

Case Report

Variation of vertical dimension and prosthetic therapy

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Abstract

Changes in vertical dimension can be indicated in prosthetic treatment to improve aesthetic and / or oral functions or to simplify the resolution of a case. In some situations, the increase of vertical dimension of occlusion could be an interesting alternative to invasive therapy as surgical or orthodontic treatment. A complete diagnosis is the starting point to planning any modification in occlusal schemes. Variation of vertical dimension and how and when it could be changed has always been a challenging prospect for the general dental practitioner. This article aims to illustrate and to discuss the rationale behind changes in vertical dimension and demonstrate how it can be achieved using a case report.

Keywords: vertical dimension of occlusion, variation, increase, prosthetic treatment, tooth wear.

INTRODUCTION

During an extensive prosthetic reconstruction, the choice of the vertical dimension of occlusion (VDO) is an essential step for the success of treatment.

For many practitioners, VDO has a fixed value that should be determined for each patient and preserved during prosthetic treatment.

On another side, many arguments are, frequently used to justify the changes of VDO in both direction, increasing and decreasing, especially mechanical reasons. Indeed, in some cases, increasing the VDO may be the only logical alternative to create sufficient prosthetic space for replacing missing teeth or restoring worn ones.^{1,2}

For a long time, many authors believed that VDO could not be increased because it causes temporomandibular disorders (TMD)^{3,4,5,6,7}.

This belief derived from the following hypothesis: an elevation induces an increase in the tonicity of elevator muscles, increased tooth mobility and finally the intrusion of teeth. This ingression would generate a decrease in VDO and a return to its initial value¹.

On the other hand, other authors as Palla (1995), concluded that an increased VDO does not appear to disrupt the chewing function. On the contrary, it has been

shown that the increase of vertical dimension (VD) causes a relaxation of elevator muscles found clinically when wearing the occlusal splint^{8,9,10}.

Therefore, could we change the VDO to resolve some cases when there are therapeutic needs especially prosthetics ones? How to verify that the therapeutic VD will be in harmony with all the anatomical and neuro-physiological determinants?

The aim of this article is to answer these questions and to clarify certain concepts about the VDO through a clinical case.

CASE REPORT

A 45-year-old female visited our prosthetic department with the chief complaint of missing teeth in the mandibular arch and severe worn dentition in maxillary one.

The recent medical examination revealed a healthy patient with no contraindication for any potential dental corrections. Diagnostic data were gathered by personal history, clinical examinations, radiographs and study cast. (Fig1,2,3)



Fig. 1: Preoperative photograph showing severe attrition of maxillary teeth.



Fig. 2: orthopantomographic radiograph: Note the endodontic exposure, small clinical crowns and the quantity of teeth worn.



Fig. 3: Lateral cephalogram radiograph: showing normodivergent profile with skeletal class I.

Intraoral examination revealed a loss of dental tissue in the maxilla that was greater at the palatal surfaces of anterior teeth. Coronary height of these teeth was reduced. At mandibular level, the posterior teeth on the right side were missing. (Fig. 1)

In order to restore function and aesthetic, fixed prosthesis in maxilla and removable partial denture in mandibular level were indicated.

Before any attempt to restore a functional occlusion and esthetics, we need to find the cause of the excessive tooth

