ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

*International Journal of Dental Science and Innovative Research (IJDSIR)*

*IJDSIR : Dental Publication Service*

*Available Online at: www.ijdsir.com*

*Volume – 6, Issue – 4, July - 2023, Page No. : 68 - 83*

# An evaluation of anatomic structures in posterior palatal seal area & analysis of the relation between palate configuration radio graphically and width of posterior palatal seal area. An in vivo study.

[1]Divya Sakalle, Assistant Professor, Department of Dentistry, L. N medical college and J. K Hospital, Bhopal.[1]

[2]Brajendra S. Tomar, Associate Professor, Department of Prosthodontics, Crown & Bridge and Implantology, Rishiraj College of Dental Sciences & Research Centre, Bhopal Madhya Pradesh.

[3]G. S. Chandu, Professor & Head, Department of Prosthodontics, Crown & Bridge and Implantology, Rishiraj College of Dental Sciences & Research Centre, Bhopal Madhya Pradesh.

[4]Shubhra Singh, Associate Professor, Department of Periodontology, Rishiraj College of Dental Sciences & Research Centre, Bhopal Madhya Pradesh.

[5]Medha Bhushan, Associate Professor, Department of Conservative and Endodontics, Rishiraj College of Dental Sciences & Research Centre, Bhopal Madhya Pradesh.

[6]Nithin T. Mathews, PG Resident, Department of Prosthodontics, Crown & Bridge and Implantology, Rishiraj College of Dental Sciences & Research Centre, Bhopal Madhya Pradesh.

**Corresponding Author:** Brajendra S. Tomar, Associate Professor, Department of Prosthodontics, Crown & Bridge and Implantology, Rishiraj College of Dental Sciences & Research Centre, Bhopal Madhya Pradesh.

**Citation of this Article**: Divya Sakalle, Brajendra S. Tomar, G. S. Chandu, Shubhra Singh, Medha Bhushan, Nithin T. Mathews, "An evaluation of anatomic structures in posterior palatal seal area & analysis of the relation between palate configuration radio graphically and width of posterior palatal seal area. An in vivo study", IJDSIR- July - 2023, Volume – 6, Issue - 4, P. No. 68 – 83.



**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

## Abstract

**Introduction:** Retention is essential for the success of a maxillary complete denture, which is retained against the force of gravity. Besides the sufficient extension of the denture, a properly designed posterior palatal seal is the most important Factor in determining denture retention. a well-fitting and retentive complete denture requires a well-fitting tissue surface and a peripheral seal which is created by the soft tissue draping over. In the posterior region, it is mainly by the posterior palatal seal.

**Aim of study:** To evaluate relationship between palatal configuration radio graphically and posterior seal area intraorally in edentulous and dentulous group.

**Objectives of study:** The objective of this study was to investigate the relative location of the vibrating lines and to determine the correlation between the seal area of the

posterior palate and the palatal contour with lateral cephalogram radiography.

**Methodology:** A total sample size of hundred patients was taken. Among them fifty participants were dentulous and other fifty were Edentulous. Male and female ratio was nullified by taking twenty five Male and Twenty five Female patients in either groups of Dentulous and Edentulous participants. Age group was 45-65 years for both the groups.

**Summary:** This aim of this randomized cross sectional study is to evaluate relationship between palatal configuration radio graphically and posterior seal area intraorally in edentulous and dentulous group and to investigate the relative location of the vibrating lines and to determine the correlation between the seal area of the posterior palate and the palatal contour with lateral cephalogram radiography.

**Keywords:** Cephalogram, Radiography, Denture

**Introduction**

Patient's expectations are considered as main factor in designing of prosthesis for giving a successful treatment. They expect a good prosthesis which is well-retained in mouth for a long duration and work efficiently during stomatognathic function. Hardy and Kapoor1 emphasized the fact that retention and stability obtained by adhesion and cohesion resist the forces, which are directed in vertical direction. A well-fitting and retentive complete denture requires a well-fitting tissue surface and a peripheral seal which is created by the soft tissue draping over. In the posterior region, it is mainly by the posterior palatal seal.2 at the posterior extension of the maxillary denture, where the tissues are less compliant, special attention is required to make the seal effective. This is the post dam3 region. According to Glossary of Prosthodontic Terms-9 Posterior palatal seal: that portion of the intaglio surface of a maxillary removable complete denture, located at its posterior border, which places pressure, within physiologic limits, on the posterior palatal seal area of the soft palate; this seal ensures intimate contact of the denture base to the soft palate and improves retention of the denture; syn, postpalatal seal.4 Posterior palatal seal area: the soft tissue area limited posteriorly by the distal demarcation of the movable and non movable tissues of the soft palate and anteriorly by the junction of the hard and soft palates on which pressure, within physiologic limits, can be placed; this seal can be applied by a removable complete denture to aid in its retention syn, POSTPALATAL SEAL AREA.4 The post dam is a raised portion of the denture base at the posterior extent of the upper denture and is located on its fitting surface. This is its orthodox position.3

Anatomical Considerations for Posterior Palatal Seal

Posterior palatal seal consist of two components, namely, pterygomaxillary seal area and post palatal seal. Pterygomaxillary seal extends through pterygomaxillary notch continuing 3-4 mm anterolaterally, approximating the mucogingival junction.1,4 It occupies entire width of hamular notch.5 The notch is covered by pterygomaxillary fold (extend from posterior aspect of tuberosity to retromaolar pad). This fold influences' the posterior border seal if mouth is wide open during final impression procedure.6 Pendleton's7 anatomical dissections and histological and clinical examination have shown this area to vary greatly in size, form, and character. Marks 8 have shown the tissue in this area to be variable in character. Anterior vibrating line demarcates zone of transition between no movement of the tissue overlying hard palate and some movement of the tissues of soft palate. It serves as anterior border of posterior palatal seal. It is not a straight line due to presence of posterior nasal spine. It always occurs in soft

palate.9 It is not the junction of hard and soft palates.10 According to Gerald S. Wintraub, it is usually located in the junction of hard and soft palates.6 It can be recorded by Valsalva manoeuvre (ask patient to blow gently through nose with nostrils closed using finger) or by Sharry's method (ask patient to say ''ah'' with short vigorous bursts). 9,10 Posterior vibrating line is an imaginary line at the junction of the aponeurosis of the tensor veli palatine muscle and the muscular portion of the soft palate.11 It is elicited by asking the patient to say ''ah'' in short bursts in a normal, unexaggerated fashion posterior vibrating line marks the most distal extension of denture base. 13,14 Fovea palatine is a clinically visible indentation in the mucosa of the midline of the palate formed by the coalescence of several mucous gland ducts. There is lot of difference of opinion on the location of fovea palatine and anterior vibrating line. Fovea palatine is located just posterior to location of hard and soft palates.15,16 According to Swenson, vibrating line is 2 mm in front of fovea palatine.13 Silverman17 concluded that posterior palatal seal can be extended 8.2 mm distal to vibrating line for retention and stability. In a study by Lye,15 the mean position of vibrating line is 1.31 mm behind fovea.

