it or not, since 80% of patients with a lot of wear on the teeth have normal freeway space (FWS)^{6,7}, which consists of the difference between the Vertical Resting Dimension and the Vertical Occlusal Dimension. According to Almog and Ganddini⁸ (2006), dental wear caused by parafunction progresses three times faster than physiological wear. In addition, differential diagnosis is not always possible, because it can always exist a combination between pathological and physiological wear⁸. The loss of VOD caused by physiological wear is usually compensated by continuous tooth eruption and alveolar bone growth, in situations where there is an imbalance between wear and the compensatory mechanism⁹.

Conforming to Abduo¹⁰(2012), an increased or decreased VOD can cause permanent or recoverable damage to the patient. These damages may affect masticatory, muscular, articular, phonetic and aesthetic function. When these alterations are related to the decrease of VOD, its mainly because of the wear or absence of dental elements and, when related with the increase of VOD, its usually because of a deliberated increase by the manufacture of inadequate prostheses¹¹. This article refers a report of a clinical case of a prosthetic rehabilitation in which the patient needed to increase the VOD.

Case report

A 54-year-old male patient sought dental care. His major complaint was his "unpleasant smile," and he was willing to improve his self-esteem through oral rehabilitation treatment.

After anamnesis and clinical and radiographic examinations, the following was observed: unsatisfactory restorations, presence of secondary carious lesions and need for endodontic treatment in teeth 22, 35 and 44, also, presence of thin lips, barely visible upper central incisors, average smile and inverted smile (Figure 1). Gingival contour was adequate, but the restorations were not satisfactory, with fractured dental crowns on teeth 22 and 45, and due to wear, it caused attrition on anterior-inferior teeth (Figure 2).



Figure 1 - Dental and aesthetic evaluation of the smile.



Figure 2 - Intraoral images in occlusion and upper and lower arches.

Initial study gypsum models (Durone type IV –Dentsply Ind. Comp. Ltda, Rio de Janeiro, RJ, Brazil) were obtained and placed in a semi-adjustable articulator. Lucia's Jig was made and adapted in the anterior teeth region and then, a bite record of posterior areas was obtained with addition silicone (Occlufast Rock – Zhermack SPA, Rovigo, Italy).

For evaluation of VOD, a combination of metric and phonetic methods was used. The patient had a loss of 2mm in VOD due to dental wear, FWS was 4.0 mm, however, no occlusal collapse was observed, only discomfort in his usual bite. After presentation of treatment plan and patient's consent, treatment started. Treatment plan included correction and harmonization of the inverted smile, through the rehabilitation of all dental elements.

In the upper arch, total crowns with IPS

e-max (Ivoclar Vivadent, Schaan, *Liechtenstein*) were performed on the anterior and posterior teeth and on the lower arch, total crowns on posterior teeth and e-max veneers on the anteroinferior region, considering the presence of adequate dental remaining enamel. Before execution of dental preparations for total crowns, natural teeth were replicated using condensation silicone (Zetaplus - - Zhermack SPA, Rovigo, Italy) and refined with fluid silicone (Oranwash - - Zhermack SPA, Rovigo, Italy). These molds had to be of a sufficient thickness, in order to avoid distortions on the provisional restorations which were obtained with bisacrylic resin (Structur, color A2, Voco, Cuxhaven, Germany). After preparation of all teeth (Figure 3), the impression was done by the double-step and double cord technique using, using addition silicone impression material (Express XT, 3M ESPE, CA, USA).



Figure 3- Dental preparations of the upper arch in frontal and occlusal views

The preliminary impression was internally relieved with a tungsten drill Minicut PM tronco-conical # 79, preserving the finishing line. In addition, scape channels were made on the palatal area so the excess of fluid silicone material could flow without causing any distortion.

For the second step impression, only the second retractor cord was removed and the low viscosity silicone was deposited into the gingival sulcus and over the preliminary impression. As a result, an accurate copy of all the teeth and gingival sulcus was obtained. Once the upper and lower impressions were ready, they were sent to

the laboratory together with the bite registration and the Semi adjustable articulator (SAA) with guide pin opened at 1.5mm.

