

## Alteration of the vertical dimension of occlusion: Clinical repercussions



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### ABSTRACT

The loss of the vertical occlusion dimension (OLD) is the result of a major occlusal imbalance, where, in addition to the loss of dental elements, the responsible factor may be parafunctions, such as bruxism. The reestablishment of the vertical dimension of occlusion is very important for the

preparation of prosthetic works since its non-establishment can cause damage. The objective of this study was to conduct a narrative review of the literature to clarify the clinical repercussions caused by the alteration of the vertical dimension of occlusion. Studies on the subject were searched electronically through the Medline database, via PUBMED, without restricting the language of the publications and the limit of publication dates. The search strategy was developed using a combination of keywords and general terms related to the vertical dimension of occlusion and dental prosthesis. A total of 31 references were included in this review. According to the reviewed articles, we can infer that if the vertical dimension of occlusion is not correctly reestablished, remaining increased or decreased, damage may occur in the teeth, muscles, TMJ, swallowing, phonation, auditory system, and even in the patient's posture, affecting their balance, so its reestablishment is of paramount importance for the success of oral rehabilitation.

**Keywords:** Vertical dimension of occlusion, Dental prosthesis, Occlusion.

## 1 INTRODUCTION

Often tooth wear is found in several patients, some factors such as age, presence of parafunction, occlusion, eating habits, and conditions such as amelogenesis or dentinogenesis imperfecta interfere with the degree of wear. When tooth wear becomes excessive, it is necessary to evaluate and reestablish the vertical dimension of occlusion (OLD).

The vertical dimension is considered as the height of the face determined between two fixed points, one located in the maxilla and the other in the mandible. The height of the face when the teeth are at maximum intercuspation is defined as the vertical occlusion dimension (OLD)<sup>1</sup>. The height of the face when the teeth are separated and the jaw is in a position of physiological balance is called the vertical resting dimension (RLD)<sup>2</sup>.

The correct reestablishment of OLD is essential for the proper function and comfort of the patient, however, it is one of the greatest obstacles in oral rehabilitation<sup>3</sup>. Its inadequate



reestablishment will lead to the failure of prosthetic work, and even to iatrogenesis. Decreased or increased OLD can cause damage related to masticatory, muscular, articular, phonetic, postural and aesthetic function<sup>4; 5; 6; 7;8</sup>.

In the era of evidence-based dentistry and despite 50 years of publications on the subject, the determination of OLD remains a process basically based on professional clinical experience<sup>9</sup>. Therefore, the objective of this study is to review the literature and verify the clinical repercussions caused by the alteration of the vertical dimension of occlusion.

## 2 METHOD

### 2.1 DESIGN AND RESEARCH QUESTION

The present study was conducted as a narrative review of the literature in order to answer the following question: "What are the clinical repercussions generated by the alteration of the Vertical Dimension of Occlusion?".

### 2.2 SEARCH STRATEGIES

Studies on the subject were searched electronically through the Medline database, via PUBMED, without using a limit of publication dates. The search strategy was carried out using a combination of keywords and general terms related to OLD and dental prosthesis. The following combination was performed (occlusion vertical dimension AND dental prosthesis).

An examiner independently screened titles, abstracts and subsequent selection of references for complete reading. Literature reviews, systematic reviews, clinical cases, and books that addressed the topic were included in this review. The references of all included studies were manually analyzed for possible inclusion of studies. The electronic search (Pubmed) resulted in the identification of 144 references. Of these, 46 were excluded in the screening of titles, and 72 in the screening of abstracts, 26 references were evaluated in full. Some additional references were found through manual search, totaling 32 references.

## 3 LITERATURE REVIEW AND DISCUSSION

The vertical occlusion dimension (OLD) is the vertical distance between the mandible and the maxilla when the teeth are in contact<sup>10</sup>. Over time, patients may suffer changes in this dimension due to tooth loss and wear, which is also common in restorative procedures, during orthodontic treatments, and in patients with temporomandibular disorders<sup>4</sup>.

According to some authors, the physiological resting position, as it is a position determined by muscle balance regardless of the presence and/or position of teeth, remains constant throughout the individual's life in the presence or absence of teeth and could be used as a reference in the



reestablishment of OLD<sup>11; 12; 13</sup>14, except for minor changes due to age, the relative stability of the clinically determined resting position is generally accepted<sup>11; 12; 13</sup>.

The resting position implies harmony in the tonicity of the levator and depressor muscles, but its presence, by itself, is not indicative of muscle harmony. The observation that the clinically determined resting position does not always coincide with the limit of minimum muscle activity suggests that the neuromuscular mechanism is much more complex than previously thought<sup>15</sup>. An important aspect of the jaw resting position is the free functional space (FFE) that is present between the occlusal surfaces of the upper and lower teeth when antigravity tone is maintained. This space varies with the type of occlusion and with the hypotonicity or hypertonicity of the muscles related to mastication. In the anterior part of the arches, this space, on average, can vary between 1 and 4mm.

