

Role of Mucobuccal Sulci in Determination of Occlusal Vertical Dimension in Dentate Subjects

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ABSTRACT

Aim: To find out the distance between the mucobuccal sulci of maxillary and mandibular arches and the cusp tips of posterior teeth and evaluate the occlusal vertical dimension in dentate subjects.

Study Design: Cross sectional observational study.

Place and duration: Prosthodontic department of Lahore Medical and Dental College, Lahore, from 2nd September 2022 till 2nd December 2022.

Methodology: A total of 45 dentate subjects including 20 males and 25 females were selected. Alginate impressions (irreversible hydrocolloid) of both arches were taken in stock trays. Impressions were poured in hard plaster and stone casts were fabricated. Digital vernier caliper with accuracy of 0.01mm was used for recording the distance from the depth of mucobuccal sulci of both arches to the cusp tips of all posterior teeth of the respective arches. The distance from maxillary mucobuccal sulcus to the mandibular mucobuccal sulcus in maximum intercuspation was also calculated.

Result: The distances measured from the maxillary mucobuccal sulcus to the buccal cusp tips of maxillary first premolar, second premolar and first molar were found to be 16.86mm; 15.94mm, and 15.45mm respectively. The distances measured from the mandibular mucobuccal sulcus to the buccal cusp tips of mandibular first premolar, second premolar and first molar were 17.02mm, 15.14mm and 14.26mm respectively. The mean distance recorded from the depth of maxillary and mandibular sulci in maximum intercuspation positions showed shortest distance at first molar area i.e.; 26.88mm as compared to the distance found in first premolar 35.22mm and second premolar 35.63mm areas.

Conclusion: The mean distances recorded between maxillary and mandibular sulci in intercuspation position were 35.22mm, 35.63mm and 26.88mm respectively. These values may be helpful in determination of occlusal vertical dimension by selecting appropriate teeth and shaping occlusal rims while fabricating complete dentures

Keywords: Dentate, Dental arch, Mucobuccal sulcus, Maxilla, Mandible, Occlusal vertical dimension, Posterior teeth.

INTRODUCTION

Edentulism is a term used for patients with complete loss of teeth¹. Edentulous patients' rehabilitation procedures are quite complicated and challenging^{1,2}. Complete dentures are the most frequently made prosthesis for an edentulous patient to restore patients' esthetics, functional and social needs.¹⁻³ The fabrication process of a complete denture demands high accuracy in all its steps of fabrication³.

Recording and establishing an accurate occlusal vertical dimension is among one of these procedures that should precisely be carried out in order to avoid functional and esthetic failure⁴. Vertical dimension of occlusion by definition is the distance measured between two selected points when occluding members are in contact⁵. After tooth extraction or loss of teeth this vertical distance is lost and dentist needs to find out the accurate vertical height at which patient not only efficiently masticate, swallow, speak but also have an esthetically pleasing look^{5,6}.

Maxillomandibular relationships like horizontal and vertical relations are determined in an edentulous patient before teeth setup.⁷ Record basis and wax occlusal rims are made on master cast for recording precise relations^{6,8}. Occlusal rims are constructed on record bases or permanent denture bases to be used in recording jaw relations and for teeth arrangements⁸. They are shaped and trimmed to the accurate vertical height of the patient's mouth. Incorrect recording of vertical dimension can result in increasing or decreasing occlusal vertical dimension⁹. An increased vertical result in muscle cramping, mouth fullness, difficulty in speech, swallowing and mastication¹⁰. In few individuals' temporomandibular joint problems and associated muscular spasm has also been reported due to increased vertical

height. Similarly, a decrease vertical results in deepening of facial folds, poor mastication, tongue biting and development of deep folds at the corner of mouth resulting in angular cheilitis¹¹.

Many methods have been documented in literature for registering the accurate vertical dimension but none has universal acceptability^{11,12}. The reason could be explained on the basis of the variation existing in the physiological characteristics of the individual across the world¹⁰⁻¹². Various methods including pre-extraction records, phonetic method, cephalometry and facial measurements have been used as useful tools in recording accurate vertical dimension. None of the above methods is accurate and every method has its limitations^{10,12}.

Pre-extraction records are said to be inexpensive, stable and reusable records^{9,11,12}. Few old studies have taken preextraction measurements from anterior region to determine occlusal vertical dimension¹³.

