DETERMINATION OF RELATION BETWEEN THE VERTICAL DIMENSION OF OCCLUSION AND RIGHT HAND LITTLE FINGER

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Abstract

Background Determination of the VDO is one of the most important steps in making complete denture. Objectives The present study evaluates the relation between vertical dimension of occlusion, and the length of the little finger of right hand. Material and Methods A cross-sectional study was conducted on 200 dentate subjects selected both males and females were involved in the study. Measurements of the vertical dimension of occlusion were recorded clinically using modified digital vernier caliper, with the person is seated correctly on the dental chair in an upright position; and instructed to close his teeth in centric occlusion. The length of the little finger of the right hand was measured from tip of finger to the farther most point on palmer digital crease. The measurements were taken with the hand straight, flat and supine position, Results showed that the vertical dimension of occlusion was significantly and positively correlated with the length of the little fingers, in females more compatible than males. Conclusion Since the variations between the vertical dimension of occlusion and the length of little finger are within the range of 1mm for females and 2mm for males respectively. As a conclusion of the present study vertical dimension of occlusion prediction through this method is reliable, and reproducible. Also the method is simple, economic, and non-invasive; hence, it could be recommended for everyday practice.

Key words Dento-facial, right small finger, V.D.O., complete denture measurement

Introduction

The vertical dimension of occlusion defined VDO as a distance measured between two points when the occluding members are in contact, while vertical dimension of rest VDR is defined as the distance between two selected points measured when the mandible is in the rest physiologic position (Glossary of Prosthodontics terms 2005). Determination of the VDO is one of the most important steps in making complete
denture (Thompson, 1942). To maintain a harmonious craniofacial system, the dental practitioner must establish an appropriate occlusal vertical dimension (OVD). Several methods can be used to determine an appropriate OVD. The patient presenting with decreased OVD represents a particular challenge for the dental practitioner in fabricating conventional dentures (Mays, 2003). Are some of the techniques utilized for determining occlusal vertical dimension (Millet et al. 2010). Many methods have been proposed to determine occlusal vertical dimension that include measuring vertical dimension at rest, (Silverman, 1953) phonetic method. (Pyott, 1954) Cephalometric radiographs, (Turner, 1969) pre-extraction records (Jackson, 2008). The determination of an acceptable VDO for an edentulous patient is even more dependent upon clinical judgment, and upon the skill and experience of the dentist (Unger, 1990). The VDO play multiple essential roles, which are functional, esthetic, physiological, and psychological roles (McCord and Grant, 2000). Unfortunately there is no one precise scientific method for determining VDO (Millet et. al. 2010). Silverman reported consistent results in measuring VDO by phonetic methods, in patients with class I jaw relationships. Also believed that the exact measurement of the natural VDO is most essential in the successful practice of many phases of dentistry (Silverman, 1953). It has been believed that the greatest cause of full denture difficulties is the failure to duplicate the normal VDO. In occlusal reconstruction, many clinicians have found, through experience that increasing the VDO for patients with supposedly shortened VDO ended in failure. The dental profession realizes that it has never had an accurate, scientific, and practical method with which to measure the patient’s natural VDO it has been reported that the use of the speaking method to measure a patient’s VDO before the loss of the remaining natural teeth, and to record this in term of millimeters, and to reproduce this measurement in complete denture after tooth extraction. Researchers found that physiologic rest position was not consistent even in the same patients, and may not constitute a reliable reference position for assessment of VDO (Fayz and Eslami, 1988). The terminology of the initial report has been simplified to describe the same method of measuring VDO (Meyer Silverman, and Washington, 2001). The Willis device is designed to measure the distance from the lower border of the septum of the nose to the lower border of the chin and the distance from the outer canthus of the eye to the corner of the lip with the teeth in occlusion, and these measurements was equal to each other (Greets, 2004). This study was designed to assess the possibility of any correlation between VDO and length of fingers in Kurdish population so that it can serve as a simple and precise method for estimating VDO. Recording the correct vertical jaw relation is believed to be an elusive step, but its significance can’t be overlooked if optimum function and aesthetics were to be achieved. It is the
responsibility of the dentist to establish an appropriate lower facial height when lost, which should be within the range of patient›s adaptability and acceptability. If VDO is increased or decreased, it would end up deteriorating the existing patient›s condition instead of improving it. Although Prosthodontics as a whole has progressed leaps and bounds with a variety of techniques being proposed and practiced for the evaluation of VDO none of them is scientifically more accurate than other. Each method advocated has its own limitations. They are either tedious, time consuming, require special instrument/equipment, or expose patients to radiation (Turrell A. 2006).

