Journal of Pharmaceutical Research International

32(43): 78-86, 2020; Article no.JPRI.64674
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Evaluating Distance between Vibrating Line and Fovea Palatinae in Class I, Class II and Class III Soft Palate Types

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Authors' contributions

This work was carried out in collaboration among all authors. Author BK collected data and wrote the protocol. Authors MA and AN designed the study and managed analysis. Author NK performed the statistical analysis and author SA wrote the first draft of the manuscript. Author MAL managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2020/v32i4331073
Editor(s):
(1) Dr. Q. Ping Dou, Barbara Ann Karmanos Cancer Institute, Wayne State University, USA.
Reviewers:
(1) Enrique Bernardo Rotemberg Wilf, Uruguay.
(2) Jamille Silva Nogueira, State University of Campinas, Brazil.
Complete Peer review History: http://www.sdiarticle4.com/review-history/64674

Original Research Article

Received 10 November 2020
Accepted 15 January 2021
Published 27 January 2021

ABSTRACT

Objective: The objective of this study was to evaluate the mean distance between the vibrating line and fovea palatinae in Class I, Class II and Class III Soft Palate types.
Methodology: This study was conducted at Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences Karachi among 197patients. Duration of study was six months. All patients were

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examined for vibrating line clinically, assessed using phonation method. Subsequently, distance between vibrating line and fovea paltatinae was measured with uncalibrated compass in various contours of soft palate.

Results: Out of 197 patient, the vibrating line was seen in130 (64%) anterior to fovea palatinae, whereas, 67 (34%) vibrating line was at the fovea palatinae. The mean distance of those anterior located vibrating line from fovea palatine was calculated as 2.13 (±0.82) mm in Class, 2.07 (±0.69) mm in Class II and 1.80 (±0.82) mm in Class III soft palate contours.

Statistical analysis showed no significant between gender, while statistically significant difference among age group and mean distance of anterior located vibrating line from fovea palatinae were found.

Conclusions: The mean distance of vibrating line which is predominately found anterior to the fovea palatinae was 2.07 (±0.77) mm.

Keywords: Distance; vibrating line; fovea palatinae; soft palate contours.

1. INTRODUCTION

Edentulisim is the state where patient does not possess any natural tooth [1]. Despite an expected decrease in the rates of edentulousness with age, still a large group of patients will require complete dentures [2]. Treating edentulous patients with complete denture is demanding task and its success depend upon proper retention, stability and support of prosthesis [3]. Complete denture retention is attained by physical forces; mostly through seal like a valve in between the mucosa and peripheral border of complete denture, that prevent liquid and air trapping under the denture [4]. However, the peripheral seal could be problematic, as sometimes, it is not successfully achieved across the post dam area of the maxilla, thus more attention required while dealing with this step of complete denture fabrication [5,6]. This kind of seal at the palatal part of maxillary complete denture posteriorly require distinctive attention during its extension, because soft tissues in this specific area of oral cavity varied widely in contrast to the sulcus tissues of labial and buccal region [7]. The extension of maxillary denture posteriorly at post dam plays major role in retention and comfort of patient and the establishment of posterior palatal seal is difficult during making impression [8,9].

In clinical literature, soft tissues displacement is considered as the precarious factor which determines the post dam seal at the junction of hard and soft plate. However, a little attention is paid towards the neurophysiologic and psychologic concerns in connection to the extension of the post dam of maxillary complete denture [10]. Adjacent to vibrating line of soft palate, fovea palatinae are noticeable clinically as small pointed depressions of the mucosa near to the midline at the hard and soft palate junction, Such structures are also considered as guide for finding the appropriate extension of the maxillary denture [3].

Clinicians often prefers the posterior extension of upper complete denture up to the vibrating line [11]. The vibrating line is taken as an imaginary line on the soft palate and is prominent while the functioning of movable tissues, [1] and reliant on visual observation [12]. In Practice, the common methods for evaluating the vibrating line and post dam are phonation “ah” sound, swallowing, palpatory method using a T burnisher and nose-blowing or valsalva maneuver [3,11-17].

Since patients have varying the soft palate contours, thus location of vibrating line is likely to vary accordingly [18]. Furthermore, movement of soft palate and displacement of the mucosa at post dam area vary from person to person [7]. Millsap CH classified soft palate contours in three classes on the basis of angle between the soft and hard palate. Class I Soft palate is quite horizontal and makes a 10 degree of angle with respect to hard palate, class II descends and make a 45 degree angle, whereas, class III moves down and make an angle with the hard palate at 70 degree [19].