The aim of the current study was to determine occlusal vertical dimension taking in account the parameters obtained from posterior natural dentition. If some preextraction measurements could be used in dental laboratory during occlusal rim construction that will aid in restoring loss occlusal vertical dimension in simple and inexpensive way. The objective of the current study was to find out the distance between the mucobuccal sulci of maxillary and mandibular arches and the cusp tips of posterior teeth and evaluate the occlusal vertical dimension in dentate subjects.

METHODOLOGY

It was a cross sectional observational study that was carried out in Prosthodontic Department of Lahore Medical and Dental College from 2nd September 2022 till 2nd December 2022. A total of 45 dentate subjects i.e.; 20 males and 25 females were selected between age ranged from 20 to 35 years. The participants were the students, house officers, and supporting staff of the same

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college. Subject's selection was done by non-probability purposive sampling. The sample size was calculated from a previous study on determination of occlusal vertical dimension in dentate patients.¹⁴ The inclusion criteria for the sample selection were set and subjects with full sets of healthy dentitions in both arches were included in the study. All subjects were free of gum diseases, gingivitis, periodontitis and without inflammation of mucobuccal sulci in both arches. Those having signs of attrition, erosion, cusp fractures, gingival recession and vertical loss were excluded. Subjects with a history of orthodontic treatments and any surgical intervention were also not selected. Informed consent was taken from all the participants. Ethical approval was obtained from Ethical Committee of the institution.

All participants were asked to sit comfortably in the dental chair. Demographic information like age and gender was recorded. Intraoral examination was carried out by the principal investigator. Health of oral tissues, mucosal health of sulci of both arches, gingival health and teeth was evaluated. Alginate impressions (irreversible hydrocolloid) of both arches were taken in stock trays after carefully selecting their sizes. Impressions were checked for the complete recording of mucobuccal sulci in both maxillary and mandibular arches. Impressions were poured in hard plaster and stone casts were fabricated. Digital vernier caliper with accuracy of 0.01mm was used for recording the distance from the depth of mucobuccal sulci of both arches to the buccal cusp tips of all posterior teeth of the respective arches. The distance from maxillary mucobuccal sulcus to the mandibular mucobuccal sulcus in maximum intercuspation was also calculated. The data was entered and analyzed in SPSS version 20. Mean, SD, ranges and coefficient of variance (CV) was found out for all the measurements.

RESULTS

A total of 45 subjects were included in the current study. 20(44.4%) males and 25(55.6%) with the age ranged from 20 to 35 years were recruited for the study. The mean age of the subjects was 26.33 years ±SD 3.94. The distance measured from the maxillary mucobuccal sulcus to the buccal cusp tips of maxillary first premolar was found to be 16.86mm;SD±1.33. The distances measured from maxillary mucobuccal sulcus to the buccal cusp tip of maxillary second premolar and first molar were 15.94mm;±SD0.925, and 15.45mm ±SD 0.623 respectively (Table I). The range of mean distances from the maxillary mucobuccal sulcus to the buccal cusp tips of posterior teeth was recorded (Table I).

The mean distances recorded from the depth of mandible buccal sulcus to the buccal cusp tips of mandibular posterior teeth, Table II. The distance measured from the mandibular mucobuccal sulcus to the buccal cusp tips of mandibular first premolar was found to be 17.02mm,±SD 0.861. The distances measured from mandibular mucobuccal sulcus to the buccal cusp tip of mandibular second premolar and first molar were 15.14mm, ±SD 0.789, and 14.26mm, ±SD 0.797 respectively (Table II). The range of mean distances from the mandible mucobuccal sulcus to the buccal cusp tips of posterior teeth was recorded (Table II).

The mean distance recorded from the depth of mandibular and maxillary mucobuccal sulci was shown in Table III. The distance recorded in first molar area was shortest i.e.; 26.88mm, ±SD 34.03 as compared to the distance found in first premolar 35.22mm ±SD 1.51 and second premolar 35.63mm, ±SD 1.94 areas (Table III).