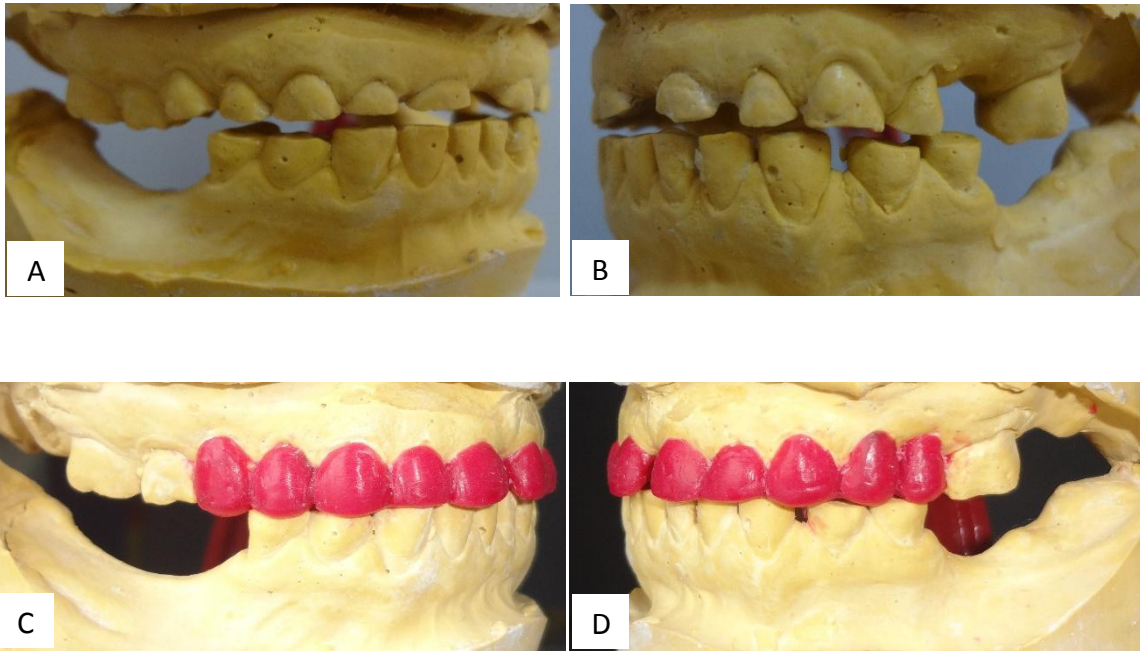


Fig. 4: Study/diagnostic cast: A-B Lateral views of diagnostic casts mounted on articulator with increased vertical dimension. C-D Diagnostic wax up at the new vertical dimension.

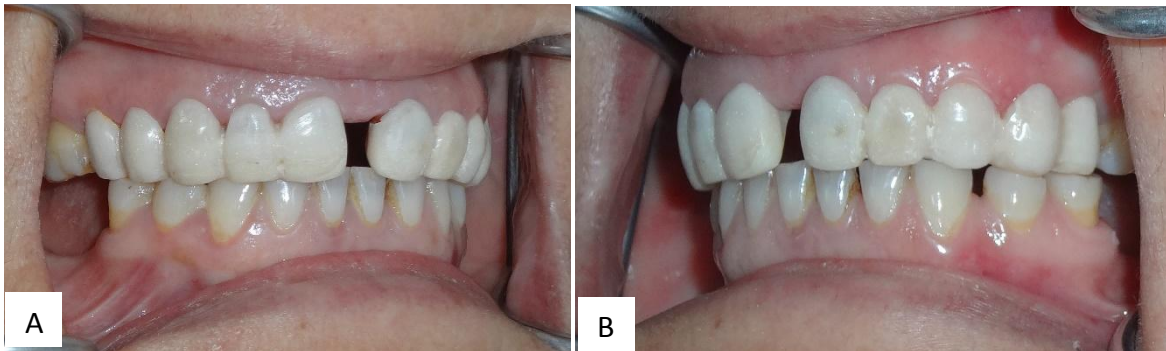


Fig. 5: A-B Occlusal View of Temporary prostheses done at the new vertical dimension of occlusion.

wear. History revealed that severe worn teeth was due to bruxism and loss of posterior support.

In order to determine whether VDO was altered or not, three points were investigated. The first point concerned phonetic evaluation. In fact, the distance between the incisal edge of mandibular and maxillary incisors was about 1 mm and it made normal “s” sound.

The second point was focused on interocclusal rest space. Indeed, the patient’s interocclusal rest space that was measured between nose tip and chin tip was 2 mm. This was the normal value corresponding to a conserved VDO. Finally, the third point examined facial appearance, which showed no collapse of the lower level of the face.¹

Despite the excessive tooth wear, the VDO was preserved. This VDO complicated the clinical situation since a reduced prosthetic space and coronary height was shown by mounting casts on semi-adjustable articulator. (Fig 4: A-B)

To create sufficient space for restoration of worn teeth and replacing missing teeth, VDO was increased 4 mm at the incisal pin of the articulator. Prosthesis are conducted after a complete treatment planning beginning with (i) cognitive behavioral therapy to manage bruxism, then (ii) oral prophylaxis including scaling and polishing, (iii) Root canal therapy in relation to worn dentition and finally (iiii) reconstruction of the severely worn dentition by fixed

