International Journal of Dental Sciences & Research
(A Peer- Reviewed Bi-Annual Journal)

ANATOMIC VARIATION AND CLINICAL IMPLICATIONS OF FOVEA PALATINE IN DETERMINING POSTERIOR PALATAL SEAL FOR MAXILLARY COMPLETE DENTURES: A SURVEY IN THE MALWA BELT OF PUNJAB

[1]Gurinder Kaur, [2]Manmeet Singh Gulati, [3]Manmohit Singh, [4]Pratik Gupta, [5]Aalok Mishra, [6]Puneet Sharma

[1] 1st Year Post Graduate Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India

[2] Professor and Head, Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India

[3] Professor, Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India

[4] Professor, Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India

[5] Reader, Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India

[6] Senior Lecturer, Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, India

Corresponding author:

Dr Gurinder Kaur, 1st Year Post Graduate Dept. of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and-Hospital, Mandi Gobindgarh, India. Email id: gkaurkamboj@gmail.com Contact No: 8284099544

Abstract

Background: The posterior palatal seal (PPS) is crucial for the retention and stability of maxillary complete dentures.

Aim: This study was aimed to assess the anatomical variability of the fovea palatine and its relationship with the vibrating line in the Malwa belt population of Punjab.

Method: A cross-sectional study with 53 participants was conducted. The vibrating line and fovea palatine were marked using the "ah" sound, "T" burnisher, palpatory method, swallowing method, and Valsalvamaneuver. Data were statistically analyzed.

Results: The study found that 96.2% of participants had a visible fovea palatine, with 47.2% located anterior to the vibrating line. The chi-square test indicated significant variance with $\chi^2 = 20.132$, $p < 0.001$, and 3 degrees of freedom.

Conclusion: The findings highlight the variability of the fovea palatine's location and suggest the need for a multifaceted approach for accurate denture fitting.

Key words: Anatomical landmarks, Fovea palatine, Maxillary dentures, Posterior palatal Seal (PPS), Retention, Vibrating line.

INTRODUCTION

The posterior palatal seal (PPS), an important anatomical feature, greatly affects the retention and stability of maxillary complete dentures. The PPS helps create suction, which stops dentures from coming loose when eating or talking. Determining the back boundary of the maxillary denture is based on anatomical landmarks such as the palatine fovea and the vibrating line.1,2 The fovea palatine, tiny depressions close to the center of the palate, are commonly utilized for defining the back edge of the denture, usually found near the junction of the hard and soft palate where the vibrating line is located.[1,3] The crucial vibrating line, which separates the mobile and fixed soft palate sections, is important for denture stability and retention.[4] Nevertheless, additional research is needed to validate the reliability of the fovea palatine and vibrating line as consistent guides for denture placement due to differences in individuals.Previous research has produced conflicting findings on the accuracy of the fovea palatine as a reference point for establishing the posterior palatal seal (PPS). Silverman SI (1971)[1] and Chen MS (1980)[3] both pointed out that there is variation in PPS dimensions and displacement patterns, indicating that the fovea palatine's usefulness may be limited due to its inconsistent location in relation to the vibrating line. Kyung KY et al. (2014)[2] highlighted the significance of considering unique anatomical differences in determining the posterior seal area, stressing the importance of accurate techniques for achieving the best denture retention.

Recent studies have brought attention to how socio-economic factors can impact oral health results, such as rates of tooth loss. Cunha-Cruz J et al. (2007)[5] observed patterns in socio-economic gaps in edentulism, highlighting the importance of personalized dental care strategies to tackle these gaps. ElmanaseerWR et al. (2024)[6] carried out a study with a comparable design in Jordan, analyzing the location of the fovea palatine in relation to the vibrating line in various soft palate classifications. Their results showed considerable variation, emphasizing the necessity of conducting studies in specific areas to comprehend local anatomical distinctions. Precisely detecting the PPS has clinical consequences that go beyond just retention. A clearly outlined PPS can decrease patient discomfort, limit the gag reflex, and stop food buildup under the denture, ultimately improving oral health and patient contentment.[4] This study seeks to offer useful recommendations for dental practitioners by confirming the reliability of the fovea palatine in the Malwa belt demographic, improving clinical results. Hence, it is timely and relevant to investigate the anatomical variation and clinical implications of the fovea palatine in determining the PPS for maxillary complete dentures. By concentrating on a particular area, it fills in the gaps in current research and offers practical insights to improve prosthodontics

