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Methods to Determine Vertical Jaw Relation- Review

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ABSTRACT

Management of worn dentition using fixed or removable prostheses is complex and among the most difficult cases to restore. Evaluation of vertical dimension is important for the management, and comprehensive treatment plan is required for all cases. Articulated casts and diagnostic wax-up provide a important information which and helpful for the evaluation of treatment options. Minimal changes to vertical dimension of occlusion is usually confirmed with the clinical evaluation of the patient using diagnostic splint or provisional prosthesis. Nevertheless, occlusal wear of prosthetic teeth is a normal process during the lifetime of a denture. In this line, vertical dimension(VD) assessment should be conservative and with careful approach and it should not be changed. Particularly, increasing the VD for bruxism patients puts a severe overload on the teeth and it often results in the destruction of the restorations.

Keywords: vertical dimension, Bruxism patients

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INTRODUCTION

It is common to find that the mandibular postural position can vary from day to day and even within the same day so that there is no specific measure that will accurately give this relationship. Many techniques have been used to estimate this position particularly in edentulous patients and include functional assays such as speech patterns and swallowing techniques. Techniques that use electrical stimulation over the right and left sides of the face have been shown to only stimulate the superficial masseter muscle and do not simulate the postural position of the mandible.

Muscular forces from the jaw muscles and to a lesser extent, tongue muscles, facial muscles, and passive elastic properties of the soft tissues establish a vertical dimension of occlusion in a patient with a normal dentition. The fact that vertical dimension of occlusion does not change significantly in the adult suggests that equilibrium is established between the hard (teeth, alveolus, and compact bone) and soft tissues (jaw muscles, tongue muscles, facial muscles, and connective tissue).

Any disruption of these components will affect the balance of the forces, and change will occur in the form of bony remodelling and or soft tissue adaptation. Over the years, a lot of effort has gone into establishing and improving the ideal technique for determining the vertical dimension. This review presents the currently prevalent techniques of recording the vertical dimension, with their pros and cons, so that it can serve as a guide to clinicians.

RECORDING THE VERTICAL DIMENSION OF OCCLUSION:

Using physiologic rest position as a guide to record the vertical dimension of occlusion:

Thompson related the variations in rest position to hypo or hyper tonicity of the musculature and he described short and long term variations. Tallgren concluded that the VDR position adapted to changes in the VDO in both dentulous and edentulous patients. Atwood contended that rest position is a dynamic rather than a static concepts and that it varies from person to person and within each person and within each person.

He stated that the vertical zone of suppressed electromographic activity found by Jarabak supported this concept of a postural range. Atwood suggested that a cinefluoroscopy technique coupled with electronics could provide a better insight into the variability of rest position.

Coccaro tested the accuracy of three methods in establishing the vertical dimension of rest position using cephalometric on people with normal dentitions. Cephalometric radiographs showed no significant statistical difference when comparing with these three methods.

Carlsson and Ericson found that phonetic method produced a greater vertical distance reading than did the relaxation method. Atwood used combination of swallowing and phonetics in

cephalometric studies of rest position. He finally judged relaxation by facial expression. Relaxation is essential in all of these techniques.

Tactile sense in establishing vertical dimension:

In tactile sense, the patient is supposed to recognize when he has reached the degree of jaw opening which was attained when the natural teeth were present. Lyte and Timmer have adopted a more refined technique using a central bearing device fixed to upper and lower occlusion rims. McGee stated that, methods upon which the patient's muscular perception transferring the vertical occlusal dimension from the dentist to the patient, he found that patients tended to register a reduced vertical dimension of occlusion because they felt more comfortable in that position.

Measurement of closing forces to establish vertical dimension:

This theory is based on the premise that maximum closing forces can be exerted when the mandible is at the vertical dimension at rest position. A force meter is attached to upper and lower base plates and registers. The pressure that patient can exert as the vertical dimension is varied. Smith stated that the boos biometer was the best approach to a simple reliable device for determining the vertical dimension of rest position.

Phonetics in establishing the occlusal vertical dimension:

This theory is dependent upon a correlating during speech of the interocclusal distances, the position of the occlusal plane, and the position of the tongue relative to the occlusion rims or teeth. The most popular sound used as an aid in determine rest position is the labial 'M' sound which can be said without the use of teeth.

Phonetics used before occlusion is developed:

When the vertical dimension of rest position has been measured between the triangles of tape on the face, the occlusion rims are built up until the vertical dimension of occlusion equals this measurements, methods used to guide the mandible into rest position vary. Some dentists prefer the 'M' sound in conjunction with complete relaxation. Ismail and George concluded that this method is questionable since the vertical dimension of rest position adapts itself to the vertical dimension of occlusion.