Rationale and Importance of Posterior Palatal Seal:

it is possible to obtain acceptable stability and retention by a perfectly adapted denture base through the forces of adhesion, cohesion, and interfacial surface tension.1 Posterior palatal seal will create a partial vacuum that will not operate continuously, but one that will come into play only when horizontal or tipping thrusts tend to dislodge the denture and then only long enough to overcome the emergency.18 Functions of Posterior Palatal Seal Ettinger and Scandrett2 summarized function of posterior palatal seal as it, To provide retention, prevents ingress of fluid, air, and food between denture and tissue, diminishes gagging reflex, provides embedded sunken distal border which is less conspicuous to tongue, supplies a thick border to counteract denture warpage due to dimensional changes during the polymerization shrinkage of methyl methacrylate resin.19 Weintraub6 described added functions of posterior palatal seal as it, Adds confidence and comfort to the patient by enhancing retention, Establishes impression material from sliding down into the pharynx.18, 20 Parameters of Posterior Palatal Seal Posterior palatal seal has specific characteristics with different parameters, it is variable in its size, shape location, and depends on anatomical configuration of soft and hard palatal, their relationship, muscle coordination, and amount of tissue displaceability.11, 21 Size Hardy and Kapoor1 claimed that on an average, the dimension of posterior palatal seal was 2 mm at the midpalatal region and hamular notch and 4 mm at the greatest curvature region of posterior palatal seal. But wide range of variation was also found.1 Silverman performed a study evaluating the posterior palatal seal clinically, radiographically, and histologically, and he found that the greatest mean anteroposterior width of posterior palatal seal is 8.0 mm (with 5-12 mm of range).17 Shape Winland and Young performed a survey to evaluate the forms of posterior palatal seal used in various schools of United States. They found that five different forms of posterior palatal seal were commonly used.22 Location of posterior palatal seal is not consistent and show lot of variation but on an average anterior vibrating line is 1.31 mm distal to fovea palatini.15, 16 Displacement/compressibility Lot of variation has been found within the posterior palatal seal area. But low compressibility has been observed in midpalatal raphe and hamular notch region. High compressibility has been in the lateral part of cupids

bow. Its variation depends on the form of palatal vault like in class I palate posterior palatal seal area remains shallow, while it is deep in class III palate.11, 12 Classification of soft palate Palatal throat form as given by House.23 Class 1: Large and normal in form, with a relatively immovable band of resilient tissue 5-12 mm distal to a line drawn across distal edge of the tuberosities Class 2: Medium size and normal in form, with relatively immovable resilient band of tissue 3-5 mm distal to a line drawn across the distal edge of the tuberosities

Class 3: Usually accompanies a small maxilla. The curtain of soft tissues turns down abruptly 3-5 mm anterior to a line drawn across the palate at the distal edge of the tuberosities.23 Methods of Recording Posterior Palatal Seal Different methods can be used for recording posterior palatal seal and at different stages of complete denture construction. Choice of method employed and timing depends on operator preference and experience.1, 9, 10, 11, 12 Hardy and Kapoor classified them in to functional, semi functional, and empirical technique.1, 24, Different methods of recording can be broadly divided in to conventional approach8 , functional technique, fluid wax technique19, extended palatal technique24, and arbitrary technique.1,9,10,11,12 Ultrasonic technique of recording posterior palatal seal. Ultrasonic effects are non ionizing (do not have sufficient energy to displace electrons from orbital shell. It is indicated in patients with only class I, II type of palates, Miniature transducer (10 MHz linear array) is used along with a real-time B-mode to view image of soft tissue. Mark posterior palatal seal using conventional method. Place a thin rubber band on anterior 1/3rd of transducer, which serves as an index that would appear in monitor. Toothpaste is used as a line couplant. The transducer is taken intro oral cavity and initially moved posteriorly to the left of midline to locate hard and soft palates junction. Once the rubber band is visualized on post vibrating line, a Polaroid picture was made. Then it was moved to right side of palate. The average distance of posterior vibrating from junction of hard and soft palate is 2-9 mm with 4-6 mm wide posterior palatal seal.25 The recording of posterior palatal seal is of great significance, because it is vital factor in establishing the peripheral seal which enhances retention by utilizing the atmospheric pressure.18,20 Posterior palatal seal preparation is an integral part of maxillary complete denture fabrication, requiring an assessment of physiological and technical parameters and careful examination during the diagnostic phase of the treatment can alleviate many potential problems.9,10,26

**Material and method**

This study was a randomized cross-sectional study carried out in Rishiraj college of dental sciences and research centre (Bhopal) within a time span of one and a half year. The study population was recruited from department of prosthodontics, Rishiraj College of Dental Sciences & Research Centre. Bhopal. The ethical clearance was obtained by ethical committee.

A total sample size of hundred patients was taken. Among them fifty participants were dentulous and other fifty were Edentulous. Male and female ratio was nullified by taking twenty five Male and Twenty-five Female patients in either groups of Dentulous and Edentulous participants. Age group was 45-65 years for both the groups. The subjects were selected for the study on the basis of following in inclusion and exclusion criteria.

Inclusion criteria Subjects with acceptable general health.• No known allergies to products used during study.• Subjects with acceptable neuromuscular

coordination.• Subjects with no palatal lesions.• Subjects with any major defect or oral cavity.• Subjects not having any contradictions to x-ray exposure.• Subjects willingness to participate in study.• Exclusion Criteria Subjects with any known allergy• Subjects having any palatal or oral lesion.• Subjects having any sought of deformity of stomatognathic system• Pregnant females or lactating mother• Uncontrolled metabolic or systemic deformity• Psychosomatic disorder•

**Methodology**

Methodology To mark the posterior palatal seal area inside patients mouth. Participants were seated on the dental chair in upright position. Participants were asked to rinse with astringent mouth wash so as to wash out any mucin layer and to reduce the salivary flow. Palate was milked properly with cotton swabs so as to milk out any residual mucous or saliva from palatine glands. This process further condition the subject against any untoward gagging. The posterior palatal area was dried with gauge and palpated for hamular process. Using T-burnisher/mouth mirror, this was then marked with indelible pencil (Dr. Thompson's sanitary colour transfer applicator). T-burnisher was passed along posterior angle of maxillary tuberosities until it drops into pterygomaxillary notch. The mark was extended from pterygomaxillary notch 3-4 mm anterolateral to maxillary tuberosity approximating mucogingival junction. This completes marking of pterygomaxillary seal. Patient was asked to say "ah" in short bursts, in unexaggerated fashion. Movement of soft palate were observed and posterior vibrating line was marked and then connected to pterygomaxillary seal. Patient was advised, not to close mouth (to prevent smudging of markings). The anterior vibrating line area was confirmed visually with the Valsalva manoeuvre. The lines were marked with an indelible pen. To reduce the error involved in this process, 1 clinician performed the procedure. After both vibrating lines were marked, the locations of the anterior and posterior vibrating lines were reconfirmed with the Valsalva manoeuvre and phonation method to verify. Further an alginate impression was made to transfer the markings on the impression. Cast was poured and measurements were made with help of divider and metal scale. The distance between the anterior and posterior vibrating lines from the left and right sides was measured at mid palatine suture region, extending laterally at point of maximal distance. A lateral cephalogram was taken to quantitatively analyze the correlation between the palatal contours. . Software DIAGORA with Scandoc viewer was then used to measure the angle formed by the tangent lines of the 2 curves for the hard and soft palates. The correlations between the angle size and the distances from the anterior and posterior vibrating lines were calculated.