The surveys conducted by Rashedi and Petropoulos [20] in different dental institutes and their results revealed that majority of schools were utilizing phonation method and recording the vibrating line and same was being used as a limit for extension of maxillary denture. A Pakistani research group conducted similar type of survey in the dental colleges of Pakistan and they stated that most of instructors were utilizing phonation “ah” sound method and others methods for vibrating line and majority adopted

the concept of one vibrating line for creating the post dam seal and subsequent extension of the upper complete denture posterior to the vibrating line [21]. While Silverman [10] suggested that an extension of post dam seal of maxillary denture at average distance of about 8.2 mm could be chosen just posterior to the vibrating line.

On clinical, radiographic and histologic examination, investigators observed a mean distance of 1.31 mm between fovea palatinae and the vibrating line [22]. In another similar kind of study, researchers found the fovea palatinae at the vibrating line in 25% of the subjects. Whereas, in rest of the study participants, fovea palatinae was observed posterior to the vibrating line at mean distance of 2.71 mm [11].

A clinical study in edentulous patients by Keng SB and Ow R [23] revealed that the mean distance of the vibrating line anterior to the fovea palaninae of Class I, Class II and Class III soft palates contours were 4.02(±1.3 1) mm, 2.30 (±1.23) mm and 0.89 (±0.95) mm respectively and they also highlighted a significant correlation of distance between vibrating line and fovea palatinae in varying soft palate contours. To the best of authors' knowledge, this kind of study has not been carried out in Pakistan. Thus, this study is aimed to determine mean distance of the vibrating line with respect to fovea palatinae in different classification of soft palate. The findings of this research study would help clinicians during the placement of posterior border of maxillary denture in our setting.

2. METHODOLOGY

This descriptive study was carried out at department of Prosthodontics Dr. Ishrat-ul- Ebad Khan Institute of Oral Health Sciences, Karachi. Duration of study was six months from January to June 2013. The study was done after receiving synopsis approval from the Research evaluation Unit of CPSP (CPSP/REU/DSG-2011-217-853). Sample size was 197 patients. A Consecutive sampling technique was used in data collection of both gender from 20 to 60 years age range of patient, had healthy pink color mucosa at palate and along with clinically clear visible fovea palatine were selected. Whereas, patients of maxillofacial trauma and surgery, congenital and acquired maxillofacial defects, any pathology of palatal mucosa and without clinically visible fovea palatinae were excluded from the study. Patients were distributed into four age groups. Group A: 20-30 years, Group B: 31-40 years, Group C: 41-50 years and Group D: 51-60 years.

All selected patients were comfortably seated with their head in an upright position on the dental chair and were ask to open the mouth wide enough, subsequently examination for the clear visible fovea palatine on the palate was carried out and then soft palate contours classification was observed visually. Millap[19] classification of soft palate contour was employed in this study. After visual examination of fovea palatinae and contour of soft palate, the mucosa of palate was dried out with the help of gauze swab 2 X 2 cm and then patients were instructed to say "ah" sound in short bursts in a normal unexaggerated fashion frequently in order to practice the "Ah" sound for vibrating line. After the pronunciation of "ah" sound soft palate moved up, then position of vibrating line and fovea palatinae were marked with an indelible pencil (STAEDTLER karat aquarelle made in Germany). This method was carried out twice so as to validate the precision of markings.

An uncalibrated compass was used for measurement the distance between the vibrating and midpoint of fovea palatinae. This measurement was then checked on metric ruler/scale of stainless steel and recorded in millimeters. In order to be consistent, each measurement was noted three times and from these three results, a mean value was calculated to establish the consistency of measurement. All records were entered into structured proformas along with patient's demographic details.

All measurements are recorded by one researcher under the supervision of clinical supervisor.

Data entry and analysis was carried out with (SPSS) 16.0 version. The patients mean age were calculated. Frequency and percentage were calculated with regard to gender, age group and mean distance between vibrating line and fovea palatinae in class I, II and III soft palate types. In addition, statistical stratification was carried out for age and gender with the distance of vibrating line from fovea palatinae. ANOVA and t- test were applied to observe the significant difference. P value = 0.05 was taken as significance.

