Correlation between vertical dimension of occlusion and length of fingers in dentate subjects.

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ABSTRACT:

Objective: To determine whether there is a correlation between finger length and the vertical dimension of occlusion in dentate individuals attending the prosthodontics department at Muhammad Dental College, Mirpurkhas.

Methodology: During this cross-sectional study 2023-2024, 218 patients with crown & bridge were included. Clinical anthropometric measures were taken. The subjects received instructions to softly bite on their back teeth, keep their lips in passive contact, and keep their heads well-stabilized in order to retrieve the VDO. A Vernier caliper was then used to measure the distance. Each parameter was measured three times and average value was recorded.

Results: Average age of the patients was 25.39±2.58 years. The parameters for index finger length (r=0.669; p=0.0005), little finger length (r=0.666; p=0.0005), and the length of the tip of the thumb and the index finger (r =0.663; p=0.0005) had the highest correlations with VDO.

Conclusion: It is concluded that this procedure is simple, cost-effective, and non-invasive, therefore it might be used in routine practice to ascertain the vertical dimension of occlusion.

Keywords: Dentistry practice, Vertical dimension of occlusion, Prosthodontic therapy

Dentistry practice necessitates expertise in a variety of fields, when considering oral rehabilitation efforts, one of the first characteristics to be defined is the vertical dimension of occlusion (VDO).[1] The distance between two easily distinguished or specified anatomical locations [typically, one is on the chin and the other is on the tip of the nose], one of them is on a fixed and one on a moveable part, is the vertical dimension.[2] For prosthodontic treatment to be successful, the vertical jaw relation is critical.[3] A key component for constructing a complete denture involves determining the proper vertical jaw relation measurements.[4] One of the main purposes of aesthetic dentures is to restore an appealing appearance.[5] When lost, the dentist is responsible for establishing a suitable lower facial height. If not corrected properly than causes angular cheilitis,[1] reduce efficiency of muscle of mastication, premature wrinkles,[6] presenile appearance[7] and temporomandibular joint disorders[8] while increased VDO causes trauma due premature tooth contacts[8], clicking of teeth, elongation of face and resorption of alveolar ridge.[6] Many techniques have been developed to correlate VDO with different measurement/ methods like included closest speaking space, lingual frenal attachment,[9] vertical height of ear, vertical length of nose at mid line,[2] distance from hair line to center of eye brow[4] but none of the strategies have been demonstrated to be more scientifically valid than the others and each strategy has its own drawbacks.[6]

A published study reported that the index finger length was correlated with VDO the most substantially in males (r=0.74). The parameter-little finger length had the highest association of VDO in females. (r=0.82).[10] The subsequent study shows that there was a stronger association (r = 0.57) between little finger length and VDO in males. The connection among VDO and little finger length of females was substantial (r = 0.51).[4]

The rationale of this investigation is to determine and access the potential for an association among VDO and anthropometric measurements of index finger, little finger, and the distance between the tip of thumb and index finger (when thumb and index finger adducted). The study results helped professionals determine the proper VDO in treating patients who needed restorations like complete dentures. These methods are easy, inexpensive and these values was helpful for general dentist who can easily implement without using any complicated instruments.

Objective:

To determine whether there is a correlation between finger length and the vertical dimension of occlusion in dentate individuals attending the prosthodontics department at Muhammad Dental College, Mirpurkhas.

Methodology:

This study was conducted at Department of Prosthodontics Muhammad Dental College, Mirpurkhas. Sample size was calculated using Epitools (https://epitools.ausvet.com.au/samplesize) online sample size calculator using following values.

Correlation =0.385 (VDO estimation for length of index finger[11], Confidence Interval= 95%, power of the test=90% Total sample size calculated was 218. Sample achieved through

non-probability consecutive sampling technique. Participants were enrolled for the study after taking informed consent. Using a modified digital Vernier caliper having 0.01 mm precision, VDO anthropometric measures, index and little fingers length of the right hand, as well as distance from the tip of the thumb to the tip of the index finger recorded in millimeters.

