Assessment of Palatal Throat Form in Lateral Cephalogram and its Correlation with the Skeletal Base and Facial Divergence: An Institutional Based Study

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Citation

Sapkota B, Koju S, Mahanta SK, Rimal U. Assessment of Palatal Throat Form in Lateral Cephalogram and its Correlation with the Skeletal Base and Facial Divergence: An Institutional Based Study. *Kathmandu Univ Med J.* 2021;76(4):442-5.

ABSTRACT

Background

Along with peripheral seal, palatal throat form also has significant value to achieve good retention and stability of maxillary complete denture. The palatal throat form also determines the posterior extention of maxillary dentures and affects the comfortability of the patients.

Objective

To analyse the palatal throat form in a Nepalese population based on age, gender malocclusion and facial divergence.

Method

This study consisted of 300 randomly selected radiographs with a mean age of 21.46±5.62 years. Skeletal malocclusion in lateral palatal throat form outlines. Patient were also categorized according to different Schudy's facial divergence angle (SN-MP). The obtained data was tabulated based on the age, gender, palatal throat form, type of malocclusion and facial divergence. The results obtained were subjected to a statistical analysis to find the relation between variants of the soft palate and types of malocclusion in different gender groups.

Result

Proportion between palatal throat form and malocclusion found to be significant. There is no significant difference in proportion of different class of palatal throat form between genders. Whereas Class II palatal throat form found to be most common in all facial divergence.

Conclusion

It was observed that Class II malocclusion was most common among three types. The relation between palatal throat form and malocclusion, was found to be statistically significant.

KEY WORDS

Cephalometry, Malocclusion, Soft palate

INTRODUCTION

Soft palate is a fibromuscular portion of the oral cavity that extends from the posterior edge of hard palate into the oropharynx. It is involved in various oral functions like sucking, swallowing, speech, etc.[1] The angulation of soft palate is important during the surgery involving clefts, and also for retention of maxillary dentures.[2,3] Study have shown that lack of retention in upper denture is commonly associated with a faulty posterior palatal seal area which is related to the angulation of soft palate.[4]

To obtain a better posterior peripheral seal in the maxillary complete denture, it should be extended to include the palatal throat form with proper length and thickness. As the oral anatomy is unique for every individuals, the length (depth) and width of the palatal throat form may also varies among the different persons like the lateral throat form varies in mandibular arch.[5]

Derivatives of a common arch, the jaws and the palate may have an association between them. Various studies related to cleft lip and palate, and associated malocclusion have been conducted. It has also been proposed that most of the edentulous mouths have class I and II type of palatal throat forms and the class III are rare but exact proportion is unknown and no study till date have correlated the angulation of the soft palate and the skeletal malocclusion. Hence, this study with the aim of determining the variation in the angulation of the soft palate was conducted in a Nepalese population, and its comparison with different type of malocclusion, facial divergence, age group and sex.

METHODS

This study was descriptive cross sectional in nature. The data was collected retrospectively (from May - Oct. 2019) on the lateral cephalogram of the patient seeking orthodontic treatment in department of Orthodontics at Dhulikhel Hospital. Sample size was determined based on the formula z^2pq/e^2 where z=1.96, for a confidence level of 95%, p=proportion

Proportion was taken as 18.75% based on the prevalence of type of soft palate in a similar study done by Pal et al.

Q= (1-p)

E= margin of error taken as 0.05. Hence substituting the value, the minimum sample size required found to be 235. Hence total of 300 patients (103 males and 197 females) were randomly selected from the data base of Oral medicine and radiology at Dhulikhel Hospital. A proforma was designed for Data collection consisting of age, gender, type of malocclusion, facial divergence type and palatal throat form type by single investigator .Cephalograms were viewed using the software Planmeca Romexis software version 3.1.1.R. with the inclusion criteria of good quality radiographs of patients seeking orthodontic treatment and without other abnormalities. Exclusion criteria are radiographs with cleft palate, craniofacial syndromes, fractures of head and neck, pharyngeal pathology, nasal obstruction, enlarged tonsils or adenoids were excluded from the study. The angulation of soft palate is measured (fig. 1) based on Weine concept.[6]