**Statistical Analysis**

Data was entered in Microsoft excel 2016 for Windows. Frequencies, percentages, mean, standard deviation (SD), minimum and maximum values of variables in different groups were calculated. Shapiro-Wilk test showed that angle between hard and soft palate curve and distance between anterior vibrating line and posterior vibrating line in groups followed normal distribution. Hence parametric test, Pearson correlation test was applied to access relationship of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left in dentulous and edentulous subjects. Based on Evans' (1996) criteria, strength of Pearson correlation coefficient (r) was categorised: r = 0.00-0.19: Very weak relationship r = 0.20-0.39: Weak relationship r =0.40-

0.59: Moderate relationship r =0.60-0.79: Strong relationship r = 0.80-1.00: Very strong relationship.

P value <0.05 was considered statistically significant. Data analyses were performed using version 21.0 of the Statistical Package for Social Sciences (IBM Corporation,

Armonk, New York, USA).

Interpretation of P values:

P > 0.05 - Not significant

P <0.05 - Significant

P <0.01 - Highly significant

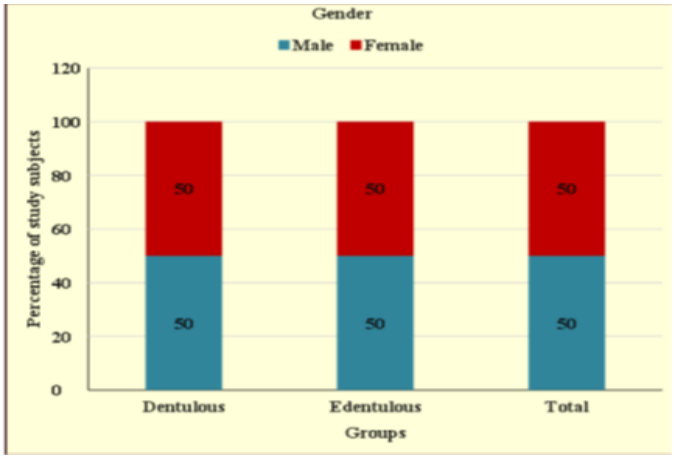
P <0.001 - Very high significant

Observation and Result:

Table 1: Gender wise distribution of study subjects in dentulous and edentulous groups.

| Groups | Gender | | Total |
|---|---|---|---|
| | Male n (%) | Female n (%) | n (%) |
| Dentulous | 25 (50.00) | 25 (50.00) | 50 (100.00) |
| Edentulous | 25 (50.00) | 25 (50.00) | 50 (100.00) |
| **Total** | 50 (50.00) | 50 (50.00) | 100 (100.00) |

Table 1 and Graph 1 show gender wise distribution of study subjects in dentulous and edentulous groups. In both, dentulous and edentulous groups, there were 25 (50.00%) males and 25 (50.00%) females.

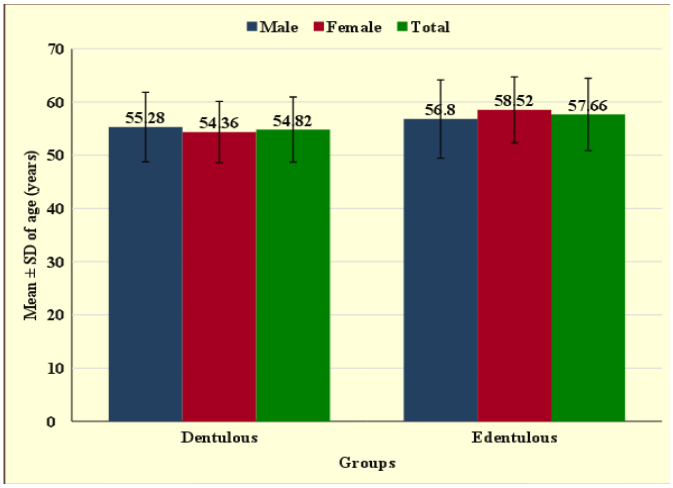



Graph 1: Gender wise distribution of study subjects in dentulous and edentulous group

Table 2: Mean, standard deviation, minimum and maximum age of study subjects in dentulous and edentulous groups.

| Gender | Age (years) | Groups | |
|---|---|---|---|
| | | Dentulous | Edentulous |
| **Male** | Mean ± SD | 55.28 ± 6.54 | 56.80 ± 7.35 |
| | Min-Max | 45.00-65.00 | 45.00-65.00 |
| **Female** | Mean ± SD | 54.36 ± 5.77 | 58.52 ± 6.21 |
| | Min-Max | 45.00-65.00 | 45.00-65.00 |
| **Total** | Mean ± SD | 54.82 ± 6.12 | 57.66 ± 6.79 |
| | Min-Max | 45.00-65.00 | 45.00-65.00 |

Table 2 and Graph 2 show mean, standard deviation, minimum and maximum age of study subjects in dentulous and edentulous groups. In dentulous group, mean ± SD of age among males and females was 55.28 ± 6.54 years and 54.36 ± 5.77 years, respectively. In all the dentulous subjects mean ± SD of age was 54.82 ± 6.12 years. Minimum and maximum values of age in males, females and total sample were 45.00 years and 65.00 years. In edentulous group, mean ± SD of age among males and females was 56.80 ± 7.35 years and 58.52 ± 6.21 years, respectively. In all the edentulous subjects mean ± SD of age was 57.66 ± 6.79 years. Minimum and maximum values of age in males, females and total sample were 45.00 years and 65.00 years.




