Section A-Research paper

Correlation of length of palm, width of palm, thumb height, length of ear with vertical dimension of occlusion in dentate subjects: An observational study

Dr. Archana Shah [1]*, Dr. Takshil Shah [2] , Dr. Shuchi Shah [3], Dr. Diptesh Rami [4], Dr. Tamanna Chhabra [5], Dr. Rajesh Sethuraman [6]

1. Assistant Professor, Department of Prosthodontics, Faculty of Dental Science DDU, Nadiad, Gujarat, India

2. Assistant Professor, Department of Prosthodontics, Siddhpur Dental College & Hospital, Gujarat, India

3. Assistant Professor, Anaesthesiology, Dr N. D. Desai Faculty of Medical Sciences and Research, Nadiad, Gujarat, India

4. Assistant Professor, Department of Prosthodontics, Siddhpur Dental College & Hospital, Gujarat, India

5. Professor, Prosthodontics and Crown and Bridge, KM Shah Dental College and Hospital, Vadodara, Sumandeep Vidyapeeth, Gujarat, India

6. Professor and HOD, Prosthodontics and Crown and Bridge, KM Shah Dental College and Hospital Vadodara Sumandeep Vidyapeeth, Gujarat, India

Corresponding Author: Dr Archana M. Shah
Assistant Professor, Department of Prosthodontics, Faculty of Dental Science DDU, Nadiad, Gujarat, India

Email: archanapray@gmail.com

ABSTRACT:

TITLE: Correlation of length of palm, width of palm, thumb height, length of ear with vertical dimension of occlusion in dentate subjects- an observational study. AIM: The aim of the study was to determine the correlation of length of palm, width of palm, thumb height, length of ear with vertical dimension of occlusion in dentate subjects. An observational study. MATERIALS AND METHODOLOGY: According to the inclusion and exclusion criteria 318 participants was selected. Anthropometric measurements of vertical dimension of occlusion, length of palm, width of palm, thumb height, length of ear were recorded by using digital vernier calliper. After that statistical analysis of the data was done by Spearman correlation coefficient analysis. RESULTS: On the basis of Spearman correlation coefficient test, it showed that there is significant correlation between vertical dimensions of occlusion maximum with thumb height, the p value is .000 and it correlation value is .619, then with ear height with the p value .000 with its correlation value as .555. , then with width of palm the p value is .000 and correlation value is .487 and then with length of palm the p value is .004 and correlation value is .161. Therefore the study shows that there is significant

correlation between thumb height, ear length, width of palm, length of palm with vertical dimension of occlusion. CONCLUSION: On basis of the results of the study, it can `be concluded that there is correlation between vertical dimensions of occlusion with length of thumb, then with length of ear, in width of palm, length of palm. Maximum correlation is between VDO & thumb height and the order of decreasing correlation other parameters are as follows, ear height, width of palm, and length of palm.

KEYWORDS: Vertical Dimension Of Occlusion, Length Of Palm, Width Of Palm, Thumb Height, Length Of Ear, Vernier Caliper

Introduction

The focus in Prosthodontics has shifted from removable to fixed prostheses with implants riding high, still the concepts like jaw relation remain at the baseline providing foundation to arbitrate our decisions for all the prosthetic rehabilitation procedures.[1] 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 is to be achieved. Glossary of Prosthodontics Terms defines vertical dimensions 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 member.[2]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 registered too high or too low, it would end up deteriorating the existing patient's condition instead of improving it. While Prosthodontics as a whole has been progressed leaps and bounds with variety of techniques being proposed and practiced for the assessment of VDO, none of the mis-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.[3] Furthermore, radiographic setup to provide lateral cephalographs[4] or Electromyographic machine[5] may not be available in most of the dental offices. Leonardo da Vinci and McGee[6] correlated VDO with various anthropometric measurements. According to them original VDO is most often similar to the distance from the outer canthus of one eye to the inner canthus of the other, vertical height of the ear, two times length of one eye, horizontal distance between the pupils, and vertical length of nose at the midline. Anthropometric measurements were used to determine proportions of body parts since antiquity, when sculptors and mathematicians followed the golden proportion, later specified as a ratio of 1.618:1.[7] In line with these observations, this study was designed to assess the possibility of any correlation between VDO and width of palm, length of palm, length of ear, length of thumb, so that it can serve as a simple and precise method for estimating VDO. The research hypothesis was that there would be a significant relationship between the vertical dimension of occlusion and width of palm, length of palm, length of ear length of thumb.[1] The human face has been the subject of study since man could first express himself .as civilizations have risen and subsequently faded away, one thing

that has remained same is art, in most cases, drawing painting and so on faces. During renaissance,Da Vinci, Michael Angelo, and duhrer led other artists to study faces. Facial proportion was discovered; there were standards set for balance and harmony of the lower face[8]

MATERIAL AND METHODOLOGY

This observational study was conducted in the Department of the Prosthodontics and Crown and Bridge K.M.SHAH DENTAL COLLEGE & HOSPITAL, Piparia, Vadodara.The study was done on 318 students.

