



Novel Technique to Determine Vertical Dimension of Occlusion from Interpupillary Distance in Kashmiri Population

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Abstract:

Background: A number of techniques are being practiced for the evaluation of VDO, but none of them is scientifically more accurate than other. **Objectives:** The purpose of this study was to find correlation between vertical dimension of occlusion (VDO) and interpupillary distance (IPD). **Material and Methods:** A study was conducted on 60 dentate subjects comprising of 30 males and 30 females. Anthropometric measurement of VDO and IPD was recorded clinically using modified digital vernier caliper. Correlation between VDO and IPD was studied using Spearman's coefficient. Statistical Package for Social Sciences (SPSS) Software Version 11.5 was used. **Results:** VDO and IPD was more in males compared to females. VDO was significantly and positively correlated with IPD only in males whereas females showed a weak correlation. Hence, regression equation was derived only for males. **Conclusions:** Since the variations between VDO and IPD are within the range of 2-4 mm, VDO prediction through this method is reliable and reproducible for male patients. Also, the method is simple, economic, and non invasive; hence it could be recommended for everyday practice to determine vertical dimension of occlusion in case of male patients.

Keywords: Anthropometry, interpupillary distance, vertical dimension of occlusion.

I. 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 and one on a movable member¹. Importance of establishing an appropriate lower facial height cannot be overlooked. Increased vertical dimension can lead to Discomfort, Trauma, and Clicking of teeth & Loss of freeway space. Decreased vertical dimension: can lead to Inefficiency, Cheek biting, Soft tissue sags, & the lines on the face are deepened. Although many techniques exist for the evaluation of VDO, none of them is scientifically more accurate than other and each method has its own limitations² like they are tedious, time consuming, or expose patients to radiation³, require lateral cephalogram⁴In the past, VDO has been correlated with various anthropometric measurements like the distance from the outer canthus of one eye to the inner canthus of the other eye, vertical height of the ear, twice the length of one eye, and vertical length of nose at the midline. In line with these observations, we designed this study to find correlation between VDO and IPD so as to explore the possibility of another method for determination of VDO. The research hypothesis was that there would be a significant relationship between the VDO and IPD.

II. MATERIAL AND METHODS

This study was conducted on 60 dentate subjects (30 males and 30 females) in the age range of 20 to 30years having no deformity of eyes. Subjects were selected randomly from Government Dental College and Hospital. All the participants' have class I jaw relationship with periodontically sound teeth in both jaws. Subjects with following conditions were not included in the study, open or deep bite, missing teeth, attrition, restorations in the oral cavity, temporomandibular

joint disorders or any other pathology in the maxillofacial region, history of trauma, orthodontic treatment or orthognathic surgery. Clearance from the Institutional Ethical committee was obtained. All subjects provided written informed consent to participate in the study. Anthropometric measurement of VDO was recorded clinically in millimetres using a modified digital vernier caliper with an accuracy of 0.01mm as described by us in an earlier study². Inter papillary distance (IPD) was measured from mid pupil of one eye to mid pupil of another in millimeters (Fig. 1). To record the VDO, subjects were instructed to bite lightly on posterior teeth. The lower tip of digital vernier calliper was placed firmly below chin so that soft tissues get compressed and upper tip was raised until it touch lightly base of nasal septum(Fig. 2) All the measurements were recorded thrice by a single operator and their mean was used for further analysis to minimize the error. For all the parameters of the study mean, standard deviation and range were calculated. Correlation was studied using Spearman's rank correlation coefficient method. Statistical Package for Social Sciences [SPSS] Software Version 11.5 was used.



Figure.1. Measurement of Interpupillary Distance



Figure. 2. Measurement of Vertical Dimension of Occlusion

Table .1. Descriptive statistics of vertical dimension of occlusion (VDO) and interpupillary distance (IPD)

Sex	Measurements	Mean (mm)	SD(mm)	Min (mm)	Max (mm)
Male	VDO	63.4	4.3	54.3	70.6
	IPD	60.2	2.9	54.5	68.9
Female	VDO	57.6	3.2	48.9	65.5
	IPD	59.5	2.6	54.2	65.3

Table.2. Sex specific correlations between Vertical Dimension of Occlusion (VDO) and Interpupillary Distance (IPD).

Sex		Correlation Coefficient	IPD
Male	VDO	r	0.326**
		P-value	0.001
		n	200
Female	VDO	r	0.115
		P-value	0.128
		n	200

Correlations (r) by Spearman's method. P-value < 0.05 is considered to be significant correlation. **P < 0.001 (Highly significant correlation) the coefficient of correlation [r] by Spearman's method between the measured variable and VDO, at the probability level of 95% is presented in table 2. From table 2, it was observed that VDO is significantly and positively correlated with IPD only in males [r- 0.326] whereas in females, correlation of VDO with IPD was weak [r- 0.128]. Hence, regression analysis was performed for prediction of VDO using IPD only in males (Fig. 3).

