A STUDY TO EVALUATE THE RELIABILITY OF FOVEA PALATINI FOR DETERMINING THE POSTERIOR BORDER OF THE MAXILLARY COMPLETE DENTURE

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ABSTRACT

Aims: The aim of this study was to examine and establish the precise relationship of Fovea palatini to the posterior vibrating line and to the hard and soft palate.

Materials and Methods: Study was carried out on twenty five edentulous subjects of both sexes ranging age from 45 to 65 years. Study was carried out in two parts, first part consisted of clinical study and second part of radiographic examination.

Results: When collected data was compared statistically it was observed that clinical and radiographic study did not differed significantly. Fovea palatini of all subjects were anterior to vibrating line and were separated at varying distance. Clinical study and radiographic study could not establish any constant relation between Fovea palatini and the vibrating line.

Conclusions: For clinical point of view Fovea palatini cannot be regarded as reliable guides or landmarks for locating the posterior border of maxillary complete prosthesis.

KEYWORDS: Fovea palatine, Occlusal radiograph, Radiopaque markers, Vibrating line

INTRODUCTION - The border seal of denture to be effective depends upon the proper extension of the denture borders both in width and in height so that they fill the mucobuccal space. At the posterior aspect of the maxillary denture, in the area of the soft palate, there is no tissue fold to seal the denture border. The border seal is completed in this region by developing the posterior palatal seal. The posterior region of the maxillary denture rests on the anterior portion of the soft palate which is supported by the palatine aponeurosis. The anterior part of the soft palate is relatively immovable and resilient as compared to the posterior portion of the soft palate. This arbitrary junction is called the vibrating line which acts as the landmark for creating the posterior palatal seal.

Skinner and Chung have demonstrated the importance of the posterior palatal seal experimentally and stated that the most effective addition to increase in retention was the postdam. Any reduction in the posterior palatal seal produced a decrease in retention.¹

There is a difference of opinion among the various workers regarding the method for locating the posterior border of the maxillary denture. Two techniques for locating the posterior border of the maxillary complete denture have been discussed in the literature.²

One of these relates to the anatomical relationship between the Fovea palatine and posterior border of the maxillary denture. The other is the physiological approach that is the displacement of soft tissue of the vibrating line / area as the critical factor in the posterior palatal seal technique. However, there are disagreements regarding the location of the Fovea palatine in relation to the hard and soft palate as well as to the vibrating line of the palate. There is also considerable difference of opinion regarding the use of these anatomical structures as landmarks for determining the posterior border of the maxillary denture.

This study was undertaken to record the frequency of the presence of the Fovea palatine and to examine and establish a relationship between the Fovea
palatine and the vibrating line, thus to assess the reliability of the fovea palatine as anatomical landmarks for determining the location of the posterior border of the maxillary denture.

MATERIALS AND METHODS

The present study involved 25 subjects of both sexes ranging in age from 45-65 years and was conducted in two parts. The first part consisted of a clinical study and the second part of a radiographic examination.

The clinical study used the technique, as described by Silvermin², of phonation of ‘ah’ sound by the subject to visually observe and locate the posterior vibrating line. The subject was instructed to say ‘ah’ in short burst in a normal, exaggerated fashion. While observing the movement of the soft palate, that is, noting the area between the shallow displacement and marked muscular activity, the posterior vibrating line was observed and marked with an indelible pencil. Prior to making the markings, the subjects were instructed to rinse with an astringent mouth wash to remove any stringy saliva which might have prevented clear markings. The posterior palatal mucosal surface was kept dry with a piece of gauze. The Fovea palatines were then visually located, and marked with the tip of the indelible pencil. A line was drawn, joining the two fovea palatines across the midline of the palate. After verification of the two markings, the distance between the two was measured by an uncalibrated engineering compass. The measurement made by the compass was then compared directly with the calibrations of a stainless steel metric ruler. The distance was recorded in millimeters.

The radiographic study was performed to ascertain the relationship of the Fovea palatine to the posterior vibrating line of the palate and to the hard and soft palates i.e. the distal edge of the hard palate with the aid of occlusal radiographs.

An occlusal radiograph as per the technique described by McCall and Wald³, was taken of each subject with the Fovea palatine and the posterior vibrating line marked with radiopaque markers. For the purpose of marking the fovea palatine and the posterior vibrating line with radiopaque markers, a template of auto curing acrylic was fabricated for each subject, which was marked at the exact location of the Fovea palatine and the posterior vibrating line with radiopaque markers so that when the template was inserted in the mouth of the subject the radiopaque markers lay on the Fovea palatine and posterior vibrating line.