Sample size description - 318 under graduate and post graduate student of k.m shah dental college and hospital Where n_s is sample size form infinite population 50% success N is population formula is

$$n = \frac{n_s}{1+\frac{n_s-1}{N}},$$

Where N is total number of student of K.M SHAH dental college & hospital undergraduate and post graduate students.

- Time scale of study- 1week
- Selection criteria - Students were selected based on inclusion exclusion criteria mentioned below.

INCLUSION CRITERIA:

1. Participants with complete set of dentition.
2. Participants with symmetrical facial form.
3. All the participants had eugnathic jaw relationship and a definite centric stop with at least 28 fully erupted,
4. Periodontally sound teeth in both jaws.
5. No developmental anomaly related to hand and fingers.

EXCLUSION CRITERIA:

1. Participants with mental or physical disabilities or psychological disorders.
2. Participants who refuse to give consent for the study.
3. Open bite or deep bite cases.
4. Teeth anomalies.
5. Attrition.
6. Extensive prosthesis or restorations in the oral cavity.

7. Temporomandibular joint disorders, or any other pathology in the maxillofacial region.
8. History of trauma.
9. Orthodontic treatment or orthognathic surgery.

EQUIPMENTS AND INSTRUMENT&MATERIALS:

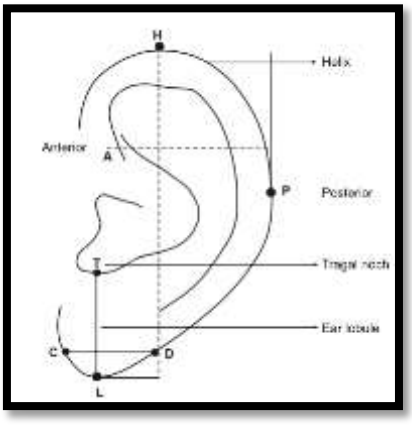
1. Digital Vernier Caliper
2. Eosin pencil

METHODOLOGY: -

For this study, students of KMSDCH, Pipariya was selected. Clearance from the Institutional Ethical committee was obtained. Subject was informed about study procedure verbally in their local language as well. After the subject was ready to participate, all subjects was provided with written informed consent to participate in the study. Anthropometric measurements of vertical dimension of occlusion, length of palm, width of palm, thumb height, length of ear was recorded.

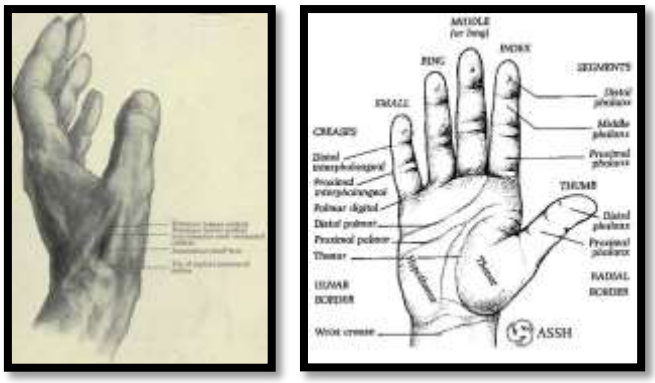
First measurement was done for vertical dimension of occlusion and was measured from the point marked at the base of the chin at mid symphasis region with the teeth in maximum intercuspation.

The second measurement was recorded of the length of ear it was recorded from upper border of ear to lower border of the pinna of ear Head position put on support of wall and measurement will be recorded.



Third measurement was done for length of the thumb.

Length of the thumb will be measured from tip of the thumb to radial border on flat platform hand was kept and traced, and then measurement recording was done.



Fourth measurement was done on width of palm.on flat platform hand was kept and traced, then measurement recording was done. Natural digital concavity near palmer border of crease to medial thumb diverges from lateral index fingre Fifth measurement was done on length of palm.mid point of interstyloid line to beginning of palmon flat platform hand was kept and then measurement recording was done.

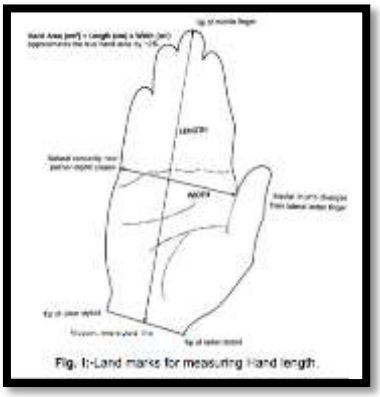


Fig. I:-Land marks for measuring Hand length.

