

# Correlation of Vertical Dimension of Occlusion with Various Facial Dimensions in Male Kashmiri Population- an Anthropometric Research.

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## ABSTRACT

**Background:** The study was conducted in male Kashmiri population to correlate VDO with various facial measurements, since there is no absolute method to determine the VDO for all individuals. The facial landmarks can reliably be used to determine occlusal vertical dimension in edentulous patients since they are accessible and relatively unchanged throughout the life. Objectives of the study: To correlate various facial measurements with vertical dimension of occlusion in male Kashmiri population. **Methods:** A total number of 200 dentate male Kashmiri subjects in the age group of 20-50 years were selected for this study. The vertical dimension of occlusion was measured between subnasion to menton. Digital Vernier caliper was used for measuring different facial parameters that were selected for this study. The results were tabulated by employing Student's independent t-test. Graphically the data was presented by bar diagrams. A P-value of less than 0.05 was considered statistically significant. **Results:** The results of this study revealed that parameter superior surface of right ear to inferior surface of right ear, center of pupil of right eye to center of pupil of left eye and distance from the outer canthus of the right eye to right ear show no significant difference with VDO in male gender and hence can be correlated positively with VDO in males.

**Keywords:** Vertical dimension of occlusion; length of right ear; Digital vernier caliper, Kashmiri population.

## INTRODUCTION

Vertical dimension of occlusion (VDO) is defined as the distance between two selected anatomic points or marked points (usually one on the tip of the nose and other upon the chin), one affixed and one on a movable member when the occluding members are in contact.<sup>[1]</sup> In a denture wearer, VDO is established with maxillary and mandibular base plate with occlusal rims in place. Clinical judgement plays a major role in the assessment of this important component.<sup>[2]</sup> The literature describes different means to determine the VDO for the rehabilitation of edentulous patients. The methods to determine the VDO can broadly be divided into physiological and mechanical methods. Physiological methods include the use of physiological rest position, swallowing, phonetics, aesthetics, use of wax occlusal rims, tactile-sense method, electromyography, Boos bimeter method,

facial measurements, pre-extraction records and cephalometry. The mechanical methods include ridge relations and measuring distance between incisive papilla to mandibular incisors.<sup>[3]</sup> However VDO determination using a single scientifically proven technique is not possible [Zarb et al].<sup>[4]</sup>

If VDO is not correctly restored or established rapid resorption of the residual alveolar ridges may occur. If the dentures are fabricated at a greater occlusal vertical height, premature tooth contact may result in discomfort to the patient, trauma to the underlying tissues, temporomandibular joint dysfunction, clicking sound, increased fullness of the mouth, fatigue in the peri-oral musculature, inefficiency in chewing.<sup>[5]</sup> However decreased VDO leads to reduced biting force, cheek-biting, sagging, pre-senile appearance, angular cheilitis, deep nasolabial furrows, folds at the angles of mouth, tongue may fall back towards the throat and consequently displacement of adjacent tissues which may lead to the obstruction of Eustachian tube and hence

Impaired hearing, temporomandibular joint disorders leading to clicking sounds, headaches, neuralgia, Costen's syndrome.<sup>[6]</sup> Thus, recording the correct VDO is the most critical step while the fabrication of prosthesis and if not

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measured properly it may result in negative consequences of the residual oral structures.

Craniofacial measurements offer significant advantages in determining the VDO. These are objective rather than the subjective criteria. Since, there is no absolute method to determine the VDO for all individuals, the facial measurements are attractive because they require no radiograph or other special measuring devices. The facial landmarks can reliably be used to determine occlusal vertical dimension in edentulous patients since they are accessible and relatively unchanged throughout the life.<sup>[7]</sup>

The present study was therefore undertaken to determine the reliability of various facial measurements in determining the VDO. Variations between the facial landmarks would determine the reliability of the parameters like chin- nose distance.

## MATERIALS AND METHODS

### Source of data:

A total number of 200 dentate male Kashmiri subjects in the age group of 20-50 years having full set of dentition, no malocclusion, no attrition, no history of systemic and developmental disorders, no congenital or acquired deformity of eyes, nose, ears and lips, no gross facial asymmetry were randomly selected from among the students, staff, patients & attendants visiting Government Dental college, Srinagar. A written consent was obtained from each of the selected subject. The study was approved by the ethical review board of the institute.