The radiopaque markers consisted of lead foil backings of x-ray films. An occlusal radiograph was taken of the subject with the template, marked with radiopaque markers, in the mouth.

From the x-ray, the distance between the Fovea palatini and the posterior vibrating line was measured in millimeters and then compared mathematically and statistically with the measurements made in the clinical study.

Tracing of the posterior margins of the bones and the Fovea palatini were made from the occlusal radiograph. A straight line was traced through the palatine suture and another line was drawn at right angles to the first line and passing through the tip of the palatine bone. The distance between the Fovea palatini and the second line was measured to predict the relationship of the Fovea palatini to the distal edge of the horizontal part of the palatine bone.

The distance separating the two Fovea palatini across the midline was also measured and recorded in millimeters.

RESULTS

Out of 27 subjects screened, 25 subjects (92.6%) has ideal Fovea palatini located on either side of the midline. There were no Fovea palatini present in one subject (3.7%) and one subject (3.7%) had two Fovea palatini present on the left side of the midline of the palate.

The clinical study revealed that out of 25 subjects with ideal Fovea palatini, 3 subjects (12%) had Fovea palatini coincident with the vibrating line and others 2 subjects (8%), 1 subject (4%), 5 subjects (20%), 6 subjects (24%) and 8 subjects (32%) had Fovea palatini located within 1-2 mm, 2-3 mm, 3-4 mm, 4-5 mm and more than 5 mm respectively anterior to the vibrating line.

The width of the indelible pencil was approximately 0.5 mm. For the purpose of mathematical and statistical analysis, 3 subjects whose Fovea palatini coincided with the vibrating line were recorded as 0.5 mm.

There were 14 individual observations which were above the mean value (3.95 mm) and 11 individual observations below the mean value (Table I).

The radiological study revealed that 4 subjects (16%) had Fovea palatini coincident with the vibrating line. Although 1 subject (4%), 1 subject (4%), 5 subjects (20%), 6 subjects (24%) and 8 subjects (32%) had Fovea palatini located 1-2 mm, 2-
3 mm, 3-4mm, 4-5mm and more than 5mm. respectively anterior to the vibrating line.

The Fovea palatini of the 4 subjects whose Fovea coincided with the vibrating line were considered to be located 0-1mm. anterior to the vibrating line.

There were 16 individual observations which were above the mean value (3.88mm) and 9 individual observations below the mean value (Table 1).

When mean values of observations of clinical and radiological studies were compared, it was observed that observations of the clinical and radiological studies did not differ significantly (t= 1.26, p>0.05) (Table 1).

It was also observed that the mean distance from the posterior margin of the hard palate to the fovea palatini was 2.47mm. (Table 2). There were 12 individual observations below the mean value and 13 observations above the mean value. The maximum distance was 4.1mm.

It was also reported that the Fovea palatini were separated from each other across the midline by an average mean (of 25 subjects) distance of 2.89mm. (Table 3).

**DISCUSSION**

The fovea palatini have been used as guides or landmarks for locating the posterior border of the maxillary complete prosthesis due to their proximity to the vibrating line and their position in relation to the hard and soft palate. Hickey and Zarb, and Mcgregor and Millsap stated that the fovea palatini are always located in compressible tissue and are in very close proximity to the vibrating line. They advocated the technique of using the Fovea palatini as landmarks for locating the posterior border of the maxillary complete prosthesis. Others like Sharry, Silverman have expressed opinions against such a technique stating that the fovea palatini are unreliable as landmarks as because their position varies and that utilizing such a technique, could lead to loss of several millimeters of posterior palatal seal area depending upon the palatal configurations.

It is generally agreed that the posterior limit of the maxillary complete denture prosthesis should end at the posterior vibrating line, which is the junction of the movable and the immovable tissue of the soft palate. The position of the fovea palatini in relation to the posterior vibrating line and the hard and soft palate is not agreed upon by the various authors. While authors like Hickey and Zarb, Heartwell and Rahn, report the location of the fovea palatini as slightly posterior to the junction of the hard and soft palates, in the glandular tissue of the soft palate area, others like Lye report the location of the fovea palatini in the soft tissue of the hard palate.