Discussion

The ideal method of restoring OVD and thus promoting better oral health has been quite an interesting and important aspect of prosthodontics, yet the correct and universal method has not been found. There are several thoughts and evidences regarding restoration of the correct OVD. These include the use of anterior teeth measurements,[9]closest speaking space [10],[11] cephalometric radiographs[11,12]intraoral and extra oral anatomic landmarks,[13] and measurement of fingers.[1] All these methods are with some or the other disadvantages like high cost and, difficult to practically apply. Any variation in determining OVD can be detrimental to the aesthetics of facial soft tissues, induce speech difficulties, and cause temporomandibular joint discomfort. Pre-extraction record is undoubtedly superior to these methods.[14] But recording the OVD of all patients and keeping it for future use is not always possible. In the absence of pre-extraction records, Knowledge about aesthetics, relationship of teeth to the ridges, lip length measurement, and phonetics are employed in case there are no pre-extraction records.

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. Undoubtedly, establishment of a correct vertical dimension of patients face is one of the prime factors to be considered in fulfilling this goal. Literature review depicted that many methods have been described and used by professionals over the years for the purpose of vertical dimension determination, but none of them is fully accepted or considered completely correct. So far among pre-extraction records, methods like measurement of vertical and horizontal overlap of natural anterior teeth, speaking method and tattoo dot method are agreed to be the most reliable ones. In absence of records, one cannot even find out a point to begin, the position of mandible would stay to restore vertical dimension of occlusion. In order to solve the problem, an investigation was carried out to determine a simple yet feasible method by studying the relationship between vertical dimension of occlusion and craniofacial landmarks. The results supported the research hypothesis that there would be a significant relationship between the vertical dimension of occlusion and the craniofacial distances.[1]

Leonardo da Vinci [7,15] in his book "Anatomical Studies" contributed several observations and drawings on facial proportions. He found chin nose distance equal to the parameters "a", "b" and "j". In present study mean values of same parameter (a and b) were 59.58 and 58.35 mm respectively which indicates no close approximation with the chin nose distance. The mean value of parameter "j" was 63.58 mm and this value is more significantly related to the chin nose distance. Therefore this can be recommended for determination of occlusal vertical dimension. Misch also agreed with this finding of the Leonardo.

McGee [6] determined the known vertical dimension of occlusion with five parameters "d, f, g, h and i". RuchiLadda and co-workers also advocated parameter "i" for the determination of occlusal vertical dimensions.1Nagpal A and co-workers stated parameter "g" in Indian population comparable to chin-nose distance [16] In our study mean values of parameters "d, g, h and i" were 58.51, 67.35, 65.70 and 61.41 mm respectively and did not constitute close approximation for the determination of OVD among Pakistani population. The parameter "f" more in Caucasians, described by McGee gave us mean value of 63.71 mm which correlated with the chin nose distance. Misch also stated this parameter for measurement of OVD and can be used for the determination of occlusal vertical dimension.13 According to Willis theory, the parameter "g" should be equal to the chin nose distance same like described by McGee and again as described above did not coincide in Pakistani population and thus cannot be proposed for the determination of OVD .[17]

Al-Dhaher HA and co-workers advocated the relationship of parameter "c" and chin nose distance.[18] Nagpal A and co-workers also confirmed this parameter comparable with chin nose distance in Indian population.[16] The present study could not confirm

this relationship. In this study, ear-eye distance had mean value 69.47 mm, which did not match with the chin nose distance.

A study done by Misch, according to it, the occlusal vertical dimension is related to twelve different facial measurements.[7] He adopted nine parameters previously described by RuchiLadda, Knebelman, Leonardo, McGee and Willis., In addition to these, he mentioned three parameters "e, k and l" by himself. In our study mean values of these parameters were 66.66, 63.90 and 62.29 mm respectively. The result of parameters "e" and "k" did not correlate, while the mean value parameter "l" coincides with the chin nose distance. Due to this correlation parameter "l" can be proposed to be used for the determination of OVD among Pakistani individuals[20]. Parameter are given below

a) Superior surface of right ear to inferior surface of the right ear
b) Hair line to right eyebrow line
c) Mesial wall of right external auditory canal to lateral corner of the bony orbit
d) Bridge of the nose to base of the right ala of the nose
e) Right eyebrow line to base of the right ala of nose
f) Right corner of lips to left corner of lips along the curvature
g) Outer canthus of right eye to right angle of mouth
h) Center of pupil of right eye to lower Border of upper lip
i) Center of pupil of right eye to center of pupil of left eye
j) Outer canthus of right eye to inner canthus of left eye
k) Outer canthus of right eye to inner canthus of right eye
l) Inner canthus of right eye to inner canthus of left eye
m) Lower border of the septum of the nose to most under surface of the mandible

This study was undertaken to investigate the relationship between the OVD and the length of the thumb, Eh, LP, Pw taking into account that the body parts grow proportionately. This provided data on a selected sample of dentulous Guajarati population that can become a reference for the establishment of the OVD in edentulous patients.