### Methodology

After fulfilling all the selection criteria and obtaining an informed consent, each subject was made to sit in an upright position, looking forward, head without any support and occlusal plane parallel to the floor. Each subject was instructed to relax the lips and close teeth in maximum intercuspation. The vertical dimension of occlusion was measured between the base of nose [subnasion] to most under surface of the symphysis (menton). Digital Vernier caliper was used for measuring different facial parameters that were selected for this study. Flexible scale was used to measure the distance from chelion to chelion along the curvature of lip.

### The various facial parameters that were selected for this study are as:-

1. Superior surface of right ear to inferior surface of right ear [A1]. [Figure 2]
2. Right corner of lips to left corner of lower lips along the curvature [A2]. [Figure 3]
3. Outer canthus of right eye to right angle of mouth [A3]. [Figure 4]

4. Center of pupil of right eye to center of pupil of left eye [A4]. [Figure 5]
5. Outer canthus of right eye to inner canthus of left eye [A5]. [Figure 6]
6. Outer canthus of right eye to inner canthus of right eye multiplied by 2 [A6]. [Figure 7]
7. Inner canthus of right eye to inner canthus of left eye multiplied by 2 [A7]. [Figure 8]
8. Bridge of nose to base of the right ala of the nose [A8]. [Figure 9]
9. Pupil of right eye to rima oris [A9]. [Figure 10]
10. Distance from the outer canthus of the right eye to right ear [A10]. [Figure 11]

## RESULTS

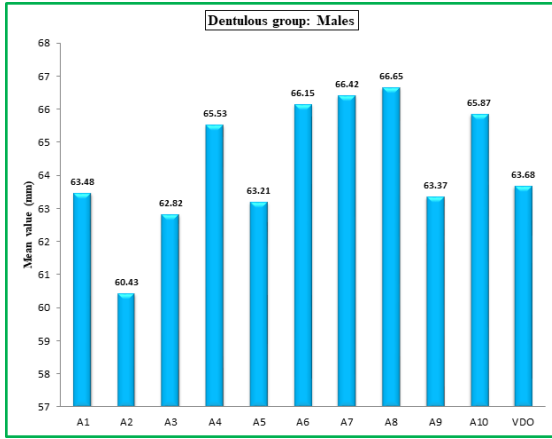
Statistical Methods: Statistical software SPSS (version 20.0) and Microsoft Excel (version 5.00) were used to carry out the statistical analysis of data. The results were tabulated by employing Student's independent t-test. Graphically the data was presented by bar diagrams. A P-value of less than 0.05 was considered statistically significant.

**Table 1: Comparison of various facial parameters with VDO in male Kashmiri population.**

S.No.	Parameter	Mean value [mm]	P-value
1	Superior surface of right ear to inferior surface of right ear [A1]	63.48	0.496
2	Bridge of nose to base of the right ala of nose [A2]	60.43	<0.001*
3	Right corner of lips to left corner of lips along the curvature [A3]	62.82	0.004*
4	Pupil of right eye to rima oris [A4]	65.53	<0.001*
5	Center of pupil of right eye to center of pupil of left eye [A5]	63.21	0.109
6	Outer canthus of right eye to inner canthus of left eye [A6]	66.15	<0.001*
7	Outer canthus of right eye to inner canthus of right eye (x2) [A7]	66.42	<0.001*
8	Inner canthus of right eye to inner canthus of left eye (x2) [A8]	66.65	<0.001*
9	Distance from the outer canthus of the right eye to right ear [A9]	63.37	0.297
10	Distance from outer canthus of right eye to corner of mouth [A10]	65.87	<0.001*
11	Lower border of septum of nose to most under surface of mandible (VDO)	63.68	-

[Table 1 and Graph 1] depict 10 facial parameters correlated with vertical dimension of occlusion in males. The mean value of parameter VDO (vertical dimension of occlusion) was 63.68 and the mean value of various facial parameters A2, A3, A4, A6, A7, A8 and A10 were 60.43, 62.82, 65.53, 66.15, 66.42, 66.65 and 65.87 respectively

and showing statistically significant P-value ( less than 0.05 ) thus indicating a significant difference in their measurements as compared to parameter “K” and hence these parameters cannot be compared with vertical dimension of occlusion in Kashmiri population .



**Graph 1: graphic representation of comparison between various facial parameters with VDO in males.**

The mean values of parameter A1, A5 and A9 were found out to be 63.48, 63.21 and 63.37 respectively indicating a statistically non-significant P-value (more than 0.05) thus showing non-significant difference of these parameters with VDO and hence can be compared with VDO in male kashmiri population.