Provisional restorations, made in the laboratory with bisacrylic resin, were adapted into dental preparations (Figure 4). Subsequently, upper provisionals were divided into three parts and the lower provisional into two parts, in order to facilitate the cementation (Calcium Hydroxide -Hydro C, Dentsply Ind. Comp. Ltda, Rio de Janeiro, RJ, Brazil). Occlusal contacts were assessed and balanced using articulating film (AccuFilm II, Parkell™, Farmingdale, New York, USA).



Figure 4 – Provisional restorations being placed

The patient remained with provisional restorations for one month in order to adapt himself to the new VOD and bite arrangement. During the evaluation and adaptation time, no adjustments were required and no symptoms were reported by the patient. The adaptation to the new VOD was verified by phonetic testing, asking the patient to pronounce words with “s” producing sibilant sounds, verifying the correct pronunciation of the words and freeway space.

After 30 days, veneer and crown preparations were done and new upper and lower impressions with new bite registration were taken, as described before.

Prior to cementation, adaptation, occlusal and interproximal contacts were checked on definitive e-max restorations. The inner surface of all restorations was etched with 10% hydrofluoric acid (Condac Porcelana – FGM Dental Products, Joinville, Brazil) for 20 seconds, then profusely washed with water and then Silane (Silano Prosil-FGM Dental Products, Joinville, Brazil) was applied

and let stand till complete volatilization.

Ultratop Retractor No. 000 (Ultrapak – Ultradent Products, Inc, South Jordan, UT, USA), soaked in hemostatic solution (Hemostop - Dentsply Ind. Comp. Ltda, Rio de Janeiro, RJ, Brazil) was placed in the gingival sulcus to allow removal of excess cement after cementation. The cementation was performed with RelyX veneer (3M ESPE, CA, USA) taking proper care to eliminate proximal excess cement with dental floss before and after photopolymerization (3H Xlite II LED curing).

After removal of the retractor cord, a number 12 scalpel blade was used to remove cement excess from the gingival sulcus. As was done with temporary restorations, occlusal contacts of final restorations were analyzed using AccuFilm II film. Subsequently, surfaces worn during occlusal adjustment were polished with Dura-White porcelain polishing tips (Shofu, Japan) and also, interproximal contacts were assessed with dental floss (Figure 5).



Figure 5- Intraoral final photographs of the cemented restorations

At the end of the treatment it was possible to appreciate the length increasing of upper incisors and the new contour of teeth, following the line of the inferior lip, providing a great improvement in the smile aesthetics (Figure 6).

After 1 year follow-up, clinical and radiographic checkups were made to evaluate the conditions and performance of crowns and veneers. No discomfort was reported and all restorations remained clinically satisfactory (Figures 7 and 8).



Figure 6 - Smile after cementation of the crowns.



Figure 7 - 1 year following-up intraoral photographs.



Figure 8 - Smile after one year follow-up.

Discussion

As a result of aging, there is an irreversible loss of dental structure and to rehabilitate these patients, an interdisciplinary approach is necessary, with a pertinent treatment plan which reestablishes the function and the lost aesthetic²¹. This clinical case report describes how aesthetics and function may be integrated through scientific and practical knowledge.

The smile can be jeopardized by dental wear and its rehabilitation has become one of the most challenging aesthetic demands for dentists^{12,13}. Aesthetic procedures require continued learning and updated knowledge about the aesthetics principles and technical possibilities available in contemporary dentistry¹⁴.

Occlusal tooth wear is a process that occurs throughout our life^{15,16}, and it has usually a slow progression. However, when combined with dental friction and parafunctions, it can generate an even greater and irreversible loss of tooth structure¹⁷.

Pathological wear occurs when the normal rate of wear is accelerated by endogenous or exogenous factors⁹. Bruxism is considered the greatest cause of tooth wear¹⁵. According to Jain et al¹⁶ (2016), there is a loss of 0.3 mm of dental enamel in a period of 10 years.

Regardless of the patient's demand, it is necessary a set of exams such as periodontal assessment, radiographic examination, study gypsum models mounted on a semi-adjustable articulator, diagnostic wax-up, initial photos and dentofacial aesthetics analysis^{12,14,18,19,21}. In cases of severe dental wear, the evaluation of the vertical occlusal dimension (VOD) is necessary before any restorative treatment, since the absence of dental structure is related with VOD alterations^{10, 18,19}.