practice in Punjab. The results would be advantageous for dental students, general practitioners, and specialists as they provide a dependable way to determine the back boundary of maxillary dentures, leading to better patient care and contentment.

The need to understand the regional anatomical variations between the fovea palatine and the vibrating line motivated this study, as it is crucial for creating the posterior palatal seal (PPS) in maxillary complete dentures. Previous studies have indicated differences in the location of the palatal fovea, potentially impacting the longevity and care of dentures. This study aimed to establish the frequency and position of the fovea palatine in relation to the vibrating line in the Malwa belt population of Punjab, to evaluate its potential as a landmark for locating the PPS. The main objectives were to document the occurrence of anatomical differences, evaluate their impact on denture grip, and provide practical advice for dental practitioners to enhance clinical outcomes and patient satisfaction within this group.

Methodology

Study design and sample: This research used a cross-sectional approach to assess the anatomical differences in the fovea palatine and its connection to the vibrating line. The study was carried out in the Malwa region of Punjab and involved 53 participants of both genders, with 21 men and 32 women in the sample groups. All individuals chosen for the study had either a full set of teeth or some missing teeth, meeting the criteria of having a healthy pink palate with visibly visible fovea palatine on all soft palates. Exclusion criteria involved past craniofacial trauma or surgery, craniofacial anomalies present at birth or acquired later, inflammation or pathology in the palatal mucosa, and restricted mouth opening.

Method used: The palatal mucosa was dried using 2 × 2 cm gauze as part of the approach to guarantee visibility. The "ah" sound, which lifts the soft palate, was then directed to be said by participants. This pronunciation was done with an indelible pencil, marking both the vibrating line and the fovea palatine. To confirm the correctness of the markings, this process was carried out twice for each participant. Various methods were employed to identify the vibrating line:

- T Burnisher: This tool was used to palpate the soft palate and identify the vibrating line.
- Palpatory Method: Manual palpation of the palate to feel the soft palate's movement.
- Swallowing Method and ValsalvaManeuver - Participants were asked to swallow and perform the Valsalvamaneuver (nose-blowing) to enhance the visibility of the vibrating line.

Data recording: The findings for the vibrating line were recorded in a pro forma, noting the position of the fovea palatine in relation to the anterior and posterior vibrating lines. Specifically, the fovea palatine's location was documented as:

- Located anterior to the anterior vibrating line
- Positioned 0.1-0.5 mm in front of the vibrating line
- Positioned 0.6-1 mm in front of the vibrating line
- Situated between the anterior and posterior vibrating lines
- Positioned above or below the posterior vibrating line