**Figure 2: Superior surface of right ear to inferior surface of right ear**

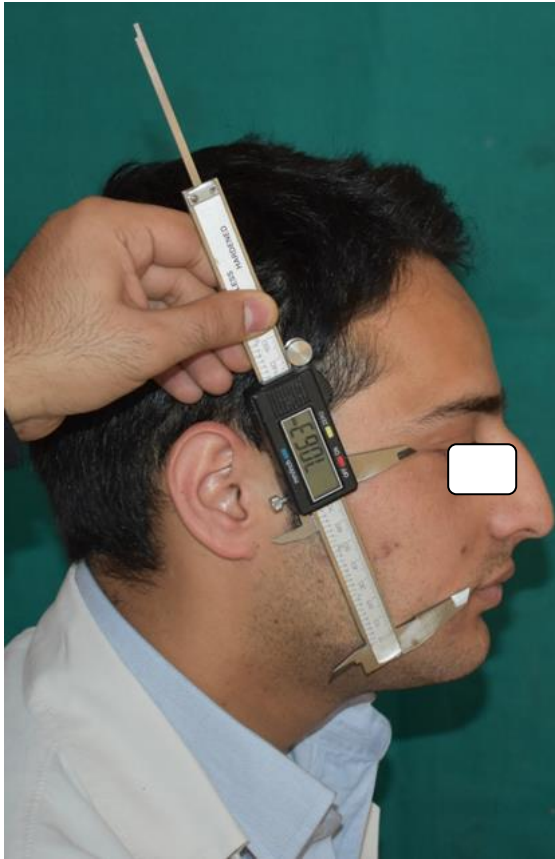


**Figure 1: VDO**



**Figure 3: Right corner of lips to left corner of lower lips along the curvature**





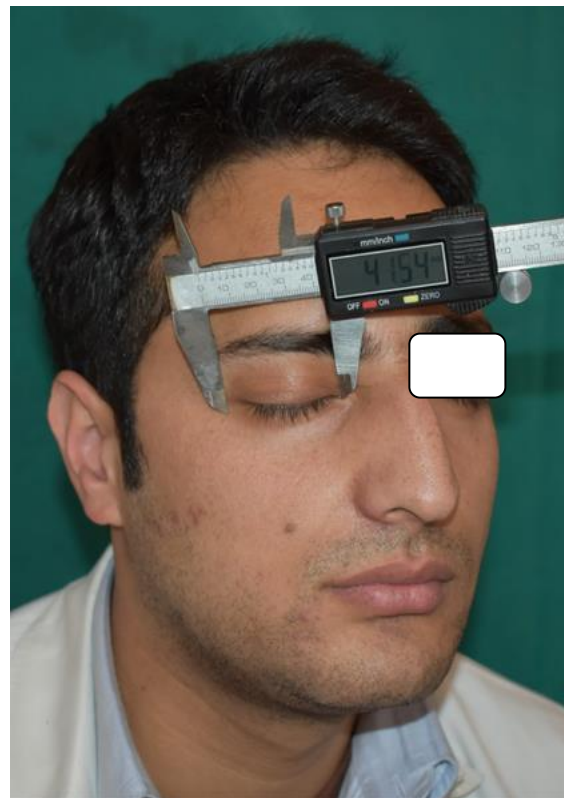
**Figure 4:** Outer canthus of right eye to right angle of mouth



**Figure 6:** Outer canthus of right eye to inner canthus of left eye



**Figure 5:** Center of pupil of right eye to center of pupil of left eye



**Figure 7:** Outer canthus of right eye to inner canthus of right eye multiplied by 2



Figure 8: Inner canthus of right eye to inner canthus of left eye multiplied by 2