Graph 2: Mena and Standard deviation of age of study subjects in dentulous and edentulous group

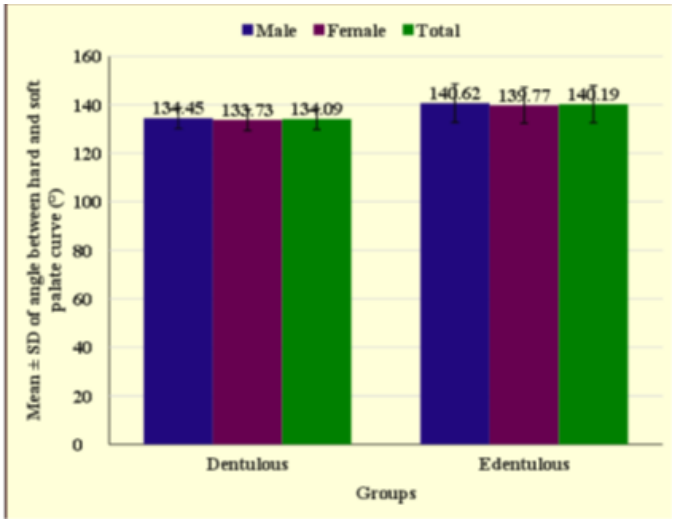
Table 3: Mean, standard deviation, minimum and maximum values of angle between hard and soft palate curve among study subjects in dentulous and edentulous groups.

| Gender | Angle (°) | Groups | |
|---|---|---|---|
| | | Dentulous | Edentulous |
| Male | Mean ± SD | 134.45 ± 4.23 | 140.62 ± 7.92 |
| | Min-Max | 123.40-142.80 | 121.02-152.87 |
| Female | Mean ± SD | 133.73 ± 4.40 | 139.77 ± 7.42 |
| | Min-Max | 123.06-144.03 | 121.02-150.33 |
| Total | Mean ± SD | 134.09 ± 4.29 | 140.19 ± 7.61 |
| | Min-Max | 123.06-144.03 | 121.02-152.87 |

Table 3 and graph 3 show mean, standard deviation, minimum and maximum values of angle between hard and soft palate curve among study subjects in dentulous and edentulous groups.

In dentulous group, mean ± SD of angle between hard and soft palate curve in males and females was 134.45° ± 4.23° and 133.73° ± 4.40°, respectively. In total sample, mean ± SD of angle was 134.09° ± 4.29°. Minimum and maximum vales of angle in males were 123.40° and 142.80°, in females were 123.06° and 144.03° and; in total sample were 123.06° and 144.03°.

In edentulous group, mean ± SD of angle between hard and soft palate curve in males and females was 140.62 ± 7.92° and 139.77 ± 7.42°, respectively. In total sample, mean ± SD of angle was 140.19 ± 7.61°. Minimum and maximum vales of angle in males were 121.02° and 152.87°, in females were 121.02° and 150.33° and; in total sample were 121.02° and 152.87°.




Graph 3: Mean and Standard deviation of angle between hard and soft palate curve among study subjects in dentilous and edentulous groups.

Table 4: Mean, standard deviation, minimum and maximum values of distance between anterior vibrating line and posterior vibrating line among study subjects in dentulous and edentulous groups.

| Area | Gender | Distance (mm) | Groups | |
|---|---|---|---|---|
| | | | Dentulous | Edentulous |
| At mid | Male | Mean ± SD | 4.04 ± 1.14 | 6.26 ± 1.86 |
| | | Min-Max | 2.50-6.00 | 3.50-10.00 |
| | Female | Mean ± SD | 3.82 ± 1.03 | 6.08 ± 1.41 |
| | | Min-Max | 2.50-6.00 | 3.00-8.00 |
| | Total | Mean ± SD | 3.93 ± 1.08 | 6.17 ± 1.64 |
| | | Min-Max | 2.50-6.00 | 3.00-10.00 |
| At right | Male | Mean ± SD | 5.20 ± 1.24 | 7.60 ± 1.77 |
| | | Min-Max | 3.00-7.50 | 5.00-11.00 |
| | Female | Mean ± SD | 5.04 ± 1.23 | 7.76 ± 1.59 |
| | | Min-Max | 3.00-7.50 | 4.50-10.00 |
| | Total | Mean ± SD | 5.12 ± 1.23 | 7.68 ± 1.67 |
| | | Min-Max | 3.00-7.50 | 4.50-11.00 |
| At left | Male | Mean ± SD | 5.32 ± 1.03 | 7.26 ± 1.82 |
| | | Min-Max | 3.50-7.00 | 4.50-11.00 |
| | Female | Mean ± SD | 5.20 ± 1.15 | 7.64 ± 1.48 |
| | | Min-Max | 3.00-8.00 | 4.00-9.50 |
| | Total | Mean ± SD | 5.26 ± 1.08 | 7.45 ± 1.65 |
| | | Min-Max | 3.00-8.00 | 4.00-11.00 |

Table 4 and graph 4 show mean, standard deviation, minimum and maximum values of distance between anterior vibrating line and posterior vibrating line among study subjects in dentulous and edentulous groups.

At mid:

In dentulous group, mean ± SD of distance between anterior vibrating line and posterior vibrating line in

males and females was 4.04 ± 1.14 mm and 3.82 ± 1.03 mm, respectively. In total sample, mean ± SD of distance was 3.93 ± 1.08 mm. Minimum and maximum values of distance in males, females and total sample were 2.50 mm and 6.00 mm.

In edentulous group, mean ± SD of distance between anterior vibrating line and posterior vibrating line in males and females was 6.26 ± 1.86 mm and 6.08 ± 1.41 mm, respectively. In total sample, mean ± SD of distance was 6.17 ± 1.64 mm. Minimum and maximum values of distance in males were 3.50 mm and 10.00 mm, females were 3.00 mm and 8.00 mm and total sample were 3.00 mm and 10.00 mm.

At right:

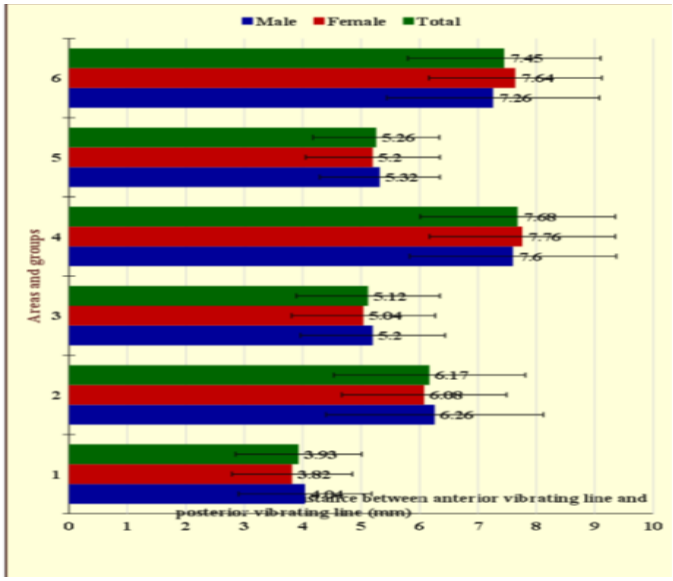
In dentulous group, mean ± SD of distance between anterior vibrating line and posterior vibrating line in males and females was 5.20 ± 1.24 mm and 5.04 ± 1.23 mm, respectively. In total sample, mean ± SD of distance was 5.12 ± 1.23 mm. Minimum and maximum values of distance in males, females and total sample were 3.00 mm and 7.50 mm.