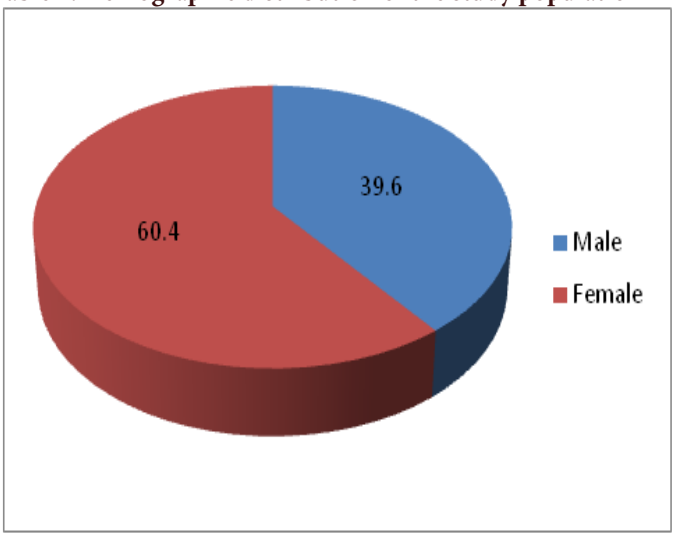
Statistical analysis was performed to evaluate the data collected, focusing on the frequency and distribution of the fovea palatine's location relative to the vibrating line. This analysis aimed to determine the reliability of the fovea palatine as a landmark for establishing the posterior palatal seal in the study population

Results

The gender-specific demographic distribution of the study population is summed up in Table 1 (Graph 1), which also gives the average age of the male participants. 53 people made up the entire sample size; 21 of them were men and 32 were women, making up 39.6% and 60.4% of the sample, respectively. 66.94 years was the mean age of the male participants, with a standard deviation of ±8.648. This suggests that there were more female participants in the study population than male participants, and the age range of the male participants was generally consistent with the given mean value.The frequency and percentage of the fovea palatine among the study subjects are shown in Table 2 (Graph 2). 51 (96.2%) of the toal participants had a present fovea palatine, whereas 2 (3.8%) did not. This suggests that most of the study population exhibited a predominant presence of the fovea palatine.The distribution of the 53 participants' fovea palatine in relation to the vibrating line is displayed Table 3(Graph 3). Out of these, two individuals (3.8%) lacked a discernible fovea palatine. The fovea palatine was positioned anterior to the vibrating line in 25 participants (47.2%), who made up the majority. Of the subjects, 12 (22.6%) had their fovea palatine posterior to the line, while 14 (26.4%) had it on the vibrating line. With three degrees of freedom, the chi-square test produced a chi-square value of 20.132 and a p-value of 0.00, which suggests that there is a significant variance in the location of the fovea palatine in relation to the vibrating line.

	Frequency	Percentage (%)	Mean age (in years)
Males	21	39.6	66.94+8.648
Females	32	60.4	
Total	53	100	

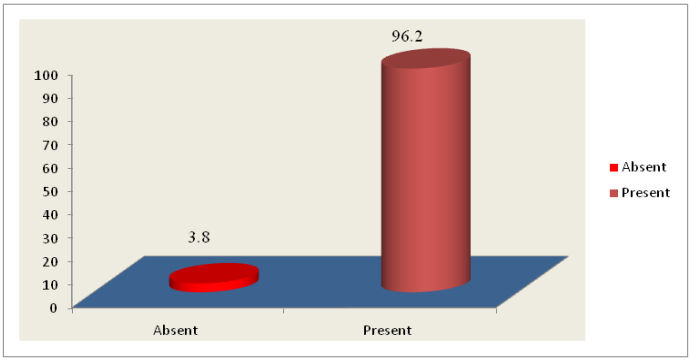
Table 1: Demographic distribution of the study population



Graph 1: Demographic distribution of the study population

	Frequency	Percentage (%)
Absent	2	3.8
Present	51	96.2
Total	53	100

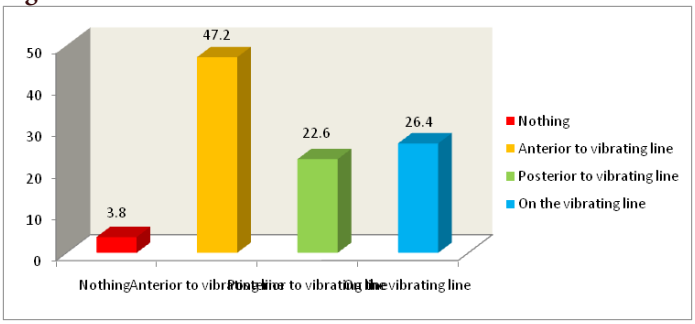
Table 2: Presence of Fovea Palatine in the study population