The increase of VOD should be considered in cases where there is little dental remnant, short crowns, little space available for restorations,

and when occlusion and / or aesthetics are compromised^{10, 20}.

In consonance with Mays²² (2003), clinicians should avoid increasing vertical dimension at a point where the patient has not functional balance. Treatments with VOD alteration do not aim to stop parafunctional activity; however, they must reduce masticatory stress¹⁴.

Ceramic crown restorations were indicated due to the need for extensive restorations. The development of more resistant ceramics, such as those reinforced by leucite or lithium disilicate²³ made possible to extend the indications of adhesive ceramics.

Additionally, metal-free prostheses do not promote cervical shadowing or corrosion, the presence of the metal could bring and would certainly compromise aesthetic excellence.

Other therapeutic alternatives may be used to rehabilitate patients who require restoration of the vertical occlusion dimension, among them: Overlay removable partial denture²⁴, fixed single crowns/prosthesis associated or not to direct restorations with light-cured composite resin.

To measure VOD correctly, there are several methods: phonetic, swallowing, Willis or metric, aesthetic, facial proportions and inter-occlusal distance. No method overlaps the other, but they must be used in order to reduce the possibility of errors and obtain a better definitive prosthetic results⁷. It is important to mention that when increasing VOD, the patient should remain with provisional restorations for a period of time, then they will be used as prototypes for the definitive ceramic restorations²⁵.

Another possibility to obtain a correct diagnosis of VOD and to evaluate the patient's tolerance to the new vertical dimension is the use of temporary removable overlay splints (Occlusal overlay splint)^{19,26}. In this case, fixed provisional restorations were chosen allowing functional, occlusal and aesthetic adjustments, providing a more predictable outcome for the rehabilitation²⁷.

To obtain the provisional restorations, the 2-step impression technique was preferred in order to guarantee a better cervical adaptation and to favor periodontal health during the period of adaptation.

A functional adaptation period with the provisional crowns, when VOD has been modified, is an important step in oral rehabilitation. This period can vary from 3 weeks to 5 months, in cases of conservative and reversible cases, and from 2 to 6 months in cases of multiple fixed prostheses^{19,26}. In this case, we opted for the careful monitoring of the patient for only one month, using provisional blocks, such as Song et al²⁶(2010), who opted for a shorter follow-up, using a vertical reestablishment plate to finally carry out the definitive rehabilitation treatment. One month was enough, in this case, as no symptoms were reported by the patient. If VOD alteration had been greater than 2 mm, probably longer adaptation time would have been required. The patient reported that he felt so comfortable that he did not remember using provisional blocks. According to Cura et al²⁸(2008), when the increase in vertical occlusal dimension is greater than 2 to 3 mm, the rehabilitation process should be done gradually. Otherwise, tension, pain, musculature spasms, problems in the joint, and disharmonies throughout the masticatory system are likely to occur. In this case report, the VOD was increased only in 2mm.

To treat the internal surface of lithium disilicate-based ceramics, 10% hydrofluoric acid was used for 20 seconds. Differently from other

type of ceramic, in lithium disilicate ceramics, etching time is inversely proportional to the flexural strength of the ceramic^{29,30}.

For cementation, a dual cured cement was used, which has better performance than the chemically activated resin cements in terms of degree of conversion and mechanical properties³¹.

Regular follow-ups are important to monitor the patient even after the definitive cementation of ceramic crowns, as it was done in the present case. Arabi et al³² (2015) affirms that the oral health of patients is positively influenced by the prosthetic treatment. The present clinic case report corroborates with this confirmation.

Conclusion

The correct management of the vertical occlusal dimension is important for a successful treatment, since it influences on the efficiency of the masticatory mechanism, helps to maintain facial appearance, facilitates swallowing and allows adequate articulation of words. It is worth emphasizing that the positive response of the patient to the new VOD, without symptoms is very important. The recovery of the vertical occlusal dimension also involves restoration of aesthetics and has positive repercussion on the patient's self-esteem.

Disclosure

The authors report no conflicts of interest in this work.

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