In edentulous group, mean ± SD of distance between anterior vibrating line and posterior vibrating line in males and females was 7.60 ± 1.77 mm and 7.76 ± 1.59 mm, respectively. In total sample, mean ± SD of distance was 7.68 ± 1.67 mm. Minimum and maximum values of distance in males were 5.00 mm and 11.00 mm, females were 4.50 mm and 10.00 mm and total sample were 4.50 mm and 11.00 mm.

At left:

In dentulous group, mean ± SD of distance between anterior vibrating line and posterior vibrating line in males and females was 5.32 ± 1.03 mm and 5.20 ± 1.15 mm, respectively. In total sample, mean ± SD of distance was 5.26 ± 1.08 mm. Minimum and maximum values of distance in males were 3.50 mm and 7.00 mm, females were 3.00 mm and 8.00 mm and total sample were 3.00 mm and 8.00 mm.

In edentulous group, mean ± SD of distance between anterior vibrating line and posterior vibrating line in males and females was 7.26 ± 1.82 mm and 7.64 ± 1.48 mm, respectively. In total sample, mean ± SD of distance was 7.45 ± 1.65 mm. Minimum and maximum values of distance in males were 4.50 mm and 11.00 mm, females were 4.00 mm and 9.50 mm and total sample were 4.00 mm and 11.00 mm.




Graph 4: Mean and Standard deviation of distance between anterior vibrating line and posterior vibrating line among study subjects and edentulous groups.

| Area | Groups | Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line | |
|---|---|---|---|
| | | Pearson correlation coefficient | P value |
| At mid | Male | 0.697 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| | Female | 0.574 (Moderate positive relationship) | 0.003 (<0.01), Highly significant |
| | Total | 0.639 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| At right | Male | 0.609 (Strong positive relationship) | 0.001 (<0.01), Highly significant |
| | Female | 0.589 (Moderate positive relationship) | 0.002 (<0.01), Highly significant |
| | Total | 0.601 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| At left | Male | 0.672 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| | Female | 0.547 (Moderate positive relationship) | 0.005 (<0.01), Highly significant |
| | Total | 0.606 (Strong positive relationship) | 0.000 (<0.001), Very high significant |

Table 5: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line among, males, females and total sample in dentulous subjects.

Table 5 and graph 5 (a, b and c) show correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line among, males, females and total sample in dentulous subjects.

At mid: In males (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.697, P <0.001).

In females (n = 25), there was a statistically significant moderate positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.574, P <0.01).

In total sample (n = 50), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.639, P <0.001).

At right: In males (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.609, P <0.01).

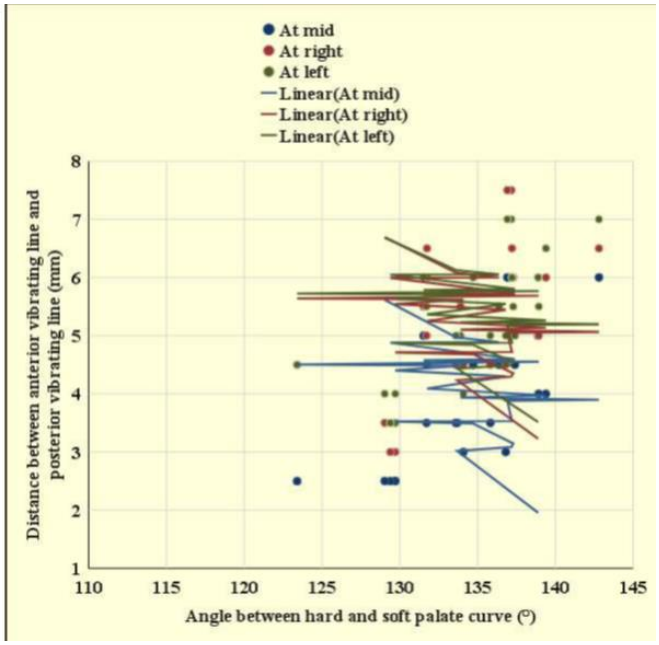
In females (n = 25), there was a statistically significant moderate positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.589, P <0.01).

In total sample (n = 50), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.601, P <0.001).

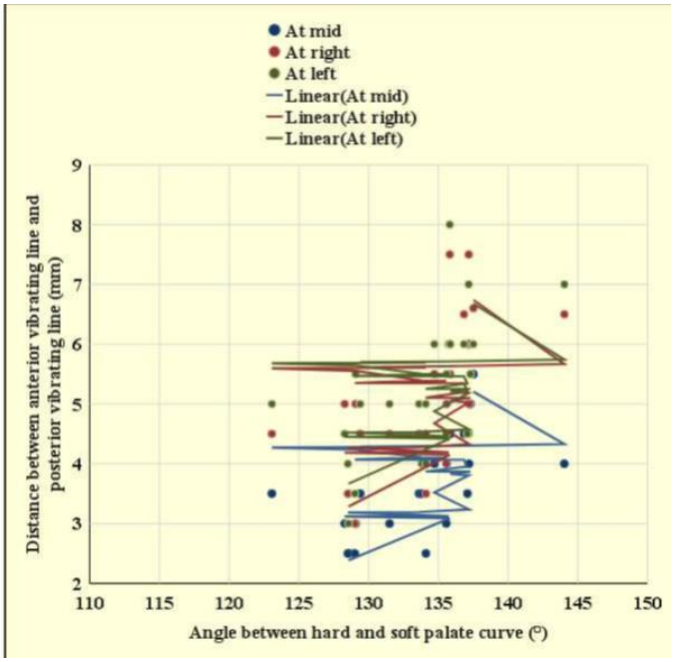
At left: In males (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.672, P <0.001).

In females (n = 25), there was a statistically significant moderate positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.547, P <0.01).

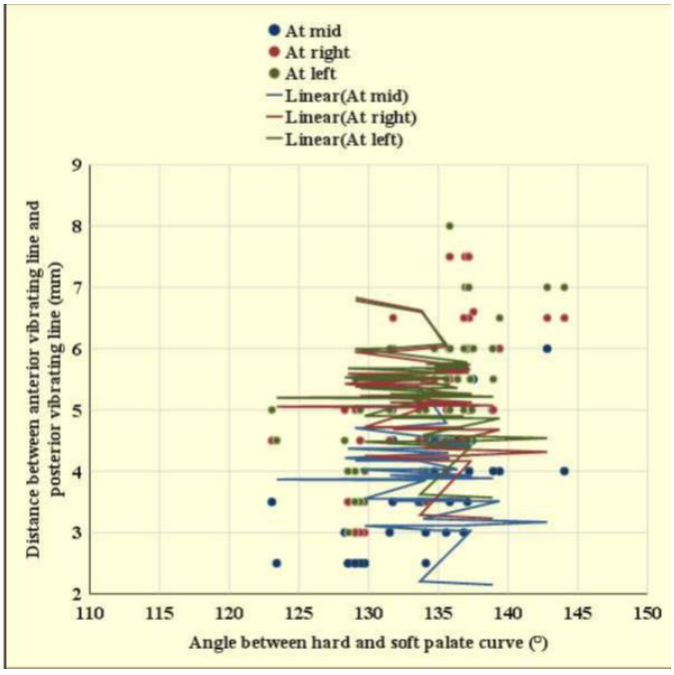
In total sample (n = 50), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.606, P <0.001).