Graph 2: Presence of Fovea Palatine in the study population

	Frequency	Percentage (%)	df	Chi square value	P Value
Nothing	2	3.8	3	20.132	0.00*
Anterior to vibrating line	25	47.2			
Posterior to vibrating line	12	22.6			
On the vibrating line	14	26.4			
Total	53	100			

Table 3: Distribution of Fovea Palatine Relative to the Vibrating Line



Graph 3: Distribution of Fovea Palatine Relative to the Vibrating Line

Discussion

An important role is played by anatomical landmarks in prosthodontics, especially in identifying the posterior palatal seal (PPS) for maxillary complete dentures. The reliability of the fovea palatine in this aspect has been a subject of frequent studies previously. However, the need for a detailed comprehension of its usage in various groups arises due to the variation in its location in relation to the vibrating line. This study consolidates results to emphasize the importance and constraints of using the fovea palatine as a reference for defining the PPS.In this study, 96.2% of participants had a fovea palatine, which aligns with findings from Chen MS (1980)[3] and Kyung KY et al. (2014)[2].The importance of fovea palatine in finding the posterior region of the maxillary dentureemphasizes its usefulness in clinical practice. Kyung KY et al. (2014)[2] further supported this by showing that a wider palatal seal region, associatedwith the palatine fovea, corresponds with a more advantageous palatal shape. Thapa D et al. (2016)[7] verified that the fovea palatine is a valuable reference point for denture construction, although they observed discrepancies in its alignment with the vibrating lines and the junction of the hard and soft palate. The importance of precise clinical methods for finding the vibrating line is highlighted by this variability, instead of just using anatomical landmarks.

The present study discovered that in 47.2% of subjects, the fovea palatine was situated in front of the vibrating line which was found to be consistent with a study by Rashid R (2017) in a Kashmiri group.[8] The anterior location indicates that the fovea palatine may not consistently match up exactly with the posterior palatal seal, although it is still a helpful point of reference when combined with other techniques. Kumar B et al. in 2016 also noted that the vibrating line is often found in front of the fovea palatine in different soft palate types, highlighting the importance of this anatomical point in determining the location of the PPS.[9] The fovea palatine's position in relation to the vibrating line showed a notable difference, with a chi-square value of 20.132 (p-value = 0.00), confirming the findings by Chen MS (1980).3 Chen emphasized the importance of considering the variability in the location of the fovea palatine during denture construction and fitting. This difference is additionally supported byKumar B et al. (2016),[9] who discovered that the vibrating line was frequently located in front of the fovea palatine. The difference noted in this study, with 22.6% of subjects having the fovea palatine located behind the vibrating line, contradicts the findings of Kumar B et al. (2016)[9] and SanoferA et al. (2017),[10] who mostly identified the fovea in front of the vibrating line. This shows the differences in anatomy and the need for personalized evaluation in making dentures.

According to RashediB (2003)[4] a variety of techniques, such as phonation, are frequently utilized in dental educational institutions to identify the vibrating line. This more expansive approach demonstrates the diversity in how PPS determination is implemented and taught. The results of the present study suggest that although the fovea palatine can be helpful, it may not always be enough to determine the PPS by itself. This highlights the importance of implementing a thorough strategy that combines various techniques to guarantee precise identification of the posterior limit.ElmanaseerWR et al. (2024) stressed the significance of grasping anatomical variations to enhance clinical results.6 The important difference in the fovea palatine's location emphasizes the need for thorough evaluation and personalization in the denture fabrication. The research's approach, which involved different methods to locate the vibrating line like the burnisher, palpatory technique, swallowing method, and Valsalvamaneuver, is consistent with the recommendation of Ansari IH (1997)[11], to integrate the PPS in the last impression phase. Ansari's method, focused on clinical evaluation instead of random techniques which guarantees a more precise determination of the PPS. This thorough methodological approach supports the results of the current study, highlighting the significance of a multi-faceted approach in correctly identifying the posterior palatal seal.

