Loss of the Vertical Dimension of Occlusion and Its Management Implications

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The Nature of the Vertical Dimension of Occlusion

The vertical dimension of occlusion (VDO) embodies in its name quantitative properties that belie its largely qualitative features at a clinical level. Its precept is that the VDO, which is essentially the distance between fixed points on the mandible and maxilla, may be accurately determined in the clinic and that its value has diagnostic validity. Unfortunately, such measurements are difficult to make and there are poor population data on the VDO and its clinical significance. The dental clinician therefore tends to consider not only the VDO but also the rest vertical dimension (RVD) and the interocclusal rest space, and to do so almost invariably in a largely subjective manner.

The VDO is determined by maxillary and mandibular growth, alveolar bone formation, and eruption of the dentition.¹ It may also be affected by tooth wear or therapeutic interventions designed to increase the effective height of the crowns of the teeth. Tooth eruption has been classified as being due to periodontal growth and active and passive eruption, although the latter is not associated with changes in the VDO unless it results in the tipping or loss of the affected tooth.

Clinical measurement of the VDO and RVD is difficult due to the mobility of the soft tissues overlying the jaws and the less-than-ideal instrumentation that is available for making these measurements,² placing considerable importance on the clinician's subjective assessment. A further problem is that the rest position of the mandible is highly variable, being influenced by many systemic and local factors including speech, emotion, jaw relationships, alveolar resorption, body position, some types of prescription and recreational drugs, and loss of natural tooth contacts. It has therefore been recommended that evaluation of the VDO should not be confined to a single technique or consideration.

Does the VDO Change?

Growth of the jaws has a major impact on the VDO, including growth of alveolar bone, which continues in later life. Tallgren³ has reported on the changes in the height of the lower third of the adult face as a result of aging, tooth wear, and the loss of teeth. It has also been suggested that growth of alveolar bone may result in the VDO remaining relatively constant or even increasing despite tooth surface loss (TSL), and proposed that the effects of TSL will depend on the relative balance between wear and compensatory growth. Where the latter is insufficient to compensate for TSL, the interocclusal rest space would increase, while in the opposite situation there would tend to be an increase in the VDO.⁴

TSL is a normal process unless it is prejudicing tooth survival or is of concern to the patient when it is classified as being pathologic. It is, however, a major cause of reduction in the VDO. TSL is caused by erosion, abrasion, and attrition, and while each of these may occur in isolation, more than one is usually involved (with erosion being the predominant factor).⁵ This is associated with an acidic diet, regurgitation, and some occupations.

Modifying the VDO

The VDO may be increased using both removable and fixed restorations supported by the teeth or dental implants, although fixed appliances tend to be better tolerated. The reasons for increasing the VDO are usually to improve the patient's facial appearance, to reduce the loss of further tooth tissue, and to improve masticatory function. It has been suggested that when a patient has a low Frankfort-mandibular angle, they are likely to have poor tolerance of an increased VDO and more extensive molar wear leading to an increased overbite and eventually, an edge-to-edge incisor relationship. In addition, active treatment is likely to require more complex intervention.

Before altering the VDO it is important to evaluate loss of molar support, the patient's phonetics, the interocclusal rest space, the contours of the facial soft tissues, and to thoroughly explore the possible causes of the condition. While significant reductions in the VDO are relatively easy to diagnose, more subtle changes are harder to recognize. Their causes, possible effects, and management become more challenging to pinpoint, often being multifaceted and based frequently on both objective and subjective criteria.

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Has the Predictability of "Osseointegration" Eclipsed That of Advanced Periodontal Treatment?

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The long-term outcome of dental prostheses is dependent on the continuing integrity of the supporting structures, be they teeth, implants, or tissues. The challenge for the clinician is to predict this outcome on an individual patient basis. However, this is just one of several patient, prosthesis, and operator parameters that will determine the overall success of the treatment.

Up to 12% of the general population are susceptible to a moderate or severe form of periodontal disease requiring advanced periodontal treatment (initial and ongoing). Many of these patients with a preference for a fixed prosthesis to replace lost teeth have potential abutments that have compromised periodontal support. Following the introduction of implant dentistry, "heroic" efforts to save these teeth are no longer considered appropriate. They are now often extracted and replaced with implants. This changed paradigm has resulted in less periodontally compromised abutments being used and an improved 5- to 10-year outcome of tooth-supported fixed dental prostheses (FDPs).¹

However, conclusions from recent systematic reviews are confusing for the clinician. Oral implants, when evaluated after 10 years of service, do not surpass the longevity of compromised but successfully treated natural teeth²; the outcome of FDP tooth abutments with severely reduced but healthy periodontal support compares favorably with periodontally intact abutments.³

The dilemma then becomes, what is the predictability of the success of advanced periodontal treatment and how does it compare with the predictability of osseointegration over the long term?

Predictability of Advanced Periodontal Treatment

The outcome of advanced periodontal therapy measured by the number of lost teeth in 600 periodontal patients over a minimum treatment time of 15 years (median treatment time: 20 years) was reported.⁴ At initial presentation, 16.5% were classified as moderate in severity (pocket depths 4 to 7 mm) and 76.5% as advanced in severity (pocket depths > 7 mm). Although only 12.6% of patients lost 4 to 9 teeth and 4.2% lost 10 to 23 teeth, the predictability of this response to therapy was poor. This "disconnect" between the predictability of the prognosis and the actual outcome has been confirmed, and other than loss of first molars at presentation, no other clinical or genetic predictability factor has been identified.

Advanced periodontal therapy involves considerable costs (eg, financial, esthetic, comfort, morbidity). The favorable outcome of periodontally compromised teeth reported in systematic reviews^{2,3} was contingent on highly motivated patients willing to participate in an accepted protocol of "supportive periodontal therapy" involving efficient oral hygiene, regular professional prophylaxis and review, and where indicated, followup surgical debridement and pocket reduction procedures. It has also been argued that retaining peridontally compromised teeth over an extended period to ascertain their long-term prognosis will subsequently complicate implant placement because of a deficiency in bone quantity.

Thus, advanced periodontal therapy can be successful in the majority of susceptible and highly motivated patients, especially in regions involving singlerooted teeth. However, this outcome is not predictable at initial presentation (Figs 1 to 3). Copyright of International Journal of Prosthodontics is the property of Quintessence Publishing Company Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.