Geertset alassessed the accuracy of the chin–nose distance measurement. The compressibility of skin over these anatomic landmarks cannot be avoided, so there may be some degrees of errors in measurement. Measurement by modified calipers invariably led to some differences in the various studies. The present study did not compare these two procedures of measuring the OVD; rather, the mean of these two were taken into consideration.

The limitations of this study were errors while measuring dimensions in large sample, and only one ethnic group was considered in the present study, so the findings cannot be extrapolated to other ethnic groups or races. Further studies in large sample and

other ethnic groups are recommended to endorse or refute the findings of the present study.

Subject to the aforementioned limitations, the following conclusions were drawn from this study:

1. Correlation of the length of the thumb, ear length, width of palm, length of palm to the OVD was statistically significant.

2. The correlation between the length of the thumb and OVD was positive and strong in the whole population, and a stronger correlation was found.

3. There was a statistically significant but mild correlation between OVD and other measurements (ear length, width of palm, length of palm)

Moreover the VDO estimated using this method is within the range of 2-4 mm which is significantly less compared to other methods where a range of 0-14 mm is given. The methodology used in this study is practical and reasonable because it is simple, economic, non-invasive, reliable, requires measuring devices and provides values which can be reproduced for future reference Besides it does not require a great amount of time and experience to master which is another advantage it enjoys over previous methods. Class I malocclusion was mostly considered for the study and other skeletal or dental malocclusions were not measured, therefore this becomes a limitation of the study. Further the subjects were not categorized based on facial forms. It was problematic to measure the selected points on round facial profile with excessive soft tissue bulk under chin.

RESULTS:

On the basis of Spearman correlation coefficient test, it showed that there is significant correlation between vertical dimensions of occlusion maximum with thumb height, the p value is .000 and it correlation value is .619, then with ear height with the p value .000 with its correlation value as .555. , then with width of palm the p value is .000 and correlation value is .487 and then with length of palm the p value is .004 and correlation value is .161. Therefore the study shows that there is significant correlation between thumb height, ear length, width of palm, length of palm with vertical dimension of occlusion.

Color Plate-1

Fig.1 Materials used vernier calliper

Fig.2 measurement taken from vernier caliper for length of ear

Fig.3 measurement taken from vernier caliper for length of palm

Color Plate-2

Fig.4 measurement taken from vernier caliper for width of palm

Fig.5 measurement taken from vernier caliper for length of thumb

Fig.6 vertical dimension of occlusion of patient

Table-1 Value of width of palm, length of palm, thumb height, ear height, vertical dimension of occlusion

No	WP	LP	T H	E H	VDO
1	36.83	59.32	13.21	20.43	19.76
2	47.43	65.01	26.01	27	30.8
3	71.87	109.15	64.85	64.59	23.53
4	82	107.82	61.41	60.41	61.39
5	77.13	109.38	64.74	61.39	76.72
6	69.08	100.78	61.09	63.09	63.09
7	74.08	98.54	56.26	57.55	58.51
8	70.3	91.2	58.3	60.68	60.86
9	66.42	97.87	58.76	58.76	58.76
10	77.2	97.3	65.2	65.2	65.3
11	67.83	91.93	67.83	59.88	67.83
12	66.02	89.01	46.63	54.87	49.37
13	84.49	112.89	74.87	66.11	66.11
14	73.33	109.89	72.74	61.7	72.48
15	78	96	61	66	64
16	86.52	115	71.21	60.2	70.1
17	78	95	66	61	74
18	76	100	60	50	60
19	82.55	109.16	63.7	63.51	63.52
20	84.59	112.34	66.63	63.87	67.1
21	70.14	88.25	53.77	49.48	60.6
22	76	101	69	62	65
23	72	93	64	56	67
24	70	93	62	60	65
25	63.32	97.31	62.25	61.27	60.86
26	62.3	98.2	61.5	60.5	60.2
27	69.5	88.88	56.5	56.45	56.5
28	67.84	97.53	59.32	55.82	65.59
29	67.38	97.2	61.18	61.19	61.18
30	78.76	107	59.77	54.19	61.78
31	71.6	87.18	51.66	52.46	59.07
32	72.02	93.25	57.9	57.61	60.03
33	64.46	103	64.26	53.04	58.27
34	70	96.76	61.4	56.24	51.54
35	65.74	88.35	61.5	56.41	52.88
36	83.02	106	64.08	62.44	75.63
37	78	96	61	63	58
38	84	114	70	65	71
39	79.64	97.73	62.65	54.1	54.5