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Patients were given instructions to softly bite on their molars, keep their lips in passive contact, along with it maintain their heads properly stabilized in order to record VDO. To enable an accurate position in vertical planes without placing the participants through any discomfort, we redesigned the tip of the digital Vernier caliper for measuring VDO. Firmly placing the lower modified extended tip of the caliper on the skin beneath the chin allowed the soft tissues to be compressed, bringing the caliper as closely as feasible to the lower border of the mandible. Thereafter the measurement was taken by raising the top point of the caliper till the tip of the nasal septum was just barely touched. With a digital caliper, the length of the right index finger was analysed on the palmar aspect from the tip of the finger to the closest point on the crease of palmar digital. The right little finger's length was additionally calculated between fingertip and the farthest point of the palmar digital crease. Straight and flat hands were employed to obtain the measurements. subsequently, respondents were instructed to position their right hand in pronation, securely over a flat object in order to measure the distance between the tips of the thumb and index finger. By the assistance of a metal ruler and marker pen, a point that approximated the tip of the thumb was inscribed on the index finger. Utilizing a digital Vernier caliper, the space was subsequently measured. It was ensured that the individuals' nails were clipped while obtaining all of these finger measurements. Each parameter was measured three times and average value was recorded. Data was analyzed by SPSS version 20. The quantitative variables like age, VDO, index finger length, little finger length along with the space between the thumb and index finger tip was presented as mean & standard deviation. Qualitative variables such as gender was reported in Frequency and percentages. Pearson's correlation coefficient was applied to identify the relation between lengths of fingers with VDO. Pearson's correlation length of fingers with vertical dimension of occlusion was applied according to age and gender. For significance, P-value ≤0.05 was used.

Results:

Total 218 patients with crown & bridge for aesthetics purpose were included in this study. Average age of the patients was 25.39±2.58 years. Mean VOD and Index finger length, little finger length along with distance between thumb and index finger tip is reported in table 1. The parameters for the index finger length (r=0.669; p=0.0005), the length of the little finger (r=0.666; p=0.0005), and the space between the index finger and the tip of the thumb (r =0.663; p=0.0005) suggested a strong correlation with VDO as presented in Figure 1, 2 and 3 respectively.

Table No 1. Length and vertical dimension of occlusion of dentate patients.

Variables	Mean ± SD	95% Confidence Interval for Mean	
		Lower Bound	Upper Bound
Vertical dimension of occlusion	53.54 ±12.88	51.82	55.26
Length of Index Finger	42.59 ±16.51	40.39	44.80
Length of Little Finger	42.59 ±16.51	40.39	44.80
Distance between index finger and tip of thumb	61.69 ±18.62	59.20	64.17

Figure No 1. Correlation of length of index fingers and vertical dimension of occlusion in dentate subjects (n=218)

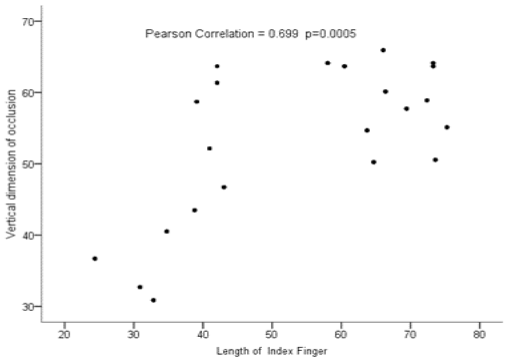


Figure No 2. Correlation of length of little fingers and vertical dimension of occlusion in Dentate subjects (n=218)

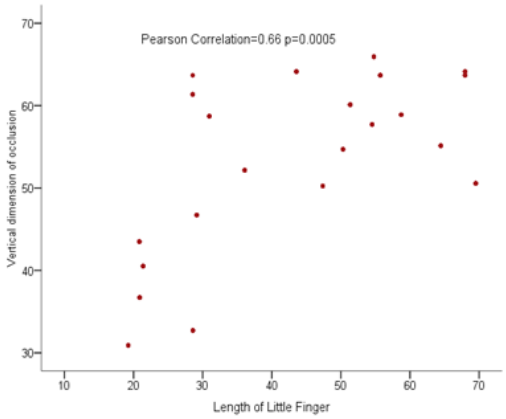
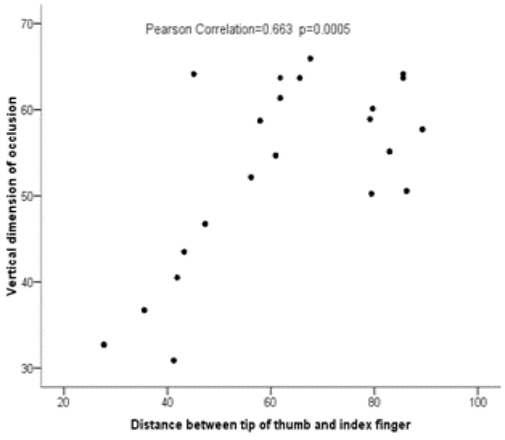