Figure 10: Pupil of right eye to rima oris

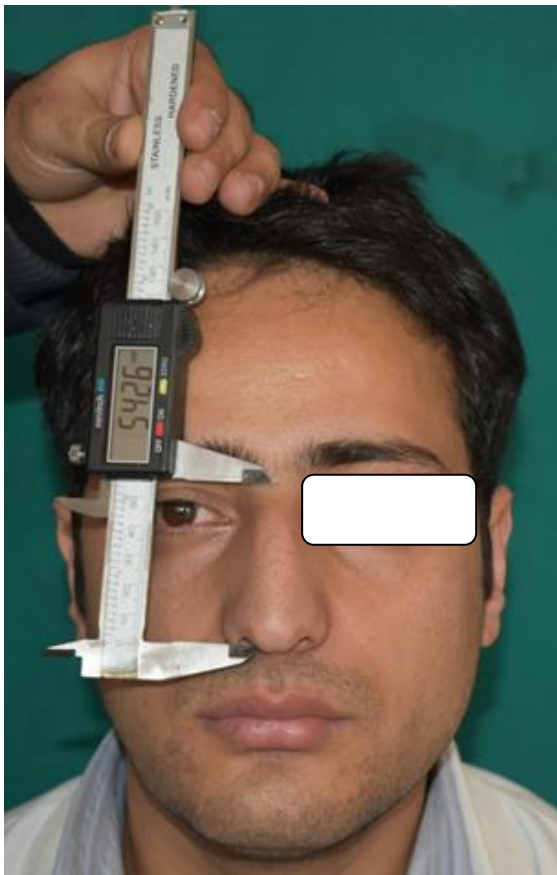


Figure 9: Bridge of nose to base of the right ala of the nose

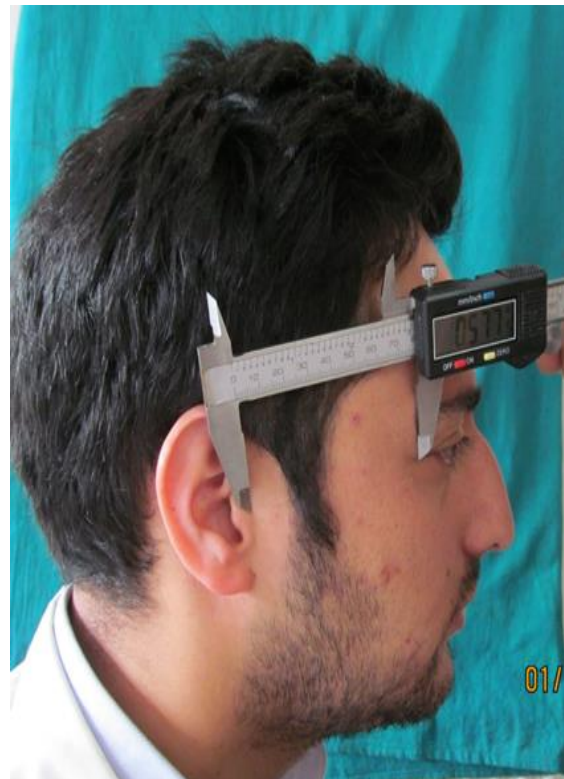


Figure 11: Distance from the outer canthus of the right eye to right ear



## DISCUSSION

Losing teeth and acquiring an artificial prosthesis in the form of complete dentures is never a great feeling for any individual. The accurate determination of the vertical jaw relation is extremely important in achieving successful prosthodontic therapy for function, esthetics and comfort to the edentulous patients.<sup>[8]</sup> The procedure of vertical relation forms the basis of all the prosthetic rehabilitation procedures. Many techniques have been used for measurement of the vertical dimension of occlusion, but there is no universally accepted or completely accurate method.<sup>[9]</sup> Pre-extraction records for determining the VDO are more accurate than post-extraction records, however they are seldom available.<sup>[10]</sup> The acceptability of any vertical dimension determination methods depends largely upon the skill, experience, and judgement of the prosthodontist. Thus, a need exists for a reliable method for accurately determining vertical dimension to facilitate dental restorations.<sup>[11]</sup> Various methods have been described in the literature which are both subjective as well as objective. The subjective methods include evaluation of aesthetics, phonetics, swallowing and patient comfort. The objective methods comprise of electromyographic records, biting power, utilization of facial measurements. Presently vertical dimension is measured based on physiologic references, such as use of pre-extraction records, measurement of former dentures and ridge relations.<sup>[12]</sup>

The aim of this study is to assess this correlation in male Kashmiri population. The vertical dimension of occlusion (chin-nose distance) in dentate patients when the teeth are in centric occlusion is comparable to occlusal vertical dimension when upper and lower denture bases along with occlusal rims are in contact, thus the current study was carried out on dentate patients. This study may be helpful in determining lost vertical dimension of occlusion in edentulous patients. If an anthropometric correlation is found between the VDO and certain parameters which are easily accessible to the clinician and are static, the time taken for this procedure could be significantly reduced. Also, the conclusions would be objective for every clinician. Since the readings are specific for the particular individual, it can be easily reproducible from time to time. Accuracy and repeatability of the measurement are considered the best criteria in selecting the best method to use. The ability of the technique to adjust, the type and complexity of the equipment needed and the time taken to document the measurement also have to be considered.

