

Correlation between vertical dimension of occlusion and length of little finger

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Abstract

Vertical dimension of occlusion (VDO) is the distance between the two selected anatomic or marked points, one on a fixed point on the maxilla and one on a movable point on the mandibular member. Though various methods are advocated for its estimation, each has its own limitations. The purpose of this study was to estimate the VDO from the length of little finger. The study was conducted on 60 dentate subjects (30 males and 30 females) in the age range of 20 to 30 years, having no deformity of fingers. Measurements of vertical dimension of occlusion and length of little finger of right hand were recorded using a digital vernier caliper. Statistical analysis was done using paired 't' test and Pearson correlation. Results showed that the difference between VDO and length of little finger ranged from -3.73 to + 3.90 mm in males and - 3.07 to 3.13 mm in females respectively and the difference between mean values of VDO and length of little finger was 0.52 mm in males and -0.23 mm in females respectively. Hence VDO was found to be almost equal to the length of little finger in the study group. The study revealed that the little finger can be used for determination of VDO in males and females.

Key words : Little finger, Vertical dimension of occlusion, Anthropometric correlation.

Introduction

Glossary of Prosthodontic Terms defines vertical dimension as the distance between the two selected anatomic or marked points (usually one on the tip of the nose and the other upon the chin), one on a fixed point on the maxilla and another on a movable point on the mandibular member[1]. Recording of correct VDO is very important. Vertical dimension between the two selected points can be determined, either when the teeth are in maximum intercuspation that is vertical dimension of occlusion (VDO), or in the rest position of the mandible that is vertical dimension of rest (VDR)[2].

It is the responsibility of the dentist to establish an appropriate lower facial height when lost. A decrease in VDO, does not allow the muscles of mastication to function at their normal length with adequate force, resulting in reduction of their efficiency, premature wrinkles, deep nasolabial furrows and folds at the angles of the mouth leading to salivary retention causing angular cheilitis. If VDO is increased while fabricating a

complete denture, it will decrease the interocclusal rest space leading to discomfort, incomplete muscle contraction, unesthetic appearance due to elongation of face, clicking of teeth and resorption of alveolar ridge.

Frequently, difficulties are encountered in the determination of the correct VDO in complete denture patients. Many methods have been proposed to determine VDO that include the use of vertical dimension of rest (VDR), speaking method, cephalometric radiographs, pre-extraction records[3,4,5,6]. Though pre-extraction records are valuable for restoring the VDO, they may not be available always. Also, none of the methods has been shown to be scientifically more valid than the other and each method advocated has its own limitations. Hence this study was done to determine correlation between VDO and length of little finger in Indian population.

Materials and Methods

This study was conducted on 60 dentate subjects (30 males and 30 females) in the age range of 20 to 30 years having no deformity of fingers. Subjects were selected randomly from a Dental College and Hospital. All the participants had Class I jaw relationship with periodontally sound teeth in both jaws. Exclusion criteria included: Open bite or deep bite cases, missing teeth, attrition, restorations in the oral cavity,

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temporomandibular joint disorders, history of trauma, or orthodontic treatment.

Clearance from the Institutional Ethical committee was obtained. All subjects gave written informed consent. Anthropometric measurements of vertical dimension of occlusion and length of little finger of right hand were recorded 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. The tips of digital vernier caliper were modified to allow a precise positioning in horizontal and vertical plane. The lower tip of the caliper was then placed firmly below the chin so that the soft tissues were compressed by pressure exerted. The upper tip of caliper was then raised until it lightly touched the base of nasal septum (Figure 1). Length of little finger of right hand was measured on palmar aspect from tip of finger to the farther most point on palmar digital crease (Figure 2). The measurement was taken with the hand held in straight and flat position. For the parameters of the study, mean, standard deviation and range was calculated. Statistical analysis was done using paired 't' test, and Pearson correlation and one way ANOVA.



Fig. 1 : Measurement of vertical dimension of occlusion



Fig. 2 : Measurement of length of little finger

Results

In males, the mean value of VDO was 61.09 mm with the range varying from 53.49 mm to 68.60 mm with standard deviation of 3.74 mm. The mean value of length of little finger was 60.57 mm with the range varying from 53.42 mm to 67.11 mm with standard deviation of 3.54 mm (Table 1, 4) whereas in females, the mean value of VDO was 55.99 mm with the range varying from 50.13 mm to 60.30 mm with standard deviation of 2.73 mm and the mean value of length of little finger was 56.22 mm with the range from 51.85 mm to 62.54 mm with standard deviation of 2.69 mm (Table 2, 4).

Thus VDO was more in males compared to females and males had longer little fingers than females.

