The validity of mucolabial reflection in determining occlusal vertical relation

Dr. Mohammed M. Mohammed Ali B.D.S, M.Sc. Dr. Abdalbasit Ahmed B.D.S, M.Sc Dr. Mohammed A. Abed Albaki B.D.S, M.Sc

Abstract

- **Background:** Different methods are being used in prosthodontics for determining occlusal vertical dimension. In this study the mucolabial reflection was used as a guide to measure the vertical distance of the maxillary and mandibular central incisors to the vestibules.
- **Materials and Methods:** A total sample of 45 subjects was studied that include (25 female and 20 male). Impression of the maxillary and mandibular arch was made with perforated tray using alginate impression material. Stone casts were made and the distance from the center of the incisal edge for maxillary and mandibular central incisors to the depth of the mucolabial reflection was measured. Also the distance from the depth of the maxillary to mandibular reflection with cast in centric occlusion was measured. The measurements were recorded by the use of a divider and boley gauge to the nearest 0.1 mm.
- **Results:** The mean distance from the incisal edge of maxillary central incisors to the mucolabial reflection was 21.1 mm for females and 21.8 mm for males while the mean distance from the mandibular central incisors to the mucolabial reflection was 16.6 mm for females and 16.9 mm for males. Also the mean distance from the depth of the maxillary to the Mandibular mucolabial reflections was 34.9 mm for females and 35.3 mm for males. No statistical significant differences were found between male and female measurements.
- **Conclusion:** The mucolabial reflection provides a good starting point for establishing a tentative occlusal vertical dimension. Also could help for a preliminary arrangement of teeth.

Keyword: Vertical occlusal dimension, teeth arrangements, teeth measurements.

Introduction

Vertical dimension is the distance between two selected points, one on the fixed and one on the movable member (maxillae and mandible) . While occlusal vertical dimension (OVD) is the distance measured when the occluding members are in contact.(1)

For a denture to be functionally and esthetically pleasing a correct OVD should be measured and established.(2)There are no universally accepted rules for determining the OVD in edentulous patients because of the wide range of physical characteristics among individuals(3)

Many authors (4 - 9) have used various techniques for determining OVD. Pre-extraction measurements from the incisal edge of the anterior teeth to the depth of the vestibule or from the maxillary to the mandibular vestibules have been suggested as a means of establishing vertical dimension complete for denture fabrication. (10 - 12)

Mc Grane(10) established a 40 mm occlusal vertical dimension for his patients, the basis for his assessment was the measurements from the mid maxillary to the mid mandibular labial freni. He speculated that the distance from the incisal edge of the maxillary central incisors to the labial vestibule adjacent to the maxillary labial frenum was 22 mm, the corresponding distance for the mandibular incisors was 18mm .The use of lateral cephalometric radiographs and a radiopaque paste to study the relation of natural anterior teeth to the mucolabial reflection was suggested by Ellinger (11). The results indicated an average distance of 20 mm from the maxillary tooth incisal edge to the upper reflection, and 16.33 mm from the lower reflection to the mandibular tooth incisal edge.

Fayz et al .(12) reported that the mean distance between the depth of the mucolabial reflection in the maxillae and mandible was 34.2mm in the right incisor region and 34.06mm in left incisor segment. The measurements were made on impression from 25 dentulous patients with the teeth in centric occlusion. According to this study, the mean distances from the depth of the mucolabial reflection to the incisal edge of the anterior teeth were 21.24and 21.28 mm for maxillary right and left central incisor and 16.54 and 16.78 mm for mandibular right and left central incisors.

The aim of the present study was to determine the relation of the mucolabial reflection to the maxillary and mandibular central incisors.

Materials and methods

The sample was selected from college of dentistry, University of Baghdad. А total of 45 Iraqi undergraduate students (25females and 20 males), the age range between (18-25) years were selected. They had all of their anterior teeth, without marked caries, restoration or artificial crowns. All had a posterior occlusal stop, and those who had undergone orthodontic treatment were excluded.

Each subject was seated on a dental chair, and impression of the maxillary and mandibular teeth were made with perforated trays using alginate impression material. The material was mixed according to the manufacturer's directions (one scoop of powder to one measure of water cylinder). A small quantity of the mixed material was applied on the mucolabial reflection of the upper and lower lip from the right to the left canine region, before the main bulk in the tray was inserted into the mouth in order to achieve more reproduction of accurate the mucolabial reflections. After the material had set, it was removed and inspected to be certain that no defect exist, especially at the mucolabial reflections.

The impression was poured immediately to avoid dimensional changes. A dental stone was used, and the casts were allowed to set, after setting of the casts, they were trimmed and washed. The following measurements were then made on the casts by using a divider, and Boley gauge to the nearest 0.1 mm (Fig 1,2,3).

- 1- The distance from the middle of the upper central incisor edge to the height of the mucolabial reflection of the upper lip.
- 2- The distance from the middle of the lower central incisor edge to the depth of the mucolabial reflection of the lower lip.
- 3- The maxillary and mandibular casts were closed in centric occlusion, and the distance from the height of the

mucolabial reflection of the upper lip to the depth of the mucolabial reflection of the lower lip at the middle of the central incisors were measured.

A divider measured all the distances, the pointed ends of the divider was punched on a cardboard, then measured with Boley gauge. (Fig. 4)

The mean values for the measurements were calculated, and used for statistical analysis.