Therefore, the results of this study emphasize the intricacy and variation involved in utilizing anatomical landmarks such as the fovea palatine to determine the PPS. While the fovea palatine is an important point of reference, its anatomical variability highlights the need for using a mix of techniques to ensure accurate denture fitting and improved patient happiness. This research highlights the importance of personalized evaluation and a varied strategy to attain good results.

Conclusion

The present study offered valuable information about the ana-

tomical differences of the fovea palatine and its connection to the vibrating line, emphasizing its importance in establishing thePPS for maxillary complete dentures. The strengths of the research were its thorough method and the utilization of various techniques to precisely locate the vibrating line, improving the practicality of the fovea palatine as a reference point in clinical settings. Although, the varying position of the fovea palatine in relation to the vibrating line showed constraints, highlighting the importance of using a comprehensive approach that includes extra techniques and clinical expertise for accurate denture fitting. This underscores the significance of tailoring denture design to suit individual anatomical variations. The results of the study support previous research and indicate that future studies should further examine anatomical differences among various populations to improve and confirm research methods. Adjusting clinical procedures according to this information will improve patient results and guarantee better denture retention.

References

1. Silverman SI. Dimensions and displacement patterns of the posterior palatal seal. J Prosthet Dent. 1971 May;25(5):470-88.
2. Kyung KY, Kim KD, Jung BY. The study of anatomic structures in establishing the posterior seal area for maxillary complete dentures. J Prosthet Dent. 2014 Sep;112(3):494-500. doi: 10.1016/j.prosdent.2014.01.002. Epub 2014 Feb 25.
3. Chen MS. Reliability of the fovea palatini for determining the posterior border of the maxillary denture. J Prosthet Dent. 1980 Feb;43(2):133-7.
4. Rashedi B, Petropoulos VC. Current concepts for determining the postpalatal seal in complete dentures. J Prosthodont. 2003 Dec;12(4):265-70.
5. Cunha-Cruz J, Hujoel PP, Nadanovsky P. Secular trends in socio-economic disparities in edentulism: USA, 1972-2001. J Dent Res. 2007 Feb;86(2):131-6.
6. Elmanaseer WR, Alamoush RA, Alsoleihat F, Al-Omiri MK. Position of Fovea Palatinae relative to the vibrating line in various soft palate classifications among Jordanian edentulous population. Sci Rep. 2024 Apr 26;14(1):9559.
7. Thapa D, Chandra S, Karki S. Verifying Relationship between Fovea Palatini, Vibrating Lines and Junction between Hard and Soft Palate. Orthodontic Journal of Nepal. 2016;6(1):32.
8. Rashid R. Verifying Relationship Between Fovea Palatinea And The Posterior Palatal Seal In Kashmiri Population. International Journal of Applied Dental Sciences. 2017;3(4):122-3 Akhtar N, Tanveer S, Chaudhary MA, Ahmad A. The reliability of foveae Palatinae in determining the location of vibrating line in edentulous patients. Pakistan Oral & Dental Journal. 2017 Jun 30;37(2):368-70.
9. Kumar B, Naz A, Rashid H, Butt AM. Location of the Vibrating Line with Respect to Fovea Palatini in Class I, Class II and Class III Soft Palate Types. Journal of the Pakistan Dental Association. 2016 Apr 1;25(2).
10. Sanofer A, Gounder R. Assessment of location of fovea palatine in relation to vibrating line in South Indian population. J Int Dent Med Res. 2017;10(3):883-86.
11. Ansari IH. Establishing the posterior palatal seal during the final impression stage. J Prosthet Dent. 1997 Sep;78(3):324-6.