No	WP	LP	T H	E H	VDO
40	72	94	67	61	67
41	70.59	95.94	55.83	61.12	63.89
42	78	105	71	56	55
43	76	85	60	56	70
44	66.48	93.19	59.6	61.57	63.91
45	78	98	65	58	65
46	68	87	65	54	68
47	85	105	75	65	70
48	76	96	58	55	70
49	63.72	80.44	58.22	57.09	54.99
50	69	85	68	50	73
51	75	92	66	57	58
52	75	92	66	57	58
53	76	78	60	55	51
54	76	90	60	56	55
55	79	94	58	58.19	59
56	64.38	89.38	60.55	56.24	60.55
57	78	108	72	62	60
58	78	95	60	60	60
59	69.39	96.06	55.9	55.9	55.9
60	69.45	93.91	56.34	56.3	56.3
61	92	101	75	56	65
62	80	98	66	59	68
63	71.37	88.07	62.17	62.47	64.44
64	73	93	61	65	69
65	68.16	99.26	60.13	54.54	61.62
66	75.48	100.82	63.99	55.52	60.62
67	69.22	99.74	62.3	59.16	63.1
68	62.86	96.19	57.56	60.48	60.49
69	72.85	96.19	58.12	51.53	58.12
70	68.8	89.94	57.02	57.01	57.02
71	65.5	81.96	54.45	54.45	54.4
72	72	96	60	59	66
73	70	97	61	60	70
74	71	93	58	62	63
75	81	91	63	62	61
76	77	94	60	62	67
77	84	94	65	64	64
78	74	91	62	62	65
79	78	93	64	64	64

No	WP	LP	T H	E H	VDO
80	80	103	62	62	69
81	81	98	63	61	65
82	64	110	68	65	67
83	75	102	75	60	62
84	71	90	55	50	60
85	70	94	68	60	68
86	75.74	104.29	55.15	55.14	55.16
87	78	95	68	53	60
88	75	97	55	60	63
89	76	98	68	60	60
90	68	85	50	50	54
91	75	101	76	58	58
92	75	102	63	60	65
93	74.18	101.69	66.83	56.47	57.55
94	82.5	89.8	66.7	55.1	70.07
95	83	108	78	60	70
96	83.32	93.76	64.24	54.39	62.45
97	85	103	70	60	65
98	68	90	68	58	58
99	72.78	90.26	59.62	53.15	68.59
100	93.67	108.57	74.72	63.07	62.42
101	76	101.36	62.64	60.42	62.64
102	47.43	65.01	26.01	27	30.8
103	67.1	95.5	60.11	57.08	64.35
104	74.68	102.13	62.9	62.35	63.05
105	76.99	97.42	59.61	62.95	62.81
106	75.58	103.9	62.62	51.32	58.3
107	65.57	91.4	57.76	58.6	59.71
108	68.41	85.47	56.71	56.34	52.88
109	71.19	103.91	59.84	56.09	54.68
110	75.99	95.15	65.39	64.25	58.88
111	67.1	95.5	60.11	57.08	64.35
112	66.82	87.05	52.53	50.08	61.11
113	69.09	89.24	61.53	54.43	56.89
114	65.6	95.89	55.3	55.6	55.1
115	65.25	84.03	55.65	55.3	56.32
116	73.56	95.45	62.02	61.02	56
117	75.02	96.2	60.02	64.01	56
118	71.5	110.1	59.6	60.5	60.2
119	69.02	105	63.7	59.41	60.3

No	WP	LP	T H	E H	VDO
120	65	96	68	60	73
121	66	95	60	55	52
122	66	95	55	55	55
123	65	84	55	55	56
124	73	95	62	61	52
125	75	96	60	64	70
126	68	89	67	53	85
127	90	100	71	65	67
128	78	110	68	60	64
129	75.58	103.9	62.62	51.32	58.3
130	75	95	60	53	75
131	75	101	56	61	64
132	71.73	91.32	58.25	54.55	54.55
133	66	87	56	60	65
134	75	98	60	60	58
135	78	90	63	54	58
136	75	96	65	55	65
137	75	94	58	55	61
138	69	95	64	60	66
139	74.07	94.25	54.75	54.97	51.71
140	65	95	65	58	74
141	76	84	60	55	74
142	70.41	92.26	59.41	57.32	56.11
143	74	90	55	55	56
144	85	98	65	65	78
145	75	86	55	54	65
146	73	86	68	57	64
147	67.86	98.66	54.46	57.5	62.82
148	76	94	65	58	66
149	75	90	63	57	62
150	78	90	70	58	70
151	74	96	71	65	65
152	78	105	68	63	61
153	89	105	68	60	68
154	73	94	65	58	58
155	88	120	75	75	65
156	75	101	65	65	68
157	47	98	71	59	61
158	80	100	61	58	72
159	75	100	68	65	68