Graph 5a: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left among males in dentulous subjects




Graph 5b: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left among females in dentulous subjects




Graph 5c: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left among total sample dentulous subjects

Positive correlation indicates that with increase in angle between hard and soft palate curve, distance between anterior vibrating line and posterior vibrating line also increases or vice versa.

Table 6: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line among, males, females and total sample in edentulous subjects.

| Area | Groups | Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line | |
|---|---|---|---|
| | | Pearson correlation coefficient | P value |
| At mid | Male | 0.547 (Moderate positive relationship) | 0.005 (<0.01), Highly significant |
| | Female | 0.757 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| | Total | 0.632 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| At right | Male | 0.608 (Strong positive relationship) | 0.001 (<0.01), Highly significant |
| | Female | 0.791 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| | Total | 0.687 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| At left | Male | 0.619 (Strong positive relationship) | 0.001 (<0.01), Highly significant |
| | Female | 0.730 (Strong positive relationship) | 0.000 (<0.001), Very high significant |
| | Total | 0.654 (Strong positive relationship) | 0.000 (<0.001), Very high significant |

Table 6 and graph 6 (a, b and c) show correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line among, males, females and total sample in edentulous subjects.

At mid: In males (n = 25), there was a statistically significant moderate positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line ($r = 0.547$, $P < 0.01$).

In females (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line ($r = 0.757$, $P < 0.001$).

In total sample (n = 50), there was a statistically significant strong positive correlation of angle between

hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.632, P <0.001).

At right: In males (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.608, P <0.01).

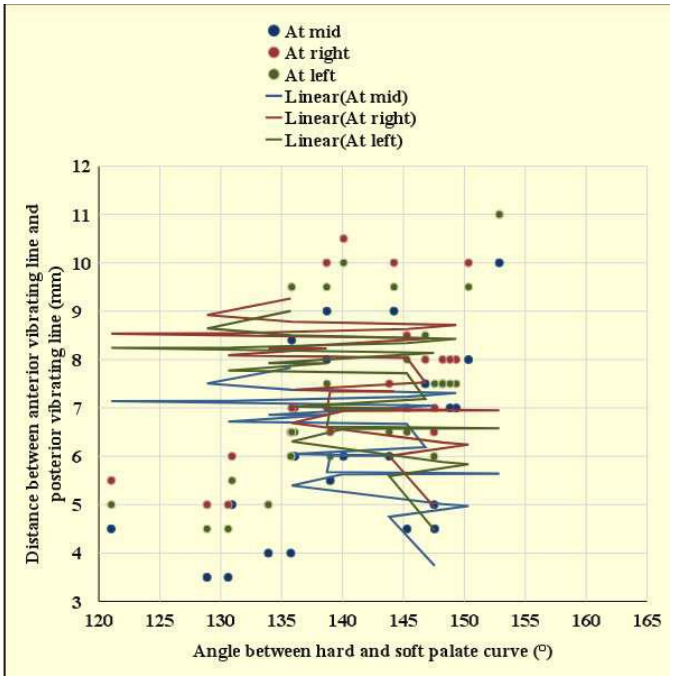
In females (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.791, P <0.001).

In total sample (n = 50), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.687, P <0.001).

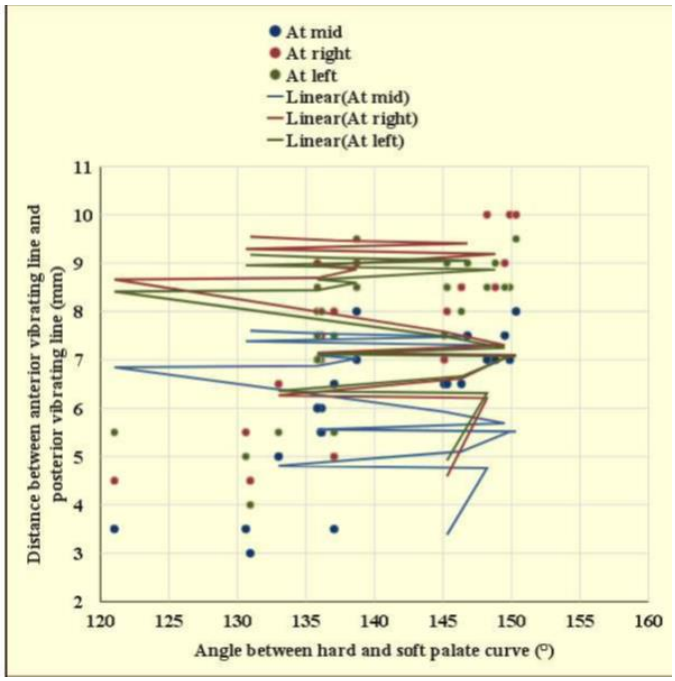
At left: In males (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.619, P <0.01).

In females (n = 25), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.730, P <0.001).

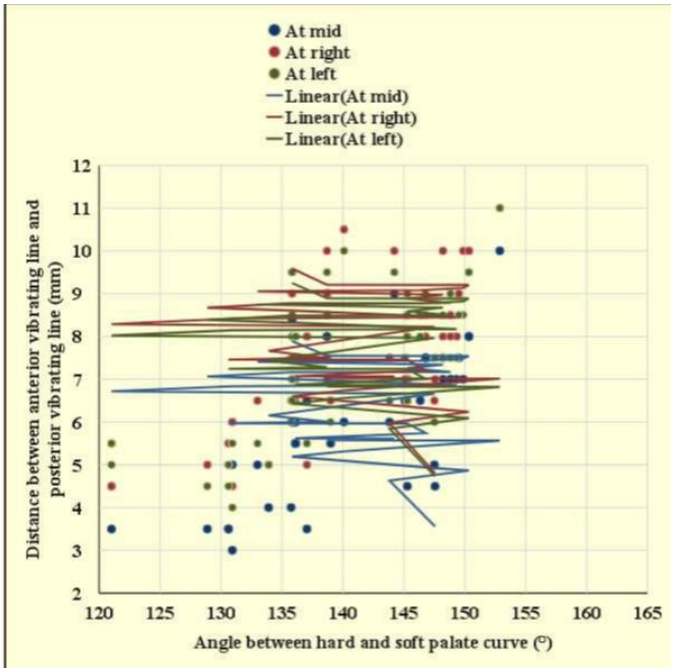
In total sample (n = 50), there was a statistically significant strong positive correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line (r = 0.654, P <0.001).