Results

Mean standard deviation and ranges were calculated. Table 1 shows that the range of distance from the center of incisal edge of the maxillary central incisors to the mucolabial reflection in female was from "17.4 mm-25.4 mm", while in male from "18.4 mm-32.1 mm". In addition (Table 1) and (Fig. 5) show that the mean distance for female was "21.1 mm" while for male as" 21.8 mm". Also Table 1 show the range of distance from the center of incisal edge of the mandibular central incisor to the mucolabial reflection in female was from "12.9 mm-22.6 mm" and in male from "14.2 mm-20.3 mm". The mean distance for female was "16.6 mm" and for male "16.9 mm" as shown in (Table 1) and (Fig. 5).

The range of distance from the depth of the maxillary to the mandibular mucolabial reflection in female was from "28.8 mm-44.5 mm" and for male from "30.6 mm-42.2 mm" as shown in (Table 2). The mean distance for females was "34.9 mm" and for male "35.6 mm" (Table 2) and (Fig. 5). Measurements of the total sample were also calculated as shown in (Table 1 and 2).

The data of the male and female was subjected to statistical t-test (Table 3). No significant sex related difference was noted in any of the measurements (P>0.05).

Discussion

The mucolabial reflection is a useful reference because it approximates the border of the denture. It can be used as a guide in the anteroposterior positioning of the anterior teeth and in determining the vertical distance of the teeth from the vestibules.

In the present study, the mean distances of the maxillary mucolabial fold to the incisal edge of the maxillary central incisors was "21.5 mm" and the mean distance of the mandibular mucolabial reflection to the incisal edge of the mandibular central was "16.7 mm". The mean distance from the maxillary to the mandibular mucolabial reflection in the region of the central incisor was "35.3 mm" .This comes in agreements with the finding of Fayz et al (12) who reported that the mean distance from the depth of the mucolabial reflection to the to the incisal edge of the maxillary and mandibular central incisors was "21.2 mm and 16.5" mm respectively.

The mean distance between the depth of the mucolabial reflection in the maxilla and mandible was "34.2 mm" in the maxillary central incisor region. According to Ellinger (11), the distance from the depth of the vestibule to the incisal edge of central incisors is "20 mm" in the maxilla and "16.33" mm in the mandible. The results of the present study also agree with the findings of Ellinger. However, a significant difference can be seen with McGrane's (10)Findings, who reported that the average distance between the maxillary and mandibular labial fold adjacent to the labial freni was "40 mm". He also found that the distance from the incisal edge of the maxillary central incisors to the labial vestibule adjacent to the maxillary labial frenum was "22 mm", the corresponding distance for the mandibular central incisors was "18 mm". The difference between McGrane's findings and this study may be because the vertical overlaps of the anterior teeth were not measured in McGrane's study and the impression materials and tray were different.

The findings of this study could help for initial establishment of OVD at approximately "35.5 mm" from the mucolabial reflection in the region of the maxillary and mandibular central incisors. Also the result of this study may help in preliminary arrangements of the maxillary and mandibular central incisors. The distance from the border of the denture to the edge of the maxillary central incisors would be approximately "21.5 mm". The mandibular central incisors would be set at "16.5 mm" from the mandibular denture border to the incisal edge.

This would be a tentative determination of OVD made and tooth position. However the final determination of OVD and correct tooth position must be at the try-in appointment when esthetics, phonetics and other factors are evaluated for each patient.

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Table 1	l Distance	from the	center of	of the	incisal	edge	for the	maxillary	and	mandibu	lar
	central inc	cisors to th	he depth	of the	e muco	labial 1	reflection	on.			

	Tooth No.	Mean (mm)	Std. Deviation	Minimum	Maximum
Female	Max. Central	21.16	2.18	17.4	25.4
	Mand. Central	16.66	2.14	12.9	22.6
Male	Max. Central	21.87	2.92	18.4	32.1
	Mand. Central	16.91	1.57	14.2	20.3
Total	Max. Central	21.51	2.55	17.4	32.1
	Mand. Central	16.78	1.85	12.9	22.6

Table 2 distances from the depth of the maxillary to the mandibular reflection with casts in centric occlusion.

	Mean (mm)	Std. Deviation	Minimum	Maximum	
Female	34.97	3.88	28.8	44.5	
Male	35.63	3.01	30.6	42.2	
Total	35.31	3.44	23.8	44.5	

Table 3 T-test between males and females measurements

Variables	Male	Female	T value	P value	Sig.
Max.CI/Max. R	21.87	21.16	0.037	0.971	N.S.
Mand. CI/ Mand. R	16.91	16.66	346	.733	N.S.
Max. R/Mand. R	35.63	34.97	326	.748	N.S.

Max.CI: Maxillary central incisors Mand. CI: Mandibular central incisors Max. R: Maxillary mucolabial reflection Mand. R: Mandibular mucolabial reflection



Figure. 5: Mean distance from the incisal edge of the maxillary and mandibular central incisor to the depth of the mucolabial reflection and between the depth of the maxillary and mandibular mucolabial reflection



Figure 1: Distance from the center of the incisal edge for the maxillary central incisors to the depth of the mucolabial reflection



Figure 2: Distance from the center of the incisal edge for the mandibular central incisors to the depth of the mucolabial reflection.



Figure 3: Distance from the depth of the maxillary to the mandibular reflection



Figure 4: The pointed ends of the divider was punched on a cardboard, then measured with Boley gauge