3. RESULT

Among 197 patients, the number of male and female patients was 58.4% and 41.6% respectively. The mean age of participated patient was 40.11 (±12.039) years. Frequency

and percentage of age groups are shown in (Fig. 1). Anterior location of vibrating line to fovea palatinae was 130 (66%) of patients, whereas, in the remaining 67 (34%) participants vibrating line appeared at the fovea palatinae. Since, the thickness of marked line with indelible pencil used in this study was about 0.5 mm, therefore, the location of vibrating line of those 67(34%) participants within 0 to 1 mm distance to fovea palatinae was taken as either at or corresponded with the fovea palatine.

The mean distance between anteriorly located vibrating line and fovea palatinae for 130 patients was 2.07 (±0.77) mm. Soft palate contours of class I, II and III exhibited the mean distance between vibrating line and fovea palatinae as 2.13 (±0.82) mm, 2.07 (±0.69) mm and 1.80 (± 0.82) mm respectively (Table 1).

The distance between vibrating ling and fovea palatiane of different soft palate contours in 130 patients is presented in (Table 2).

Statistical analysis of variance revealed no significant difference between mean distance of anteriorly located vibrating line from fovea palatinae in both genders (p= 0.628) (Fig. 2), while statistically significant difference among age group with regard to mean distance of anterior located vibrating line from fovea palatinae was identified p=0.002 (Fig. 3).

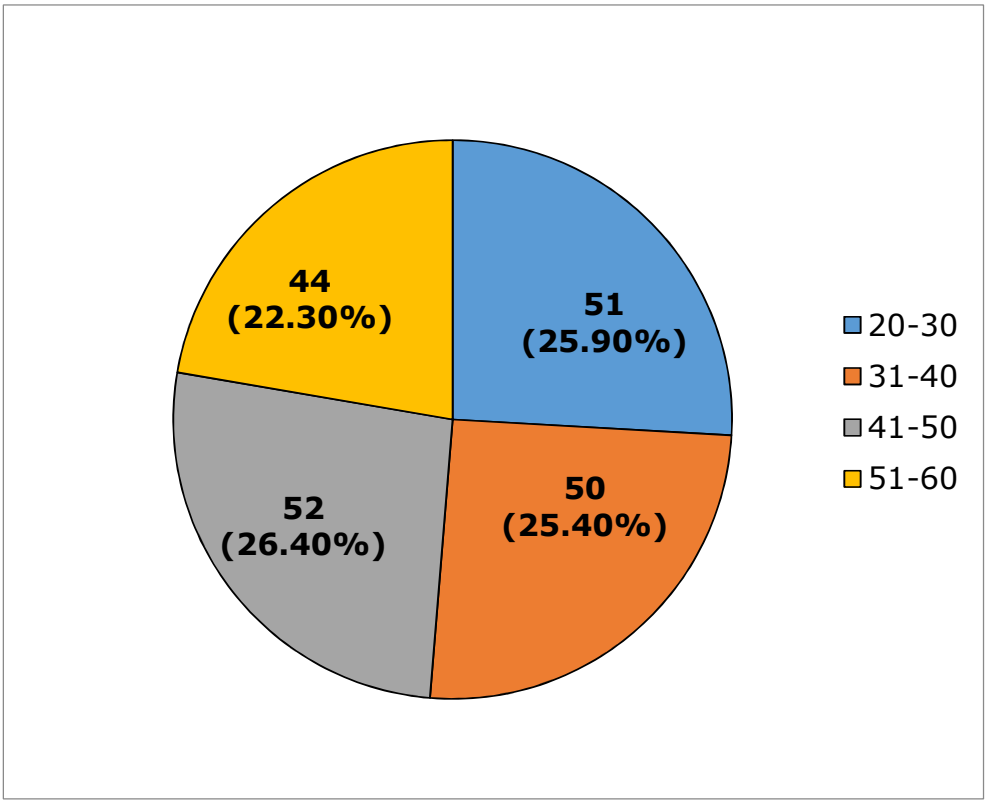

Fig. 1. Frequency and percentage of age group

Table 1. Mean distance of anterior located vibrating form fovea palatinae in different soft palate contours

Soft palate contours	N	Mean	Std. Dev
Class I	64	2.13	±0.82
Class II	51	2.07	±0.69
Class III	15	1.80	±0.82
Total	130	2.07	±0.77

Table 2. Frequency and percentage of distance of vibrating line to fovea palatinae in different soft palate contours

Soft palate contours		Distance of Vibrating Line anterior to Fovea palatinae					Total
		within 1 mm	within 1-2 mm	within 2-3 mm	within 3-4 mm	within 4-5 mm	
	Class I	2 (3.12%)	19 (29.68%)	29 (45.3%)	10 (15.6%)	4 (6.25%)	64
	Class II	0 (0%)	19 (37.25%)	22 (43.1%)	9 (17.64%)	1 (1.96%)	51
	Class III	0 (0%)	8 (50.33%)	5 (33.33%)	1 (6.66%)	1 (6.66%)	15