Graph 6a: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left among males in edentulous subjects




Graph 6b: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left among females in edentulous subjects




Graph 6c: Correlation of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left among in total sample in edentulous subjects Positive correlation indicates that with increase in angle between hard and soft palate curve, distance between anterior vibrating line and posterior vibrating line also increases or vice versa.

**Discussion**

Retention is essential for the success of a maxillary complete denture, which is retained against the force of gravity. Besides the sufficient extension of the denture, a properly designed posterior palatal seal is the most important Factor in determining denture retention.

A study was conducted byT. l. Lye15 to know the significance of the fovea palatine-in complete denture prosthodontics where they found out that fovea palatini were positioned 1.31 mm. (mean of 100 subjects) in front of the vibrating line. Radio graphically and histologically, the foveae were located in soft tissue covering tile hard palate in all specimens. H. Nikoukari21 designed a study to measure the dimension and displacement pattern of the posterior palatal seal in different palatal shapes. The effects of different materials on the displacement of tissue in the posterior palatal area were also evaluated. S. B. Keng 16 A clinical study was conducted to withdraw the relation of the vibrating line to the fovea palatine and soft palate contour in edentulous patients. They concluded that the vibrating line is located approximately 2.62 mm anterior to the fovea. Vernie27 carried out a study to determine whether the anterior and posterior vibrating lines can be distinguished as two separate lines of flexion by unbiased observers. They concluded that the anterior and posterior vibrating lines could be located by the undergraduate students as two separate lines of flexion when the appropriate action was elicited for each of them; and the palpatory method produced a line slightly anterior to the anterior vibrating line located by the Valsalva manoeuvre.

Kyu Young Kyung28 Stated that the spatial relationship between the foveae palatine and vibrating lines varies among individuals; Such variability could be related to the contour of the palate. The purpose of this study was to investigate the relative location of the foveae palatine and vibrating lines and to determine the correlation between the seal area of the posterior palate and the palatal contour with lateral cephalogram radiography. The angle of the palatal contour was measured with the Vceph program.. They found that the anterior vibrating line was located approximately 2.58 ±1.19 mm anterior to the foveae palatini, and the posterior vibrating line was located 0.71 ±0.68 mm posterior. A positive correlation was found between the distance from the anterior to the posterior vibrating line in the lateral Sagittal plane and the angle of the palatal contour at the junction of the hard and soft palate. They concluded that considering their proximity to the posterior vibrating line, the foveae palatinae could be reliable reference

points for locating the posterior border of the maxillary denture. The results of this study also suggest that a wider posterior palatal seal area could be obtained if the patient has a gentle palatal contour at the junction of the hard and soft palate.they implicated it clinically as The posterior vibrating line is located proximal to the foveae palatinae, which can serve as important reference points in clinical situations where the posterior vibrating line cannot be clearly determined. A larger posterior palatal seal area can be obtained when the slope between the soft and hard palates is moderate.Thapa29 Did a clinical study to verify the relationship between fovea palatini, anterior and posterior vibrating line, and hard and soft palate junction and their role in locating PPS area.

They concluded that recording posterior palatal seal is an important clinical step thus arbitrarily scraping of the cast using fovea palatini and hamular notch as reference, should be discouraged. Locating anterior and posterior vibrating lines and using them to determine the posterior extension and PPS should be recommended. Rupal et al30 carried out a study to evaluate the relationship between PPS width of the patient intra-orally and cephalometric tracing of the same patient. In this study a lateral cephalogram was made to trace the hard and soft palatal contour, and the angle of the palatal contour was measured with the v-ceph program. They concluded that the correlation of angle between hard tissue and soft tissue to PPS width, and the angle between ANSPNS and PNS-U to PPS width, increases with an increase in PPS width. Ujjal Chatterjee3 done a research to study the individual variations in the shape and size of PPS and its vibrating lines. The objective was to study the correlation PPS with palatal angulations. The PPS area was measured in patient's mouth. A lateral cephalogram was trace the hard and soft palatal contour, and the angle of the palatal contour was measured. They concluded that Correlation of the angle of the palatal contour to PPS width, showed perfectly positive value, while correlation of angle between anterior nasal spine, posterior nasal spine (ANS-PNS) and PNS Uvula (U) to PPS width showed partially positive value.

Aim of study and objective of the present study was to evaluate relationship between palatal configuration radio graphically and posterior seal area intraorally in edentulous and dentulous group and to investigate the relative location of the vibrating lines and to determine the correlation between the seal area of the posterior palate and the palatal contour with lateral cephalogram radiography. . The study population was recruited from department of prosthodontics, Rishiraj College of Dental Sciences & Research Centre. Bhopal. A total sample size of hundred patients was taken. Among them fifty participants were dentulous and other fifty were Edentulous. Male and female ratio was nullified by taking twenty-five Male and Twenty five Female patients in either groups of Dentulous and Edentulous participants. A single trained operator was employed to mark the anterior and posterior vibrating line intra orally using same method to reduce the error. There was no change in brand of material employed in our study to reduce the error. Lateral cephalogram was taken and angle between hard palate curve and soft palatal curve was marked using diagora software. Parametric test, Pearson correlation test was applied to access relationship of angle between hard and soft palate curve with distance between anterior vibrating line and posterior vibrating line at mid, at right and at left in dentulous and edentulous subjects. In all of the groups there was a statistically highly significant result that shows positive correlation between palatal contour and width of posterior seal area. So in our study it was concluded that with increase in angle between hard

palate curve and soft palate curve the distance between anterior vibrating line and posterior vibrating line was increased. Our findings were in concurrence with the conclusions of S. B. Keng , KyuYoung Kyung, Rupal et al , Ujjal Chatterjee et al & Thapa. So from our study we concluded that a better retentive maxillary prosthesis is obtained when we have a wider posterior palatal seal and a wider posterior palatal seal area could be obtained if the patien has a gentle palatal contour at the junction of the hard and soft palate. Male and female ratio was also in our study nullified by taking twenty five Male and Twenty five Female patients in either groups of Dentulous and Edentulous participants. It would be interesting and informative to note changes in results if the period of edentulousness would be standardized for edentulous group. Plus results can be expected to be different if there can be two different group for denture wearers and non denture wearers. Our study results were based on findings obtained from a sample of hundred subjects.

A larger sample size may increase the precision of results. This could serve as an apt platform for designing similar studies in future. Within the limitations present in our studies we can deem that a better retentive maxillary prosthesis is obtained with patient having a gentle palatal contour at the junction of the hard and soft palate and in turn having a wider posterior palatal seal.

**Conclusion**

Aim of study and objective of the present study was to evaluate relationship between palatal configuration radio graphically and posterior seal area intraorally in edentulous and dentulous group and to investigate the relative location of the vibrating lines and to determine the correlation between the seal area of the posterior palate and the palatal contour with lateral cephalogram radiography.