**Patients and Methods**

Before commencing the study, clearance from the Ethical Committee was acquired. Before starting the study, subjects were given detailed information about the procedure, and those willing to participate were included in the study. This study was conducted on 200 physically healthy dentate subjects both males and females with the age range of 20 to 30 years having no deformity of little fingers of the right hand were selected from the among students of dentistry college of Sulaimani university, the following information›s were collected; name, age, gender, chin nose distance, length of little finger. All the participants should have class I centric jaw relationship, periodontally sound teeth in both jaws. But subjects with the following conditions Open bite or deep bite cases, Teeth anomalies, attrition, extensive prosthesis or restorations in the oral cavity, Temporomandibular joint disorders., history of trauma, and Orthodontic treatment or orthognathic surgery were excluded from the study. Anthropometric measurements of chin-nose distance VDO and the length of the little finger of the right hand were recorded clinically in millimeters using a digital vernier caliper with an accuracy of ±0.01 mm. To record VDO, the subjects were instructed to bite lightly on the posterior teeth with lips in repose, head well stabilized and in upright position of the head where the mandible became in parallel to floor. The lower tip of caliper was placed firmly on the tip of the chin (mental protuberance). Now the upper tip of caliper lightly touched the base of nasal septum as seen in figure 1 and the measurement was made.
Figure 1: Measurement of the chin-nose distance (VDO).

Before measurement was done, the patient should be comfortable with lips in repose and should not exhibit any facial strain. Length of the little finger of the right hand (LFRH) was measured from the tip of the little finger to the farthest point on palmer digital crease figure 3. The measurements were taken with the hand straight and flat and supine position. While taking on finger measurements must be sure that nail of the subject was trimmed.

Figure 2: Measurement of little finger of right hand.

Similarly, readings were taken by following the above-mentioned procedure for all the remaining 200 subjects. These readings were used as data to calculate. The mean, standard deviation (SD) and standard error for all the parameters. In order to calculate these data’s to estimate VDO Statistical Package for Social Sciences (SPSS) Software (V-20) and Pearson’s correlation test were used to find the relation between
the VDO and the length of little finger of right hand at a significant level of \( P \) value of 0.05%.

**Results**
Descriptive statistics in table 1 shows the various measurements were statistically analyzed, in order to assess and analyze the results. The mean and standard deviation of all measurement recorded in the present study for all 200 cases (126 male and 74 female) as shown in table 1.

Table 1: The mean and standard deviation of all precipitants.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Chin-Nose distance (mm.)</th>
<th>Length of little finger of the right hand LFRH(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>66.17</td>
<td>64.71</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>6.23</td>
<td>5.29</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

**Frequency**
Table (2) shows the mean of sample cases (according to gender) for the chin-nose distance (vertical dimension of occlusion), and length of the little finger of the right hand. Table (3) shows the correlation between chin-nose distance to little finger of the right hand among male and female precipitants.

Table 2: Mean of precipitants according to the gender.

<table>
<thead>
<tr>
<th>No.</th>
<th>Cases</th>
<th>Chin -Nose distance (mm)</th>
<th>Length of little finger of the right hand LFRH(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All</td>
<td>66.17</td>
<td>64.71</td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>68.63</td>
<td>66.84</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>61.97</td>
<td>61.07</td>
</tr>
</tbody>
</table>
Table 3: Paired Samples Test (Paired differences).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean</th>
<th>Std. Deviation (mm)</th>
<th>Std. Error Mean (mm)</th>
<th>95% Confidence Interval of the Difference Lower</th>
<th>upper</th>
<th>T</th>
<th>def.</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDO - little finger</td>
<td>Male</td>
<td>1.79</td>
<td>6.55</td>
<td>0.58</td>
<td>0.63</td>
<td>2.94</td>
<td>3.06</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0.90</td>
<td>5.50</td>
<td>0.63</td>
<td>-0.36</td>
<td>2.18</td>
<td>1.41</td>
<td>73</td>
</tr>
</tbody>
</table>

Table 4: One-Sample Test of the male and female precipitants measurements.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Test Value = 67.59mm</th>
<th>T</th>
<th>def.</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference (mm)</th>
<th>95% Confidence Interval of the Difference (mm)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDO</td>
<td>Male</td>
<td>2.089</td>
<td>125</td>
<td>0.039</td>
<td>1.043</td>
<td>0.054</td>
<td>2.031</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.000</td>
<td>73</td>
<td>0.049</td>
<td>1.134</td>
<td>0.003</td>
<td>2.265</td>
<td></td>
</tr>
<tr>
<td>LFRH</td>
<td>Male</td>
<td>1.993</td>
<td>125</td>
<td>0.048</td>
<td>0.752</td>
<td>0.005</td>
<td>1.500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.013</td>
<td>73</td>
<td>0.048</td>
<td>1.148</td>
<td>0.011</td>
<td>2.284</td>
<td></td>
</tr>
</tbody>
</table>
Table 5: One-sample test and statistics of male and female.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Mean Difference</th>
<th>P-value</th>
<th>Std. deviation (mm)</th>
<th>Std. error mean (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chin - nose distance</td>
<td>Male</td>
<td>12</td>
<td>68.63</td>
<td>1.043</td>
<td>0.039</td>
<td>5.604</td>
<td>0.499</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>74</td>
<td>61.97</td>
<td>1.134</td>
<td>0.049</td>
<td>4.879</td>
<td>0.567</td>
</tr>
<tr>
<td>LFRH</td>
<td>Male</td>
<td>12</td>
<td>66.84</td>
<td>0.752</td>
<td>0.048</td>
<td>4.240</td>
<td>0.377</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>74</td>
<td>61.07</td>
<td>1.148</td>
<td>0.048</td>
<td>4.906</td>
<td>0.570</td>
</tr>
</tbody>
</table>