The present study revealed that the fovea palatini were anterior to the vibrating line in all individuals. However, the study could not establish any constant relationship between the fovea palatini and the vibrating line as the distance separating the fovea palatini and the vibrating line varies from individual to individual. The minimum distance separating the fovea palatini and the vibrating line was 0.5mm and the maximum distance 5.9mm.

While there were 14 individual differences between the clinical and the radiological measurements, the statistical analysis showed that these differences were insignificant at 5% level of significance. The differences in reading could have been caused by personal error committed at the time of exposure of the occlusal radiographs that is slight changes in the angulations or at the time of making measurements. The difference between the two mean values of only 0.07mm is unimportant from a clinical view point since the existing techniques and instruments for determining the vibrating line do not permit precision greater than 1mm. Secondly, the maxillary complete prosthesis is unlikely to lose its retentive characteristic if the posterior border is over extended or under extended by 0.5mm or less.

The present study revealed that the fovea palatini were located anterior to the vibrating line in all individuals. There did not exist any constant distance relationship between the fovea palatini and the vibrating line. Lye (1975) in a similar clinical study had reported the position of the fovea palatini as 1.31mm anterior to the vibrating line, the readings varying from 5mm anterior and 3mm posterior to the vibrating line. These results indicated that the fovea palatini were measured from the anterior vibrating line. This would then be consistent with the results of the present study which has revealed that the fovea palatini are at an average 3.9mm anterior to the posterior vibrating line.

The radiographic study further examined that the fovea palatini are located in the soft tissue of the hard palate in all individuals and not in the compressible tissue of the soft palate as suggested by Hickey and Zarb. The position of the Fovea palatini with respect to the posterior edge of the hard palate was not constant. The observation of the distance from the Fovea palatini to the most posterior edge of the hard palate
ranged from 0.5mm to 4.1mm and the average mean distance from the Fovea palatini to the posterior edge of the hard palate was 2.47mm. These results are consistent with the statements made by Sharry\(^7\), and Hardy and Kapur \(^10\), that the Fovea palatini are located within the tissues of the posterior part of the hard palate and can be said to mark the posterior area of the hard palate.

**CONCLUSIONS**

The present study reveals that fovea palatini cannot be regarded as reliable guides or landmarks for locating the posterior border of the maxillary complete prosthesis. The variance in location in relation to the posterior vibrating line makes the fovea palatini unreliable as landmarks.

**CLINICAL SIGNIFICANCE**

The location of the fovea palatini in the soft tissue of the hard palate contraindicates the use of these anatomical structures as guides for locating the posterior border of the maxillary complete prosthesis, which should always be located in the compressible tissue of the soft palate. The fovea palatini thus serve no other useful purpose than to receive the ducts of the palatal mucous glands around them.

**Table 1:** Distance between fovea palatine & vibrating line by the clinical & radiological studies

<table>
<thead>
<tr>
<th></th>
<th>Clinical Study</th>
<th>Radiological Study</th>
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<tbody>
<tr>
<td>Mean Distance</td>
<td>3.9540</td>
<td>3.8804</td>
</tr>
<tr>
<td>N(no. of patients)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>1.75338</td>
<td>1.83028</td>
</tr>
<tr>
<td>Std. Error Mean</td>
<td>0.35068</td>
<td>0.36606</td>
</tr>
<tr>
<td>t-value</td>
<td>1.260</td>
<td>NS</td>
</tr>
<tr>
<td>df</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Sig.P (2-tailed)</td>
<td>0.220</td>
<td>NS</td>
</tr>
</tbody>
</table>

For significant, P< 0.05

**Table 2:** Distance between fovea palatini & the posterior margin of the palatine bone in mm

<table>
<thead>
<tr>
<th>N(No. of Patients)</th>
<th>Minimum Distance</th>
<th>Maximum Distance</th>
<th>Mean Distance</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.00</td>
<td>4.10</td>
<td>2.4760</td>
<td>1.36696</td>
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</table>

**Table 3:** Distance between the two fovea palatine across the midline of the palate in mm

<table>
<thead>
<tr>
<th>N(No. of Patients)</th>
<th>Minimum Distance</th>
<th>Maximum Distance</th>
<th>Mean Distance</th>
<th>Std. Deviation</th>
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<tr>
<td>25</td>
<td>2.10</td>
<td>3.80</td>
<td>2.8900</td>
<td>0.53697</td>
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REFERENCES