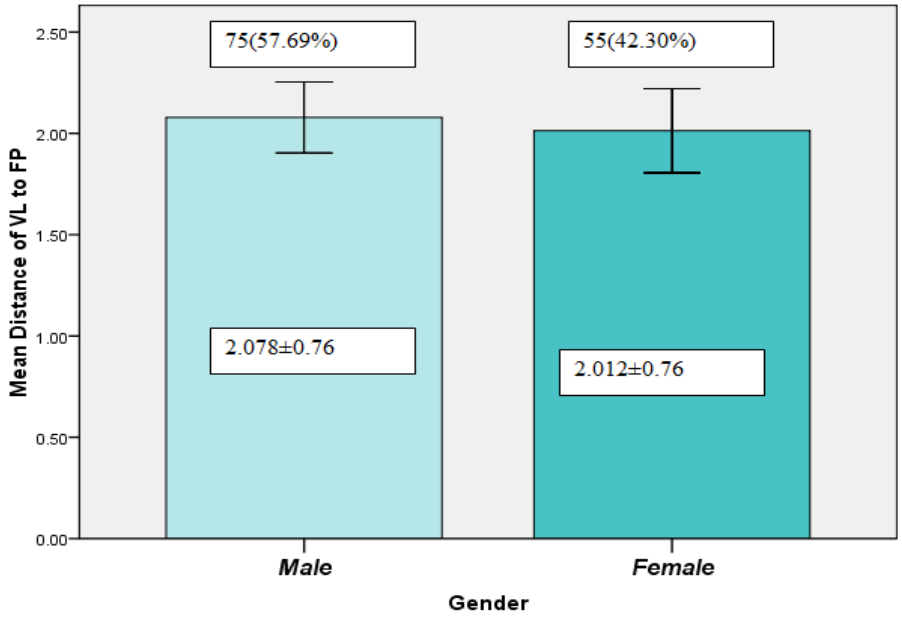

Fig. 2. Relationship of gender with mean distance of anterior located vibrating line from fovea palatinae (p = 0.628)

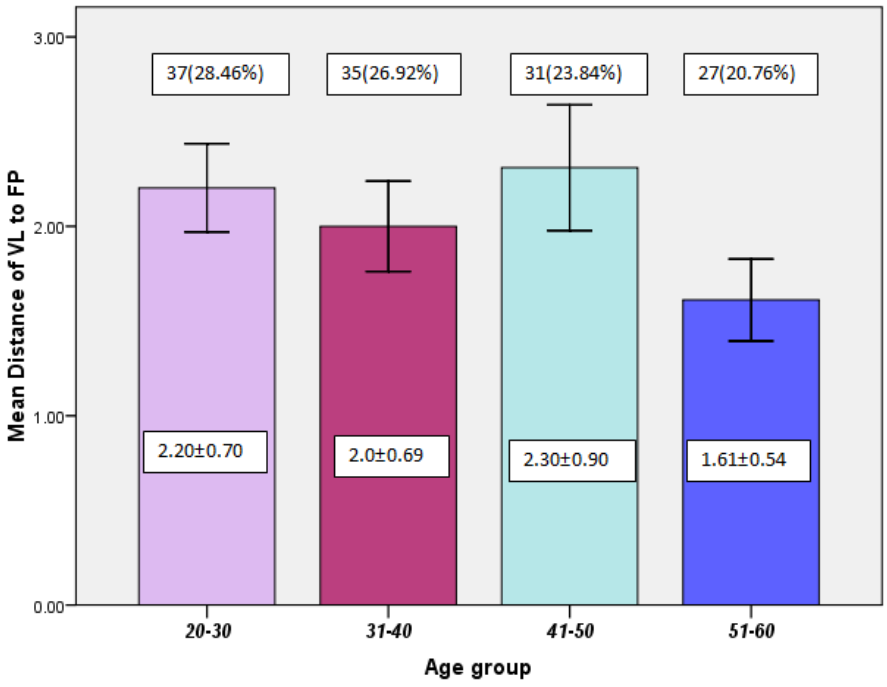

Fig. 3. Relationship of age with mean distance of anterior located vibrating line from fovea palatinae (p = 0.002)

4. DISCUSSION

Complete denture is common treatment option, despite advancement of treatment such as implant for edentulous patients, careful procedures of complete denture therapy have to be monitored to ensure the its successness [13]. A complete denture treatment can only be considered successful when it gains patients acceptance and fulfills patient's functional needs. Such success mainly relies upon the retention of denture; hence denture should be in retention whilst function [3]. Adequate seal is required for good retention of the maxillary complete denture which is mainly achieved along the compressible tissues of posterior border located slightly distal to the hard palate. However, lack of maxillary complete denture retention is well evident and it may be attributed to improper utilization of the anatomical and physiological landmarks and also inaccuracy while recording the posterior palatal seal [24].