Based on the results obtained various facial parameters were correlated with VDO in male and Kashmiri population as discussed under.

### Length of right ear [A1]

Results revealed the non-significant difference of this parameter with VDO and hence can be compared with VDO in male gender. Separate studies were also conducted by ParanjayPrajapati et al,<sup>[13]</sup> Leonardo da vinci,<sup>[14]</sup> and Janhavi J Rege et al,<sup>[15]</sup> and the results of these studies also revealing a stronger correlation of the length of ear with VDO in males as compared to female gender.

### Bridge of nose to base of right ala of nose [A2]

Significant difference of this parameter was found with VDO in males and hence cannot be compared with VDO. In a study conducted by JanhaviJ.Rege et al,<sup>[15]</sup> on correlation between VDO and facial parameters, a positive correlation was found between the distance from bridge of nose to the base of nose and VDO

### Right corner of lips to left corner of lips along the curvature [A3]

Significant difference of this parameter was found with VDO in males and hence cannot be compared with VDO. In separate studies conducted by McGee,<sup>[16]</sup> BoyanBoyanov et al,<sup>[17]</sup> and M.IrfanMajeed, M.Afzal, M. Kashif,<sup>[8]</sup> a positive correlation between the curvature of lips and VDO was revealed.

### Pupil of right eye to rima oris [A4]

Significant difference of this parameter was found with VDO in males and hence cannot be compared with VDO. In a similar studies conducted by NurEmalinaAkhma et al,<sup>[18]</sup> BishalBabuBasnet et al,<sup>[19]</sup> a positive correlation was found between the pupil to rima oris distance and VDO

### Center of pupil of right eye to center of pupil of left eye [A5]

Results revealed the non significant difference of this parameter with VDO and hence can be compared with VDO in male gender. Studies were also conducted by RuchiLadda, Vikrant O Kasat, Aruna J. Bhandari and Muhammad IrfanMajeed, TayyabaSaleem and the results of their study showed a positive correlation between interpupillary distance and VDO.<sup>[7,20]</sup>

### Outer canthus of right eye to inner canthus of left eye [A6]

Significant difference of this parameter was found with VDO and hence cannot be compared with VDO. Leonardo da vinci in his book anatomical studies found the distance from outer canthus of right eye to inner canthus of left eye correlating positively with VDO and his findings were supported by Misch also.<sup>[14]</sup>

### Outer canthus of right eye to inner canthus of right eye x2 [A7]

Significant difference of this parameter was found with VDO and hence cannot be compared with VDO. In a study conducted by Law Kam Yaw et al,<sup>[21]</sup> it was found that the distance from outer canthus of right eye to inner canthus of right eye multiplied by 2 correlated positively with the VDO

**Inner canthus of right eye to inner canthus of left eye x2 [A8]**

Significant difference of this parameter was found with VDO and hence cannot be compared with VDO. In a study conducted by Law Kam Yaw et al,<sup>[21]</sup> it was found that the distance from outer canthus of right eye to inner canthus of right eye multiplied by 2 correlated positively with the VDO.

**Distance from the outer canthus of the right eye to right ear [A9]**

Results revealed the non-significant difference of this parameter with VDO and hence can be compared with VDO in male gender. Studies conducted by Knebleman S,<sup>[22]</sup> Tsau-Mau Chou et al,<sup>[23]</sup> Z.Delic,<sup>[24]</sup> Makarem Abdul Rassol and AbhishekNagpal on correlation between VDO and facial parameter revealed the positive correlation between the distance from outer canthus of eye to ear and VDO.<sup>[25,26]</sup>

**Distance from outer canthus of right eye to corner of mouth [A10]**

Significant difference of this parameter was found with VDO, hence cannot be compared with VDO. In separate studies conducted by Mohammed Nasser Alhajj, Nadia Khalifa and Abdullah Amran,<sup>[27]</sup> Salwa Omar Bajunaid et al,<sup>[28]</sup> and AbhishekNagpal et al,<sup>[26]</sup> the distance from outer canthus of eye to corner of mouth was found to have positive correlation with VDO.

**CONCLUSION**

Based on the results obtained in this study the following conclusions were drawn:-

- Length of right ear, center of pupil of right eye to center of pupil of left eye, distance from the outer canthus of the right eye to right ear can be recommended for the determination of VDO in male Kashmiri population.
- This method can be used as an adjunct to other methods in determining the VDO. This correlation presents as additional tool or guideline to the dentist to determine the proper VDO and adds to the body of evidence.

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