No	WP	LP	T H	E H	VDO
160	71	96	60	57	57
161	70	92	62	52	60
162	68	92	55	56	70
163	75	100	66	60	60
164	75	700	66	56	66
165	67	102	60	60	60
166	75	95	65	65	67
167	70	90	61	60	63
168	75	100	71	58	55
169	80	110	70	65	75
170	75	91	70	45	65
171	81	100	73	65	78
172	66.82	87.05	52.53	50.08	61.11
173	69.09	89.24	61.53	54.43	56.89
174	76.2	99.59	62.31	55.15	60.44
175	69.66	162.5	67.11	58.24	69.92
176	74.58	93.7	63.21	60.89	58.02
177	70	100	60	60	60
178	70	95	68	55	55
179	72	100	65	50	55
180	71.07	97.7	63.52	62.24	62.23
181	90	115	67	67	67
182	80	103	67	65	62
183	80.5	98.9	70.09	62.3	67.8
184	68	89	55	55	58
185	68	94	65	63	64
186	69.7	95.41	54.65	56.45	60.6
187	75.42	99.51	60.4	53.1	66.64
188	78.3	102	64.16	54.88	65.48
189	75	90	70	60	55
190	73	100	60	62	60
191	65	98	60	60	60
192	73	100	58	58	60
193	70	94	62	60	22
194	75	103	68	63	63
195	83	95	56	56	50
196	75	105	62	62	63
197	82	115	70	65	67
198	78	98	68	60	52
199	68	94	60	60	56

No	WP	LP	T H	E H	VDO
200	47.43	65.01	26.01	27	30.8
201	85	102	63	65	65
202	76.1	94.15	56.45	59.37	59.36
203	86.12	113.1	65.45	60.45	61.45
204	78	98	65	64	65
205	76.99	97.42	59.61	62.95	62.81
206	85.5	116.6	71.9	64.5	70.4
207	64	100	58	55.5	56.56
208	71.54	92.94	58.27	56.37	51.77
209	79	104	68	65	66
210	75	104	65	60	58
211	73.67	102.4	66.99	66.12	56.89
212	80	103	65	66	63
213	107.5	80.65	68.88	57.54	60.42
214	76	95	64	65	67
215	95	106	67	65	65
216	96	105	64	63	64
217	65.57	91.4	57.76	58.6	59.71
218	68.41	85.47	56.71	56.34	52.88
219	71.19	103.91	59.84	56.09	54.68
220	70	105	71	60	65
221	47.43	65.01	26.01	27	30.8
222	67.1	95.5	60.11	57.08	64.35
223	71.8	103.94	64.26	58.9	65.7
224	77.13	109.38	64.74	61.39	76.72
225	69.08	100.78	61.09	63.09	63.09
226	74.08	98.54	56.26	57.55	58.51
227	70.3	91.2	58.3	60.68	60.86
228	77.01	106.5	69.12	58.5	70.44
229	77.13	109.38	64.74	61.39	76.72
230	69.08	100.78	61.09	63.09	63.09
231	74.08	98.54	56.26	57.55	58.51
132	70.3	91.2	58.3	60.68	60.86
133	69.08	100.78	61.09	63.09	63.09
234	74.08	98.54	56.26	57.55	58.51
235	67.1	95.5	60.11	57.08	64.35
236	77.01	106.5	69.12	58.5	70.44
237	77.13	109.38	64.74	61.39	76.72
238	69.08	100.78	61.09	63.09	63.09
239	74.08	98.54	56.26	57.55	58.51