Tooth wear is frequently diagnosed in many patients, and the loss of morphology of the incisal edge of the maxillary central incisor, for example, is considered physiological tooth wear, since the characteristics are lost with age<sup>16</sup>. Therefore, it is difficult to determine when tooth wear is physiological or pathological, because there is no fixed degree of comparison, what is known is that major wear requires interventions<sup>17</sup>.

Tooth wear is classified according to its etiology as: attrition, abrasion, abfraction and biocorrosion<sup>18</sup>. In friction, there is a loss of dental tissues, exclusively as a result of the activity of functional or parafunctional contact of the teeth, whereas in abrasion there is a wear caused by the friction action of a foreign body on the teeth, which is considered pathological<sup>19</sup>.

In abfraction, there is loss of dental tissue due to occlusal trauma, and in biocorrosion (erosion), loss of tissue due to a chemical process. In most cases, there is a combination of these processes, so there is difficulty in establishing a differential diagnosis<sup>20;21</sup>. The degree of wear and tear can vary and depends on factors such as: age, occlusion, presence of parafunction, gastrointestinal disorders, excessive intake of citrus foods and low-pH beverages, environmental and salivary factors, and congenital anomalies such as amelogenesis imperfecta and dentinogenesis imperfecta.

Some moderate changes in OLD are not harmful, as they do not lead to symptoms of temporomandibular disorders and do not cause muscle overactivity<sup>22</sup>. However, both the indiscriminate increase and decrease in OLD lead to undesirable changes. Changes in OLD generate various damages that are related to aesthetic, dental, muscular, swallowing, articular, phonetic, periodontal and even postural problems<sup>3; 4; 5; 6; 7;8</sup>.

The increase in OLD can cause damage such as: pathological bone resorption, increase and decrease in the stretching of some muscles, tooth wear, headache, TMD symptoms, TMJ pain, bruxism, phonation difficulty and masticatory deficit<sup>23;24</sup>. This is due to the decrease in free functional space and these consequences have repercussions on the main characteristics present in patients with



increased OLD, which are: enlargement of the lower 1/3 of the face, dental contact in the emission of wheezing sounds and pain<sup>23;25</sup>.

On the other hand, the decrease in OLD causes an excessive increase in the free functional space, resulting in: traumatic occlusion that affects the periodontium and causes tooth wear, hearing problems, TMJ overload, aging (loss of facial muscle tone), short face, appearance of acute and chronic oral pathologies, modification of the adrenocortical response leading to an increase in urinary cortisol levels and consequent reduction in urinary volume<sup>4;24</sup>. The main characteristics of patients with decreased OLD are: Reduction of the lower 1/3 of the face, large free functional space, excessive lip contact, and presence of angular cheilitis<sup>23;25</sup>.

Symptoms related to decreased OLD, such as hearing loss, dizziness and pain in the temporomandibular joint caused by the posterior displacement of the condyle, which compresses the retrodiscal zone, became known as Costen's Syndrome<sup>5</sup>.

A study aimed to seek an association between the type of bite and changes in the vertical dimension of occlusion with temporomandibular disorder in children and adolescents. A total of 105 individuals were evaluated, however, only 61 met the inclusion criteria, of which 35 were women and 26 were men, and the authors found no correlation between the type of bite, decreased OLD and TMD in the sample<sup>26</sup>.

In 1987, Wilding et al investigated the prevalence of TMD, diagnosed using the Helkimo index, in a sample of 51 individuals with total edentulous individuals with loss of OLD. In addition, they aimed to search for a possible association between TMD and OLD loss<sup>27</sup>. This study concluded that the loss of vertical occlusion on its own is not responsible for the temporomandibular joint dysfunction observed in patients with prostheses with reduced vertical height, since there was no statistically significant correlation between TMD and loss of OLD<sup>26</sup>.

In addition, changes in OLD can cause changes in head and neck posture, leading to a disturbance in body posture control, which can affect gait stability and make it difficult to maintain body balance<sup>7;28</sup>.

To determine if there was an alteration in the OLD, some points should be observed, if there was loss of posterior restraint; the speed of tooth wear, because if the wear is slow, there may be compensation for tooth eruption, but if it is fast, as in bruxism, there may be a change in the OLD; phonetic assessment with the use of sibilant sounds; at an interocclusal distance by marking two points, one on the nose and the other on the chin; facial appearance<sup>29;25</sup>. To evaluate these points, several methods have been proposed over the years<sup>5</sup>, the most commonly being the facial proportions, phonetic and metric methods.



#### 4 CONCLUSION

The key to the success of prosthetic rehabilitation treatment lies in the reestablishment of functional and aesthetic parameters that have somehow been altered or lost during the course of the individual's life. Among the parameters that need to be reestablished, vertical occlusion dimension (OLD) is one of the main determinants of rehabilitation treatment, both from a functional and aesthetic point of view. According to the reviewed articles, we can infer that the reestablishment of the OLD is of paramount importance for the success of oral rehabilitation and that if the OLD is not reestablished correctly, remaining increased or decreased, damage may occur in the teeth, muscles, TMJ, swallowing, phonation, auditory system, aesthetics and even in the patient's posture, affecting their balance.



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