From table 3, it was observed that in males following regression equation was reliable to determine VDO –

VDO = 30.843 + 0.500 x Interpupillary distance had a standard error of ± 3.94 in males.

Table.3. Regression Analysis in Males.

Sex	Dependent variable	Independent variable	Regression Equation	% R2	SE
Male	VDO (Y)	IPD (A)	Y = 30.843 + 0.500 x A	10.9%	± 3.94

SE -Standard error R² - coefficient of determination

IV. DISCUSSION

Loss of natural teeth and subsequent placement of an artificial prosthesis in the mouth is not a pleasurable event for any individual. The agony of the patient can be lessened by providing a prosthesis which restores the original facial appearance and functions similar to natural teeth and establishing a correct VDO is one of the important steps in accomplishing this objective². Many methods have been described in literature for the estimation of VDO, but none of them is fully accepted. Freeway space may be used as a guide to determine VDO but both long and short term variations occur⁵. Stress, respiration and head movements can lead to short term variations whereas mouth breathers and debilitated patients lead to long term variations. Methods that rely on pre-extraction records like measurement of vertical and horizontal overlap of natural anterior teeth, speaking method and tattoo

III. RESULTS

Descriptive statistics of the parameters studied is presented in table 1. From table 1, it was observed that VDO was more in males compared to females. Also, interpupillary distance was more in males compared to females.

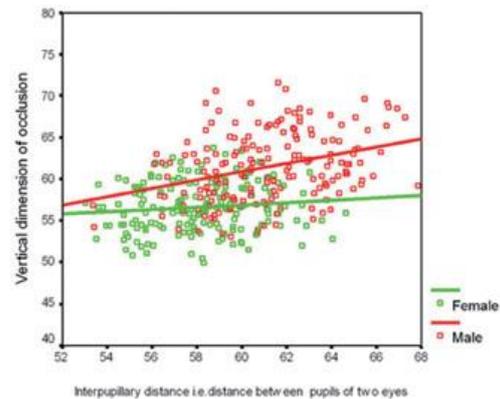


Figure.3. Scatter diagram along with regression lines of Interpupillary distance (IPD). Versus vertical dimension of occlusion (VDO).

dot method⁶ are considered most reliable, but these records are not always available². To overcome these difficulties simple yet feasible study was undertaken to determine the relationship between VDO and IPD. This study revealed a sexual dimorphism with higher values for VDO as well as IPD in males compared to females. Inter pupillary distance [IPD] is the facial measurement in the horizontal plane between the geometrical centers of pupillary apertures of both eyes. IPD increases till mid 20's. The increase then slows down with negligible changes and remains fairly constant thereafter⁽⁷⁻¹¹⁾. Hence, interpupillary distance can be used as a guide in establishing VDO when patient is totally edentulous. The interpupillary distance measured in this study showed a mean of 60.2 mm in males and 59.5 mm in females. This is in accordance with the findings of various investigators like Pointer¹² who showed a mean value of 60.14 mm in males and 57.33 mm in females. Evereklioglu *et al*⁸ found a mean IPD of

60.75 mm and 59.45 mm in males and females respectively. Swan and Stephan¹³ observed a mean IPD of 63.6 mm and 59.6 mm in males and females respectively. On the other hand, values higher than the present study are reported by Gomes *et al*¹⁴ who found a mean value of 69.97 mm and 66.68 mm in males and females respectively. Oladipo *et al*¹⁵ found a mean interpupillary distance of 69.8 mm and 66.4 mm for males and females respectively. Murphy and Laskin¹⁶ reported a mean IPD of 66.3 mm and 62.6 mm for males and females respectively. This study revealed that interpupillary distance can be used for determination of VDO only in males with a standard error of ± 3.94 but not in females. That's the reason why the regression equation was not derived for females. It can be explained by the fact that IPD parameter is fairly constant in males after early middle age, but females grow this facial parameter upto later middle age. The results of this study indicated that anthropometric measurements like IPD can be helpful in estimating the VDO in males

There are various advantages of using this method.;

- 1) VDO estimation is based on objective measurements rather than subjective criteria's such as resting jaw position¹⁷ or swallowing¹⁸.
- 2) VDO is within the range of 2-4 mm as compared to other methods where a range of 0-14 mm is given^{19,20}
- 3) Simple, non invasive method with no radiation exposure.

The limitation of the study was:

- 1) Subjects with class I malocclusion and other types of malocclusions were not taken into consideration.
 - 2) VDO measurement is difficult to record when a patient has a round facial profile with excessive soft tissue bulk under the chin.
 - 3) Did not appear useful in females.
- Hence, there is a scope for further research to confirm its applicability in different populations before deriving an appropriate regression equation which can be accepted universally.

V. CONCLUSION

The results of this study indicate the possibility of using IPD to estimate VDO in male patients with variations within a range of 2-4 mm. Further studies are required to authenticate these findings and to explore the possibility in female patients.

VI. REFERENCES

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