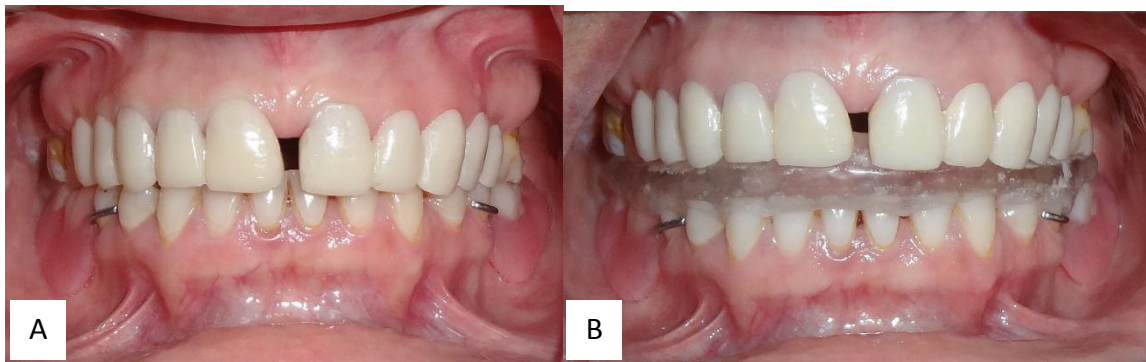


Figure 6. A- Definitive prostheses. B- Occlusal splint made to protect zircon restoration.

prosthesis and restoration of missing teeth by removable partial denture both at an increased VDO.

In order to visualize the prosthetic project, diagnostic wax up was accomplished on mounted diagnostic casts after putting the incisal pin to 4 mm (Fig 4: /A-BC-D)

At first step, an occlusal splint was worn during 1 month in order to reinforce management of bruxism and to test the new VDO.

This VDO was tested in a second time by temporary fixed and removable prostheses (Fig 5) before making the definitive ones (Fig 6).

DISCUSSION

In some situations, the lack of vertical space is an obstacle to prosthetic rehabilitation particularly if it is caused by a severe tooth wear. In these cases, the increase of VDO could be an interesting alternative to avoid invasive therapy as surgical or orthodontic treatment.

For this, we must analyze the effect of this increase on certain parameters referring to the mounted diagnostic casts on articulator, the radiological examination and cephalometric analysis.^{1,9,12}

A rational decision could be adopted in four steps:

- At first step, we need to check the musculo-articular green light: the patient must have the temporomandibular joints in good condition to benefit from a potential neuromuscular adaptation to the new VDO;
- In a second step, we check the obtaining or maintaining functional contacts in the anterior teeth (overjet and overbite)
- Then, prosthetic heights and spaces are measured taking into account the mechanical requirements
- In a last step, the impact on the aesthetics and the influence of skeletal typology, morphology of mandibular are taken into account.

We adopted these criteria to decide on the therapeutic VDO to consider for this clinical situation.

The patient could adapt to any increase in VDO since she

did not provide advanced degenerative lesions in the temporomandibular joints.

The cephalometric analysis showed that the patient had a skeletal class I with a normodivergent profile allowing an increase of the VDO.¹

Therefore, we concluded that all the criteria were in favor of increasing the VDO except for the absence of the incisive recovery, which will be further reduced, by the increase. However, the contact of anterior teeth can be optimized by the fixed prosthesis.

Synthesis criteria results in an increase of VDO by 4 mm at the incisal pin of the articulator. According to the rule of proportionality, this increase corresponds approximately to 2.5 mm at incisors and 1.3 mm at molar level.⁹

Traditionally, it has been believed that VDO has a constant value and changing this value is a precarious dental procedure causing problems such as temporomandibular disorders (TMD), headaches, tooth grinding and clenching.

A review of the literature do not suggest that increasing the VDO leads to the development or perpetuation of TMD symptoms². On the contrary, studies have shown that mild transient TMD symptoms may appear after moderate increases of VDO and these symptoms routinely resolve rather quickly. These findings suggest that the stomatognathic system has great ability to adapt to increases in VDO without any major clinical consequences.^{10,11}

Therefore, we can say that when there are therapeutic needs to increase the VDO (prosthodontic needs, aesthetics and function), care should be taken to incorporate minimum changes and that orthopedic stability is maintained during such change. Changes in VDO may be assisted by utilizing an interocclusal appliance or temporary crowns fabricated at the increased VDO. The patient should be observed for an adequate period to assure a positive stomatognathic response.^{10,13}

Permanent occlusal changes should only be attempted after the patient has demonstrated adaptability at the new vertical dimension.

CONCLUSION

As said Orthlieb⁹ (2013) "Practitioner can play with the VDO provided if he knows the rules", that is enjoy the potential for adaptation when they exist in the aim to optimize previous occlusal relationships, mechanical aspects of prosthesis retention, slightly compensate the skeletal types and promote aesthetics.

It is by combining various criteria that the best compromise defines therapeutic VDO to consider. It should be validated through a provisional restoration, particularly in relation to the muscle response.

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