Figure No 3. Correlation of vertical dimension of occlusion and distance between index finger and tip of thumb in dentate subjects (n=218)



Discussion:

Dentists who provide care for edentulous patients must prioritize the assessment of the appropriate occlusal vertical dimension (OVD). Clinical judgment remains essential during the process of fabricating a complete denture. In the

absence of pre-extraction data, several methods have been proposed for establishing the occlusal vertical dimension (OVD), with some relying on the relationships and distances between specific anatomical landmarks. Oancea et al.[12] developed an equation applicable to individuals with measurements ranging from 37 to 59 mm, utilizing cephalometric analysis to estimate lower face height. However, due to the large number of variables in this equation, using it in a clinical environment is challenging. Kamboj et al.[13] identified significant variations in the accuracy of various commonly employed techniques for estimating the OVD, such as phonetics, tactile perception, and swallowing. Furthermore, because the mandible is a moveable bone and the rest position is prone to vary, the OVD calculated from the rest position is unreliable. Another approach for determining the OVD is the distance between the distal canthus of the eye and the tragus of the ear.[14] Nevertheless, measurement is challenging because of the proximity to an important organ (the eye). As opposed to jaw position, there is no temporal shift associated with adulthood, and no critical organs are in danger, finger length could therefore serve as a better adequate technique for determining the OVD. In this study average age of the patients was 25.39±2.58 years. There were 44.04% male and 55.96% female. Quite a few research investigated the association between finger length and OVD so far. In accordance with the study's findings, the OVD had a mean value of 53.54 ±12.88.

This is in agreement with the findings among Pakistani women[10] which revealed an average value of 56.70. In contrast Al-Dhaher et al,[15] reported average value of 65.27mm among Iraqi women; while Majeed[16] reported these values as 59.6 mm for Pakistani women, Miran[17] 61.97 mm for Kurdish women, and Alhajj[18] reported it 67 mm for Yemeni women. The differences in soft tissue characteristics and topographical features among these distinct groups may account for the discrepancies observed in these results.

Our study showed that association of VDO was significant for the parameter-index finger length (r=0.669; p=0.0005), little finger length (r=0.666 p=0.0005) and distance of index finger and tip of thumb (r =0.663; p=0.0005). According to one study, the association among VDO & the index finger's length of men was substantial (r=0.745). The parameter-little finger length & VDO connection in females was significant (r=0.819).[10] while the other study shows that the association involving VDO & little finger length among men was substantial (r = 0.375). The association involving VDO & little finger length was highest among females (r = 0.550).[4] The variance in length of finger across various ethnic groups may be the cause of this inconsistency.

In the Khan SA et al study, while comparing with Sn-Me, there was a greater association involving finger length and N-Gn.[19] The strongest association was that among N-Gn and 2D, subsequent to those with 4D and 5D. The means of these measures, nevertheless, showed a significant amount of variance. Statistically insignificant (p=0.054), the variance among 2D & N-Gn remained 0.79mm. This implies that the two measures are almost equivalent to one another, which further strengthens their link and strongly shows that 2D may be utilized for predicting actual OVD using N-Gn. Contrarily, there was a 3.02mm distance between 4D and N-Gn. Although this difference remained within the range of interdental distance that is considered standard (2-4mm), it was statistically significant. The disparities in measuring techniques, population ethnicities, and sample sizes analysed may be responsible for the variances in measurements documented in different research.

The use of this technique has numerous benefits. subsequently rather than using subjective criteria like patient's jaw at rest or how they swallow,[20] VDO calculation is based on objective measurements. Furthermore, the anticipated VDO ranges between 2-4 mm in contrast to alternate approaches, which yield an average of 0-14 mm.[21,22] Additional advantages include consistent data for future use and an easy procedure that exposes the patient to no radiation.[23]

Conclusion

Our study showed that correlation of VDO was significant for the parameter-index finger length, little finger length and distance between index finger and tip of thumb. Also, this technique is straightforward, cost-effective, and non-invasive; therefore, it might be used in regular practice to ascertain the vertical dimension of occlusion.

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