1.There lies a positive relation in the distance between the anterior and posterior vibrating line and the angle between the hard palatal curve and soft palatal curve.

2.As the distance between anterior vibrating line and posterior vibrating line increases so does the angle between the hard palate curve and soft palate curve.

3.A larger posterior palatal seal area can be obtained when the slope between the soft and hard palates is moderate. Leading to increased retention of maxillary prosthesis.

**Summary**

This aim of this randomized cross sectional study was to evaluate relationship between palatal configuration radio graphically and posterior seal area intraorally in edentulous and dentulous group and to investigate the relative location of the vibrating lines and to determine the correlation between the seal area of the posterior palate and the palatal contour with lateral cephalogram radiography. The study was carried out in Rishiraj college of dental sciences and research centre (Bhopal) within a time span of one and a half year. The study population was recruited from department of prosthodontics, Rishiraj College of Dental Sciences & Research Centre. Bhopal. The ethical clearance was obtained by ethical committee. Sample size. A total sample size of hundred patients wa taken. Among them fifty participants were dentulous and other fifty were Edentulous. Male and female ratio was nullified by taking twenty-five Male and Twenty five Female patients in either groups of Dentulous and Edentulous participants. Age group was 45-65 years for both the groups. From this study we summarize that

1. There lies a positive relation in the distance between the anterior and posterior vibrating line and the angle between the hard palatal curve and soft palatal curve.

2. As the distance between anterior vibrating line and posterior vibrating line increases so does the angle between the hard palate curve and soft palate curve.

3. A larger posterior palatal seal area can be obtained when the slope between the soft and hard palates is moderate.

Retention is essential for the success of a maxillary complete denture, which is retained against the force of gravity. Besides the sufficient extension of the denture, a properly designed posterior palatal seal is the most important factor in determining denture retention.

So a better retentive maxillary prosthesis is obtained when we have a wider posterior palatal seal and a wider posterior palatal seal area could be obtained if the patient has a gentle palatal contour at the junction of the hard and soft palate.

**References**


1. Hardy IR, Kapoor KK. Posterior border seal-its rationale and importance. J Prosthet Dent 1958; 8:386-97.
2. Ettinger RL, Scandrett FR. The posterior palatal seal. A review Aust Dent J 1980; 25:197-200.
3. Schwartz WD. The post dam. Dental Update 1991; 18:26-30.
4. The Glossary of Prosthodontic Terms 9th ed. J Prosthet Dent 2017; 117-5,10-81.
5. Hartwell CM, Jr syllabus of complete denture (1st edition) philledelphia Lee & febiger publishers:1968,1-50
6. Weintraub GS. Establishing the posterior palatal seal during the final impression procedure: A functional approach. J Am Dent Assoc 1977; 94:505-10.
7. Pendleton EC. Influence of biological factors in retention of artificial dentures. J Am Dent Assoc 1936; 23:1233-51.
8. Marks BI. The microanatomy of the human edentulous maxilla. Aust Dent J 1978; 23:69-74.
9. Winkler S. Essentials of complete denture prosthodontics. Philadelphia, London, Toronto: WB Saunders; 1979. p. 171-92.
10. Jacob RF, Zarb G. Maxillary and Mandibular Substitutes for the Denture- Bearing Area. In: Zarb G, Hobkirk J, Eckert SE, Jacob RF, eds. Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Prostheses. 13th ed. St. Loius, Missouri: Mosby 2013:161-79.
11. Sharry jj. Complete denture prosthodontics – 3rd editions. New York. Mc Graw Hill BookCo.1974:191-210.
12. Bindhoo YA, Thirumurthy VR, Jacob SJ, Anjanakurien, Limson KS, Posterior Palatal Seal: A Literature Review, Intl. J Prostho & Restor Dent. 2011;1(2):108-114
13. Swenson Mg Terkler Lg. Complete Denture Prosthodontics.6th edition.St Louis.
14. The CV Mosby Company. 1970 :65-70 : 372-76.
15. Colon AK, Kotwal K, Mangelsodroff AD. Analysis of the posterior palatal seal and the palatal form as related to the retention of complete dentures. J Prosthet Dent 1980; 47(1): 23-7.
16. Lye TL. The significance of the fovea palatini in complete denture prosthodontics. J Prosthet Dent 1975;33:504.
17. Keng SB The relation of the vibrating line to the fovea palatine and soft palate contour in edentulous patients. Australian Dental Journal, June, 1983 Volume 28,No. 3-166-9
18. Silverman Denture prosthesis and the functional anatomy of the maxillofacial structures J. Pros. Den. 1956,6(3):305-331

19. T.E. Jacobson, A.J. KrolA contemporary review of the factors involved in complete denture retention, stability, and support, part I: retention J Prosthet Dent, 49 (1983), pp. 5–15
20. Woelfel B. Dimensional changes occurring in denture during processing. J Prostho Dent. 1960:61(17) 413-30.
21. Carrol EA, Shaffer FW. Redefining the posterior palatal seal on a complete denture. J Prosthet Dent 1980; 43:105-7.
22. H. Nikoukari. A study of posterior palatal seals withvarying palatal forms. J Pros. Den. 1975, 34(6):605-613.
23. Winland RD, Young JM. Maxillary complete denture posterior palatal seal:variation in size, shape and location. J Prosthet Dent 1973; 29(3): 256-61.
24. House MM. The relationship of oral examination to dentaldiagnosis. J Prosthet Dent 1958;8:208-19.
25. Silverman SI. Dimensions and displacement patterns of the posterior palatal seal. J Prosthet Dent 1971; 25:470-88.
26. Navrekar Rajeev MN, Applelboum BM. An investigation of the anatomic position of the posterior seal by ultrasound. J Prosthet Dent1989; 61:331-6.
27. Goyal S, Goyal MK, Balkrishanan D, Hegde V, Narayana AI. The posterior palatal seal: Its rationale and importance: An overview. Eur J Prosthodont 2014; 2:41-7.
28. Vernie AF, Chitre V, Aras M. A study to determine whether the anterior and posterior vibrating lines can be distinguished as two separate lines of flexion by unbiased observer: Apilot study Indian J of Dental 2008; 19(4): 335-9 [IVSL].
29. KyuYoungKyung, The study of anatomic structures in establishing the posterior seal area for maxillary complete dentures. J Prostho Dent. Volume 112, Issue 3, September 2014, Pages 494–500
30. Thapa D, Chandra S, Karki S: Verifying Relationship between Fovea Palatini, Vibrating Lines and Junction between Hard and Soft Palate. Orthodontic Journal of Nepal, Vol. 6 No. 1, June 2016
31. Rupal J Shah. A study of correlation between posterior palatal seal width and soft palatal angulation with palatal contour. J Indian Prosthodont Soc. 2016 Apr- Jun; 16(2): 154–158