Pearson correlation of VDO and length of little finger showed a value of 0.788, P-Value = 0.000 for males and Pearson correlation of VDO and length of little finger showed a value of 0.691 for females, P-Value = 0.000, which was highly significant. Combined males and females Pearson correlation of VDO and LLF was 0.840, P-Value = 0.000. One way ANOVA showed no statistically significant difference between the sexes (Table 3,5).

Difference between VDO and length of little finger ranged from -3.73 to +3.90 mm in males and difference between mean values of VDO and length of little finger was 0.52 mm in males (Table 1) The difference between VDO and length of little finger ranged from -3.07 to +3.13 mm, difference between mean values of VDO and length of little finger was -0.23 mm in females (Table 2) respectively. Hence Vertical Dimension of Occlusion is found to be almost equal to the length of the little finger in the study group (Figure 3). Therefore considering the range of mean values, difference between VDO and LLF, it can be concluded that $VDO = LLF \pm 0.37$ mm.

Discussion

Many investigators have suggested various methods for estimation of VDO. Niswonger suggested 4/32-inch

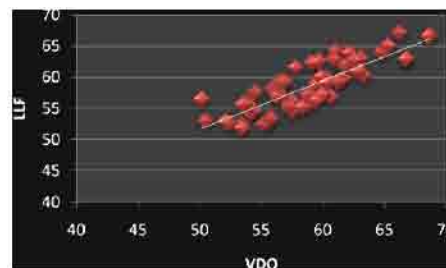


Fig. 3 : Graph showing relationship between Vertical Dimension of Occlusion (VDO) and length of little finger.

Table 1: Master Chart - Males

Sr. No.	Age (years)	Vertical Dimension of Occlusion (mm)	Length of Little finger (mm)	Diff. between VDO and little finger
01.	21	59.06	62.29	- 2.23
02.	20	64.78	64.01	0.77
03.	21	61.70	59.82	1.88
04.	22	56.54	59.35	-2.81
05.	23	58.30	55.17	3.13
06.	20	68.60	66.67	1.93
07.	22	58.76	57.12	1.64
08.	21	60.32	59.05	1.27
09.	21	66.78	62.88	3.90
10.	23	60.64	56.82	3.82
11.	20	61.05	64.20	-3.15
12.	21	63.03	63.03	0
13.	22	56.85	59.21	-2.36
14.	21	62.88	61.49	1.39
15.	21	59.93	57.08	2.85
16.	20	59.46	56.33	3.13
17.	21	57.76	61.49	-3.73
18.	20	61.29	59.27	2.02
19.	20	63.30	60.17	3.13
20.	22	54.00	55.48	-1.48
21.	20	65.28	65.01	0.27
22.	21	61.85	61.85	0
23.	20	62.88	60.93	1.95
24.	20	62.15	63.83	-1.68
25.	22	62.54	62.70	-0.16
26.	20	55.76	53.42	2.34
27.	23	66.78	62.92	3.86
28.	22	66.18	67.11	-0.93
29.	22	60.88	62.87	-1.99
30.	21	53.49	55.64	-3.15

Table 2 : Master Chart - Females

Sr. No.	Age (years)	Vertical Dimension of Occlusion (mm)	Length of Little finger (mm)	Diff. between VDO and little finger
01.	21	57.50	56.05	0.45
02.	20	59.63	62.54	-2.91
03.	20	55.74	53.03	2.71
04.	21	57.21	55.93	1.28
05.	22	59.59	59.48	0.11
06.	23	53.40	52.38	1.02
07.	22	56.65	59.11	-2.46
08.	21	55.14	52.41	2.73
09.	23	57.49	54.55	2.94
10.	21	57.20	55.27	1.93
11.	20	54.48	57.55	-3.07
12.	22	50.13	56.43	2.70
13.	22	53.87	55.70	-1.83
14.	21	58.80	55.67	3.13
15.	21	54.17	54.18	-0.01
16.	23	59.00	57.36	1.64
17.	22	53.40	51.85	1.55
18.	20	50.45	52.97	-2.52
19.	21	55.91	58.16	-2.25
20.	20	52.12	52.91	-0.79
21.	22	56.33	57.51	-1.18
22.	21	59.51	58.89	0.62
23.	24	52.42	52.67	-0.25
24.	20	56.39	57.94	-1.55
25.	22	60.30	59.75	0.55
26.	24	54.41	54.70	-0.29
27.	20	56.17	57.62	-1.45
28.	24	59.84	59.97	-0.13
29.	23	56.37	57.23	0.86
30.	23	56.30	56.90	-0.60

Two-Sample ‘t’ -Test and CI:

Two-sample ‘t’ for VDO vs LLF

	N	Mean	St. Dev	SE Mean
VDO	30	61.09	3.74	0.68
LLF	30	60.57	3.54	0.65

Difference = mu (C1) - mu (C2)

Estimate for difference: 0.520

95% CI for difference: (-1.362, 2.403)

‘t’ -Test of difference = 0 (vs not =): T-Value = 0.55

P-Value = 0.582 DF = 57

Correlations: Pearson correlation of VDO and LL F= 0.788 . P-Value = 0.000

Paired ‘t’-Test and CI:

Paired ‘t’ for VDO - LLF

	N	Mean	St. Dev	SE Mean
VDO	30	55.997	2.735	0.499
LLF	30	56.224	2.698	0.492

Difference 30 -0.226 2.135 0.390

95% CI for mean difference: (-1.024, 0.571)

t-Test of mean difference = 0 (vs not = 0):’ t’-Value = -0.58 P-Value = 0.566

Correlations: Pearson correlation of VDO and LLF = 0.691. P-Value = 0.000

Table 3 Combined Males and Females

Pearson correlation of VDO and LLF = 0.840 . P-Value = 0.000

One-way ANOVA :

Source	DF	SS	MS	F	P
Factor	1	0.6	0.6	0.04	0.840
Error	118	1870.5	15.9		
Total	119	1871.2			

LEVEL	N	MEAN	SYD.DEV
VDO	60	58.546	4.143
LLF	60	58.339	3.814

S = 3.981 R-Sq = 0.03% R-Sq (adj) = 0.00%

Pooled St Dev = 3.981

Table 4: Descriptive Statics of Vertical Dimension (VDO) and Length of Little Finger (LLF)

Sex	Number	Measurement (mm)	Minimum (mm)	Maximum (mm)	Mean (mm)	SD (mm)
Male	30	VDO	53.49	68.60	61.09	03.74
		LLF	53.42	67.11	60.57	03.54
Female	30	VDO	50.13	60.30	55.99	02.73
		LLF	51.85	62.54	56.22	02.69

Table 5: Sex Specific Correlation between VDO and LLF

Sex		Correlation coefficient	Length of Little Finger
Male	VDO	r	0.788
		'P' Valuen	0.00030
Female	VDO	r	0.691
		'P' Valuen	0.00030

interocclusal or freeway space as a guide to determine the VDO but short-term and long term variations have been reported[7]. Short-term variations occur in times of stress, respiration and head movements whereas long term variations occur in debilitated patients, mouth breathers and as a result of attrition of teeth. McGee found that methods which relied upon the patient's muscular perception tended to register a reduced vertical dimension of occlusion because patients felt more comfortable in that position[8]. Silverman placed tattoos on alveolar ridges prior to the removal of natural teeth to be used as reference points when the patient became edentulous[9]. The distance between the markings when the teeth were in centric occlusion was measured with a pair of calipers and recorded for future use. However, patients may not accept placing of tattoos on gingiva. Smith stated that the Boos bimeter was the best device because it was a simple and reliable device for determining the vertical dimension of rest position[10]. However, the bimeter has been condemned, because the closing power of the

patient is influenced by pain and apprehension. Clinically we have observed that VDO varies in natural teeth in attrition cases and also when natural teeth contacts are lost. Determination of the patient's vertical dimension has been a matter of guesswork. Clinical judgment plays a major role in the assessment of this important component in the construction of complete dentures and prosthodontic rehabilitation cases. Considering the disadvantages of previously used methods, this study was undertaken to find a simple and feasible test to estimate VDO by studying the relationship between VDO and length of fingers. This feature of human anthropometry has not yet been explored in dentistry. Our study revealed a sexual difference with higher values for VDO as well as length of little fingers in males compared to females. Sexual difference in finger length is related to growth differences in males and females[11]. In this study, measurement of only the right hand little finger was recorded, since it is a known fact that physiologically the human body maintains symmetry.

In this study the length of little finger of the right hand showed a mean of 60.57 mm in males and 56.22 mm in females. This is in accordance with the findings of Nag who showed a mean value of 56.3 mm in females[12]. However, no comparative data of little finger dimensions in males is available. The study revealed that the little finger can be used for determination of VDO in males and females. The VDO estimated using this method is within the range of 0-4 mm which is significantly less compared to other methods where a range of 0-14 mm is used[13].

The limitation of the study was that it was restricted to the subjects with class I jaw relation. Other skeletal or dental malocclusions were not considered. To authenticate these findings further studies are required to be undertaken.

Conclusion

The study revealed that length of little finger is almost equal to vertical dimension of occlusion, and hence can be used for determination of VDO in males and females. This method is simple, innovative, non invasive, economical, reproducible and does not require no sophisticated equipment.

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