Fovea palatinae and vibrating line are useful for extension of posterior border of maxillary denture [11]. The location of vibrating line varies with different soft palate contours [25].

The phonation "ah" sound method for vibrating line of palate is used in this study, which is convenient, mostly taught and used in USA, Canada schools and also in our Pakistani dental institutes [20,21]. Research work by Lye TL [22] reported that the vibrating line is positioned 1.31 mm (mean) posterior to foveae palatinae. In another study, Chen [11] utilized the nose blowing method for location of vibrating line. His study results showed that 75% patients vibrating line located anterior to the fovea palatinae, while in 25% patient's it was at the fovea palatinae. These results are almost in accordance with our study, since we identified that location of vibrating line were anterior in 66% patients, while in remaining 34% at the fovea palatinae.

In our study, among 66% of anterior located vibrating line, mean distance from fovea palatinae was 2.07 (±0.77) mm. While in Chen MS [11] such distance is reported as either 2.71 (±0.19) mm and 2.66 mm (±0.18) by observers A and B respectively.

Keng SB and Ow R [23] determined that the mean distance from vibrating line to fovea palatine in class I was 4.02 (±1.31) mm, class II was 2.30 (±1.23) mm and class III was 0.89 (±0.95). While in our study, corresponding mean distance was 2.13 (±0.82) mm, 2.07 (±0.69) mm and 1.80 (±0.82) mm respectively. According to

Zarb and Bolender [3], the vibrating line usually observed clinically 2 mm anterior to the fovea palatinae, which is almost similar with finding of our study, that is 2.07 (±0.77) mm.

Keng SB and Ow R [23] reported statistically significant difference between the distance of vibrating line and the fovea palatinae among varying soft palate Contours. Such discrepancies may be accredited to several factors. Various methods have been employed for the location of vibrating lines. Moreover, different soft palate contours may be significant in terms of varied muscular activity. For instance, Class I contour is mainly horizontal and extends posteriorly, thus exhibits least muscular activity along with a broader posterior seal. In contrast, Class III presents with more acute angle of the soft-palate along with elevated soft palate musculature. This is likely to result in a narrowed zone of compressible tissue and therefore lead to difficulty while achieving the palatal seal. [18,19,23] The compressibility of the mucosa should also be considered and may different across the posterior palatal area and the fovea palatinae could be used as guides for the placement of the posterior border of a maxillary complete denture. [13,23] Larger posterior palatal seal area could be obtained when the slope between the soft and hard palates is gentle contour [13]. It is clear from our study that the vibrating line passes either anterior or at the fovea palatinae.

5. CONCLUSIONS

In our study it was concluded that most of the sample had the most anterior vibrating line in relation to the fovea palatinae.There is a wide variation between the different age groups with regard to the distance between vibrating line and fovea palatinae in varying soft palate contours. Therefore, such anatomical landmarks should not be considered as reliable guidelines while placement of post dam seal for maxillary complete dentures.

CONSENT

The Verbal and written informed consent in Urdu and English language was taken from each included patients.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

DATA COLLECTION FORM

Form No: _____OPD Registration No: _____Date:_____

Demographic details

Subject Name: _____
Age: _____Gender: _____
Address: _____
Contact no: _____

1. Soft palate Type

Class I	Soft palate turns downward at 10 degree angle to the hard palate	
Class II	Soft palate turns downward at 45 degree angle to the hard palate	
Class III	Soft palate turns downward at 70 degree angle to the hard palate	

2. Location of vibrating line with respect to fovea palatinae

Anterior to the fovea palatinae	At fovea palatinae	Posterior to the fovea palatinae

3. Mean distance of vibrating line from fovea palatinae

Reading No 1 (mm)	Reading No 2 (mm)	Reading No 3 (mm)	Mean (mm)

Peer-review history:
The peer review history for this paper can be accessed here:
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