Facial dimensions in establishing vertical dimension:

Ivy, Bowman and Chick mentioned the use of facial measurements to determine vertical dimension for the edentulous patient. However, Willis has been given the credit for popularizing these measurements. Good friend suggested that distance from the pupil of the eye to the junction of the lips equalled that from the sub nasion to the gnathion. Harvey conducted a survey of the willis measurement on 100 young men with natural teeth. He found that upper and lower

measurements corresponded in only 27 per cent of the subjects. Bowman and chick, in a survey of 133 subjects with natural teeth, found that the measurements corresponded in only 9 percent, most of these being patients with class 1 jaw relationship. The facial measurements proposed by McGee have the support of Harvey, Pound, and Paquette. McGee correlated the known vertical dimension of occlusion with three facial measurements which he claimed remain content throughout life.

Phonetics used to establish the closest speaking space:

Silverman maintains that it is easier and more accurate method to record a measurement which relies upon muscular phonetic enunciation when the patient loses voluntary muscular control of the mandible than to record a measurement which relies upon relaxation. Thus he records the closest speaking space before the teeth are extracted. The patient is seated upright with the plane of occlusion parallel to the floor. With an upper incisal edge as a guide, a pencil line is drawn on a lower incisor when the teeth are in centric occlusion. Then, a second line is drawn above the other after the patient has said 'S', 'YESS' repeatedly. The closest speaking space is the distance between these lines. This space should be same at the try in when it is again checked phonetically and the vertical dimension of occlusion adjusted if necessary.

Deglutition in establishing vertical dimension:

Shanahan indicated that the mandibular pattern of mandible during deglutition is the same for the edentulous infant as it is for edentulous adult. He maintained that eruption of teeth is held at the occlusal plane by the act of swallowing which establishes the vertical dimension of occlusion. when constructing complete dentures, the advantages of the swallowing technique believed that soft wax on the occlusion rim is reduced during deglutition to give the correct vertical dimension of occlusion.

Ismail and George checked the swallowing method by using cephalometric radiographs to record the vertical dimension of occlusion before the teeth were extracted and after dentures were inserted. The swallowing technique produced an increase of up to 5 mm in the vertical dimension of occlusion in the edentulous group. He found that the increase was directly proportional to the number of missing posterior teeth prior to extraction of teeth.

Esthetic appearance in establishing vertical dimension:

The estimation of vertical dimension by appearance is based upon the esthetic harmony of the lower third of the face relative to the rest of the face, upon the contour of the lips and the appearance of the skin from the margin of the lower lip to the lower border of the chin, and upon the labio-mental angle. With the lips in contact, the elevation of mandible and the compression of

the lips should be just discernible on mandibular closing from rest position to the vertical dimension of occlusion.

This guide applies to normal young patients or middle aged patients with good tonus of the skin. Difficulties arise when the tonus of the skin is poor, when resorbed denture-bearing tissue preclude full restoration of the contour of the lip, in “mouth breathing” patients and in those patients described by Ballard with varying degrees of incompetent lip morphology. Under these conditions, different techniques for establishing the vertical dimension of occlusion must be used.

Open-rest method in establishing vertical dimension:

Douglas and maritato described the open-rest method of establishing the vertical dimension of occlusion. open rest position is an unstrained mouth-breathing position. the lips are slightly parted to permit observation of mesial marginal ridges of the upper and the lower posterior occlusal plane related to the corner of the mouth. Pre-extraction cephalometric radiographs of 20 patients made with the mandible in the open rest position indicated that the upper occlusion rim should be 3mm above the corner of the mouth in the premolar region and that the occlusal plane of the lower rim should be 2mm below the corner of the mouth. The authors claim that this method is more accurate than a previous study using rest position, tactile sense, and swallowing methods to determine the vertical dimension of occlusion.¹

CONCLUSION:

By considering the above review, it is apparent that we have reached a good accuracy in determining the vertical dimension for prosthodontics. But, it should be held in mind that no technique is universally acceptable due to wide clinical variations in patients. Hence, upto 3 techniques should be used to verify the initially determined value. Of these most easy to use and reasonably accurate is the phonetic method. This can be supplemented with esthetic and deglutition methods. In patients with other medical complications where these techniques cannot be used, physiologic rest position can be used to determine the vertical dimension.

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