From the observation of the above tables, results revealed that there was a statistically significant relation between the recorded measurements both in males and females precipitants which of P<0.05, especially in tables 5, because approximately they are the summation of the whole above table. Descriptive statistics of the parameters studied were presented in Table 5; it was observed that, in males the mean value of chin-nose distance (VDO) was 68.63 mm, whereas in females, the mean value was 61.97 mm. Thus, VDO is more in males compared to females. In males, the mean value of length of the little finger was 66.84 mm whereas in females, the mean value was 61.07 mm. Thus males had longer little finger as compared to females. So in a simple equation the vertical dimension of occlusion in this study is determined by:

**In males**

Chin- nose distance - length of little finger
68.63 mm – 66.84 mm = 1.79mm ~ 2.0mm
So for determination of the VDO in male equal to length of the little finger + 2 mm
VDO = LFRH + 2

**In females**

Chin- nose distance - length of little finger
61.97 mm - 61.07 mm = 0.9 mm ~ 1 mm
So for determination of the VDO
In female equal to the length of the little finger + 1 mm
VDO = LFRH + 1
Discussion
Losing teeth and acquiring an artificial prosthesis is not a pleasurable event for any individual. Nevertheless, the agony of the patient can be lessened to some extent by providing a prosthesis which restores the original facial appearance and functions akin to natural teeth. Unquestionably, establishing a correct VDO of the face is one of the important factors to be considered in accomplishing this objective. Literature review depicted that many methods have been described and used by professionals over the years for the purpose of VDO determination, but none of them is fully accepted or considered completely correct. When selecting a method, the following criteria have been recommended: accuracy and reliability of the measurement, adaptability of the technique, type and complexity of equipment needed, cost, and the length of the required to make measurement (Basker and Davenport, 2002). To overcome these difficulties, this study was undertaken to find a simple yet feasible method by studying the relationship between VDO and the length of the little finger of the right hand. And this study showed that the length of the little finger is nearer to the mean of chin - nose distance, and also showed that there is a positive correlation between these two measurements P <0.05 (Table 3 and 4) this agree with The studies conducted by Bhandari et al (Bhandari et al. 2012) have revealed a positive correlation between VDO and length of little finger in both males and females. In a similar study conducted by (Ladda et al. 2013) a positive correlation has been found between VDO had length of index finger in males and that of little finger in females. Abdul-Rassul, 2007 found that The ear-eye (right & left) and chin-nose distance were measured; the results revealed that there is a positive correlation between these measurements; also this study showed that this facial measurement may be used for clinical assessment of occlusal vertical dimension (Abdul-Rassol, 2007). The results supported the research hypothesis that there would be a significant relationship between the VDO and the length of right hand little fingers. The study revealed a sexual dimorphism with higher values for VDO the length of little finger of the right hand in males compared to females. Sexual dimorphism in finger length is related to post-puberty levels of androgen exposure (Thompson, 1942). Also measurements of only right hand fingers were recorded. This will not create any bias because it is a known fact that physiologically human body maintains symmetry. This result is in agreement with that of (Danborno et. el. 2009) found no differences in the length of fingers of both hands. This method is an attractive and practical because it requires no radiographs or sophisticated measuring devices and provides reproducible values for future reference. Besides it may reduce time-consuming process and experience. Another advantage is to connect to some previous methods. The limitation of the study was
that it was restricted to the subjects with class I malocclusion and other skeletal or dental malocclusions were not considered. Also the subjects were might not categorized based on facial forms. Furthermore, the measurement is difficult to record when a patient has a round facial profile with excessive soft tissue bulk under the chin. To authenticate these findings further studies should be carried out comprising of a broad clinical research program that would include the similar analysis for edentulous population in other ethnic groups and then appropriate regression equations may be constructed which can be accepted universally. However, the operator should keep in mind that VDO is the result of a musculoskeletal balance. The correct VDO can be better described as a range instead of as a fixed point. Therefore, in order to evaluate the VDO, a pluralistic method should be adopted at all the stages of rehabilitation to maximize the benefits and minimize damage to the stomatognathic system.

**Conclusion**
Measurement of the right hand of little finger has been considered as a method of recording VDO may provide a better parameter for both males and females. So the VDO prediction through this method is hence, it could be recommended for everyone. And the results not affected by the study being done with Kurdish people.

**References**


Greets G.A., » Comparison of the accuracy of two methods used by pre-doctoral students to measure vertical dimension» Journal of Prosthetic Dentistry, Vol.91, pp. 59-