No	WP	LP	T H	E H	VDO
240	70.3	91.2	58.3	60.68	60.86
241	70.7	92.65	61.99	52.66	60.44
242	84	115.3	65.1	64.1	65.1
243	70	103.88	63.83	64.18	64.31
244	78.53	107.67	62.84	62.33	73.76
245	77.96	102.63	61.64	61.76	70.33
246	67.1	95.5	60.11	57.08	64.35
247	47.43	65.01	26.01	27	30.8
248	74.12	64.28	56.42	59.09	57.48
249	73.12	96.17	64.27	57.08	64.48
250	77.96	102.63	61.64	61.76	70.33
251	73.01	100.03	65.011	56.56	58.32
252	69.77	95.47	56.24	60.07	64.05
253	70.03	97.85	55.61	58.19	59.51
254	79.37	100.07	63.95	65.64	65.96
255	71.5	103.88	63.83	64.18	64.31
256	68.56	101.25	60.92	65.23	56.82
257	82.84	97.89	59.82	63.11	53.64
258	72.53	103.36	61.16	61.86	54.56
259	69	99.86	60.91	67.83	59.35
260	77.96	102.63	61.64	61.76	70.33
261	77.28	102.92	63.55	65.19	61.89
262	71.92	97.05	60.95	58.25	64.8
263	77.7	104.72	60.27	60.25	68.42
264	67.1	95.5	60.11	57.08	64.35
265	77.7	104.72	62.9	62.35	63.5
266	77.7	104.02	60.24	60.25	68.42
267	74.12	64.28	56.42	59.09	57.48
268	73.12	96.17	64.27	57.08	64.48
269	75.99	95.15	65.39	64.25	58.88
270	75.6	110.42	65.5	65.5	64.5
271	72.32	97.42	54.5	54.49	64.42
272	77.01	106.5	69.12	58.5	70.44
273	82.84	97.89	59.82	63.11	53.64
274	67.1	95.5	60.11	57.08	64.35
275	75.58	103.9	62.62	51.32	58.3
276	77.96	102.63	61.64	61.76	70.33
277	77.01	106.5	69.12	58.5	70.44
278	76.5	101.2	61.02	60.2	61.2
279	70.2	68.2	59.2	60.2	59.6

No	WP	LP	T H	E H	VDO
280	73.5	64.5	56.5	58.5	54.5
281	78.5	115.6	59.56	60.25	59.8
282	77.01	106.5	69.12	58.5	70.44
283	75.58	103.9	62.62	51.32	58.3
284	74.98	102.61	63.32	62.29	63.1
285	80	100.5	65.1	60.23	60.32
286	70.05	98.1	60.5	61.5	60.1
287	74.48	102.35	58.66	63.45	66.16
288	77.38	102.75	62.44	60.53	61.58
289	86.09	115.26	67.26	68.19	66.22
290	70.1	101.6	60.5	61.5	60.4
291	66.7	90.29	58.54	59.99	59.95
292	71.5	102.5	63.1	62.5	63.1
293	70.7	101.26	60.36	54.3	63.41
294	73.71	100.63	65.31	56.56	58.32
295	69.77	95.47	56.24	60.07	64.05
296	70.03	97.85	55.61	58.19	59.51
297	79.37	100.07	63.95	65.64	65.96
298	77.8	91.52	61.8	60.98	61.8
299	76	98	64	63	63
300	73.2	103.43	61.78	54.57	54.57
301	79.5	114.5	70.2	61.02	65.2
302	80.1	116.5	71.2	62.5	61.5
303	74.5	95.6	56.8	61.5	57.6
304	79	113	69.5	61.3	65.2
305	75.5	116.5	64.5	63.5	64.2
306	75.99	95.15	65.39	64.25	58.88
307	71.2	90.1	59.6	60.1	59.6
308	74	89.5	60.1	62.5	60.5
309	71.5	89.5	56.5	54.5	55.6
310	74.12	94.28	56.42	59.49	57.98
311	73.12	96.17	64.27	57.08	64.48
312	69.5	89.5	60.1	62.5	60.5
313	73.12	96.17	64.27	57.08	64.48
314	66.82	87.05	52.53	50.08	61.11
315	69.09	89.24	61.53	54.43	56.89
316	74.5	95.6	56.8	61.5	57.6
317	77.96	102.63	61.64	61.76	70.33
318	91.56	109.34	64.97	64.97	69.56

Table -2 Mean value& slandered deviationof WP, LP, TH, EH with VDO

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
WP	318	36.83	107.50	73.7072	7.43807
LP	318	59.32	700.00	99.2017	35.24688
TH	318	13.21	78.00	61.7392	7.28078
EH	318	20.43	75.00	58.6550	6.11597
VDO	318	19.76	85.00	61.6725	7.91289
Valid N (list wise)	318				

Table – 3 Correlation coefficient table of WP, LP, TH,EH with VDO

Correlations						
		WP	LP	TH	EH	VDO
WP	Pearson Correlation	1	.154**	.655**	.593**	.487**
	Sig. (2-tailed)		.006	.000	.000	.000
	N	318	318	318	318	318
LP	Pearson Correlation	.154**	1	.208**	.140*	.161**
	Sig. (2-tailed)	.006		.000	.013	.004
	N	318	318	318	318	318
TH	Pearson Correlation	.655**	.208**	1	.713**	.619**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	318	318	318	318	318
EH	Pearson Correlation	.593**	.140*	.713**	1	.555**
	Sig. (2-tailed)	.000	.013	.000		.000
	N	318	318	318	318	318
VDO	Pearson Correlation	.487**	.161**	.619**	.555**	1
	Sig. (2-tailed)	.000	.004	.000	.000	