Table I: Distance between maxillary mucobuccal sulcus and buccal cusp tips of posterior teeth. (N=45)

Tooth	Mean distance mm	Range mm	SD mm	CV %
First premolar	16.86	15-20	1.33	1.79
Second premolar	15.94	14-18	.925	0.86
First molar	15.45	14-17	.623	0.38

Table II: Distance between mandibular mucobuccal sulcus and buccal cusp tips of posterior teeth. (n=45)

Tooth	Mean distance Mm	Range Mm	SD Mm	CV %
First premolar	17.02	15-19	.861	0.74
Second premolar	15.14	13-16	.789	0.62
First molar	14.26	12-15	.797	0.63

Table III: Distance between maxillary and mandibular mucobuccal sulci (n=45)

Tooth	Mean distance mm	Minimum distance mm	Maximum distance mm	SD
First premolar	35.22	32.01	40.01	1.51
Second premolar	35.63	31.08	39.08	1.94
First molar	26.88	23.05	34.03	3.27

DISCUSSION

Occlusal vertical dimension must be accurately measured for an acceptable complete denture prosthesis¹³. The current study was aimed to find out a simple and constant pre -extraction method for accurate determination of occlusal vertical height of a patient. The study focused on using posterior determinants i.e.; height of posterior teeth in relation to the depth of mucobuccal sulcus. The distances recorded in maxillary first premolar, second premolar and first molar were 16.89mm, 15.94mm and 15.45mm respectively. Nuran Dinckal¹⁴ and coworker reported this distance to be 19.82mm, 19.13mm and 17.22mm. These findings were in accordance with the results obtained in the current study. The minor difference of values could be due to the difference in anatomical reference points. They used buccal tubercle as the reference point where as in the current study buccal cusps tips were considered as a point of reference. The distance recorded from mandibular mucobuccal sulcus to the tip of mandibular posterior teeth were slightly low as compared to those measured by Nuran¹⁴ and coworker. The recorded first premolar, second premolar, and first molar distances were 17.887, 17.78 and 16.42mm, where as in current study these values were found to be 17.02mm, 15.4mm and 14.26mm respectively.

Very less literature was found in relation to the posterior teeth however McGran¹⁵ reported 40mm distance for his patients. Speculated distance from central incisal edge of maxillary central incisor to the mucobuccal sulcus was found to be 22mm and maxillary central incisor distance from maxillary sulcus was 18mm in his respective study. Similarly, Fayz¹⁶ et al reported slightly less measurement as recorded by McGrane¹⁵. The distance calculated on right and left sides from central incisors to the mucobuccal reflection was 34.2 and 34.06mm.

Mucobuccal sulcus is the point at which the lip or cheek mucosa turns to go towards the gum tissues. The mean distance recorded between mandibular to maxillary mucobuccal sulcus was 35.22mm, 35.63mm and 26.88mm. This distance was almost same as recorded by Nuran¹⁴ and coworker. They recorded 35.39mm, 34.67mm and 31.93mm distance in both sulci. Minimum distance recorded in their study was 30.4, 27.2 and 27.7mm however the minimum distance calculated in our study was 32.01mm and 23.05mm. Guldag¹⁷ et al calculated the mean distance between sulci and reported 37.05 in right central incisor region and 36.89 in left central incisor region. However, the distance in right and left canines on the other hand were 39.70 and 39.89. The variation in the measurements of different teeth confirmed the anatomical individuality of each patient. Precise recording of vertical dimension ensures the possibility of fabricating a well-constructed denture fulfilling patient's esthetic, functional and social requirement. Very less literature is available on such topics and no such study has been found in Pakistan.

The results of the current study could be helpful to the practitioners in formulating some guidelines for recording accurate vertical dimension and will be of use in establishing accurate vertical dimension by altering occlusal rims and teeth selection

during arrangement of artificial teeth while fabricating complete dentures.

CONCLUSION

The mean distances recorded between maxillary and mandibular sulci in intercuspal position were 35.22mm, 35.63mm and 26.88mm respectively. These values may be helpful in determination of occlusal vertical dimension by selecting appropriate teeth and shaping occlusal rims while fabricating complete dentures

Authors/contribution: KQ: Statistical analysis/ Data collection, SHAR: Data collection, KSN: Literature search, AM: Manuscript writing, TH: Literature review, WA: Conceived idea, SN: Manuscript final reading/Design research
Conflict of interest: Nil

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