	N	318	318	318	318	318
****. Correlation is significant at the 0.01 level (2-tailed).**						
***. Correlation is significant at the 0.05 level (2-tailed).**						

This table shows positive correlation on the basis of Spearman correlation coefficient test, it showed that there is significant positive correlation between vertical dimension of occlusion maximum with thumb height(p value .000)and it correlation value is .619 , then with ear height with the (p value .000)with its correlation value as .555. , then with width of palm the p value is .000 and correlation value is .487 and then with length of palm the (p value is .004) and correlation value is .161. Therefore the study shows that there is positive correlation between thumb height, ear length, width of palm, length of palm with vertical dimension of occlusion. Also, there is maximum correlation between VDO and Thumb height. Minimum correlation between VDO and length of the palm.

CONCLUSION

Within the limitation of the study &on basis of the results of the study, it can be concluded that there is correlation between vertical dimensions of occlusion with length of thumb, then with length of ear, in width of palm, length of palm. Maximum correlation is between VDO & thumb height and the order of decreasing correlation other parameters are as follows length of thumb, ear height, width of palm, length of palm.

So we can use the length of thumb measurement as VDO while patient having nose defect, or anomalies like cleft palate &or in hemi-mandibulectomy patients.

We can also use the other parameter ear height, width of palm, length of palm for determination of vertical dimension of occlusion to some extent.

This subjective method can be used along with any other method to determine the vertical dimension of occlusion.

REFERENCES

1. Ladda R, Bhandari AJ, Kasat VO. A new technique to determine vertical dimension of occlusion from anthropometric measurements of fingers 2013 Indian J Dent Res., 24(3), 316
2. Glossary of Prosthodontics Terms. 8th ed. J Prosthet Dent 2005; 94:10-85.
3. Turrell A. Clinical assessment of vertical dimension. J Prosthet Dent 2006; 96:79 -83.
4. Orthlieb J, Laurent M, Laplanche O. Cephalometric estimation of vertical dimension of occlusion. J Oral Rehabil 2000; 27:802-7.
5. Feldman S, Leupold RJ, Staling LM. Rest vertical dimension determined by electromyography with biofeedback as compared to conventional methods. J Prosthet Dent 1978; 40:216-9.
6. McGee GF. Use of facial measurements in determining vertical dimension. J

Am Dent Assoc 1947; 35:342-50.

7. Misch, CE. Objective vs. subjective methods for determining vertical dimensions of occlusion. Q International 2000;31:280
8. Angle EH: Malocclusion of the teeth and fracture of the maxilla(ed 6) Philadelphia,PA, SS publishing Co,1900,p15
9. Fayz F, Eslami A, Graser GN. Use of anterior teeth measurements in determining occlusal vertical dimension. J Prosthet Dent. 1987; 58(3): 317–322.
10. Silverman MM. The speaking method in measuring vertical dimension. *J Prosthet Dent*. 1953; 3(2): 193–199.) Swallowing method
11. Basler FL, Douglas JR, Moulton RS. Cephalometric analysis of the vertical dimension of occlusion. J Prosthet Dent. 1961; 11:831–835.)
12. Hull CA, Junghans JA. A cephalometric approach to establishing the facial vertical dimension. J Prosthet Dent. 1968;20(1):37–42
13. Fayz F, Eslami A. Determination of occlusal vertical dimension: a literature review. J Prosthet Dent. 1988; 59(3): 321–323
14. Bissau M. Pre-extraction records for complete denture fabrication: a literature review. J Prosthet Dent. 2004; 91(1): 55–58.
15. Misch ce. Measurements for determination of vertical dimension of occlusion in edentulous using accepted facial dimensions recorded from dentulous subjects. J Indian Prosthodontic Soc 2014; 14:233-42
16. Nagpal A, Parkash H, Bhargava A, Chittaranjan B. Reliability of different facial. Contemporary Implant Dent. St. Louis: Mosby, 1999.
17. Swenson MG. complete dentures. 4th ed. St. Louis: the C.V. Mosby Company;1959.p.125
18. Al-Dhaher HA, AL-Huwaizi AF. Determination of the vertical dimension by cranio-facial measurement using clinical and cephalometric analysis (comparative study). J Bagh College Dent 2009; 21: 44-7.