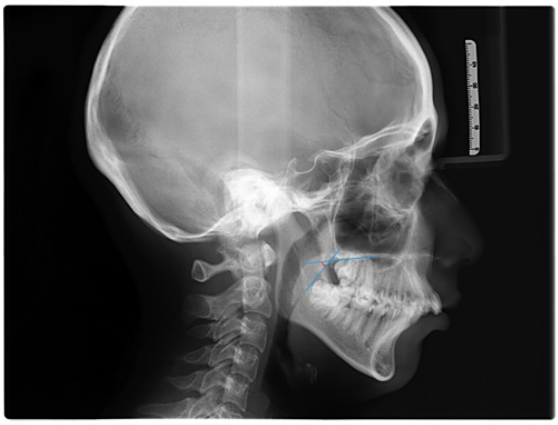

Figure 1. Soft palate angulation was measured at the point of intersection of the two tangents that is formed by a tangent drawn across the soft palate and hard palate outlines.

Skeletal malocclusion in lateral cephalogram was classified on basis of ANB angle value: Class I skeletal base: angle 2-4°, Class II: > 4° and Class III: < 0°.[7] Soft palate angulation was measured at the point of intersection of the two tangents that is formed by a tangent drawn across the soft palate and hard palate outlines. Palatal throat form was divided into three different groups Class I-below 41°, Class II-41°-50° and Class III > 40°.[8] Patient were also categorized according to three different facial divergence on the basis of Schudy's facial divergence angle (SN-MP), which was obtained by measuring the mandibular plane and S-N plane.[9] The subjects were classified into three groups: hypodivergent, SN-MP: < 31° (27°-30°), normodivergent, SN-MP: 31°-34°, and hyperdivergent, SN-MP: > 34° (35°-38°).

The obtained data were analyzed using SPSS version 20.0 for Windows (SPSS Inc., Chicago, IL, USA). The patient were segregated according to different age, gender, skeletal malocclusion and facial divergence. The statistical significance was set at a p value of < 0.05. KS-test and Sapero Wilk test were conducted to test data normality. The data was found to be normally distributed.

Since this was a descriptive study; the values have been reported in proportions. Hence chi square test was employed as a test of proportion. Palatal throat form was analysed based on malocclusion, facial divergence, age and gender

RESULTS

The distribution and proportion of various types of palatal throat form from our study population was tabulated. The gender distribution was found to be 34.3% male and 65.7% female of which more than 50% were with Class

2 malocclusion and Class II palatal throat form whereas among facial divergence 48% is hypodivergent.

Palatal throat forms did not significantly differ according to gender ($p \geq 0.05$) although it has been found that Class II palatal throat form is most common percentage wise (Table 1).

Table 1. Proportion of palatal throat form with gender

Sex	Palatal throat form			Chi sq value	p-value
	Class I	Class II	Class III		
Male	18 17.5%	50 48.5%	35 34.0%	1.013	0.60
Female	33 16.8%	107 54.3%	57 28.9%		

Class II palatal throat form found to be more prevalent among three types of facial divergence (Table 2).

Table 2. Proportion of palatal throat form with facial divergent

Facial divergent	Palatal throat form			Chi sq value	p- value
	Class I	Class II	Class III		
Hypodivergent	29 20.1%	69 47.9%	46 31.9%		
Normodiv-eregent	11 11.5%	57 59.4%	28 29.2%	4.23	0.37
Hyperdivergent	11 18.3%	31 51.75	18 30.0%		

It is suggestive of relatively stable palatal throat form with growing age although it is not statistically significant as p-value is more than 0.05 (Table 3).

Table 3. proportion of palatal throat form with different age group

Age group	Palatal throat form			Chi sq value	p- value
	Class I	Class II	Class III		
>20 years	29 19.5%	79 53.0%	41 27.5%	2.041	0.3
< 20 years	22 14.6%	78 51.7%	51 33.8%		

Comparing the proportion of palatal throat form in different malocclusion it was found to be 41.5%, 59.05%, 48.5% Class II palatal throat form respectively. There was found to be significant association between palatal throat form and malocclusion as p-value 0.01 which is less than 0.05 (Table 4).

Table 4. Proportion of palatal throat form with malocclusion.

Malocclusion	Palatal throat form			Chi sq value	p- value
	Class I	Class II	Class III		
Class 1	14 14.9%	39 41.5%	41 43.6%		
Class 2	35 20.2%	102 59.05	36 20.8%	20.26	0.01
Class 3	2 6.1%	16 48..5%	15 45.5%		

DISCUSSION

A well retained denture is one of the major factor for successful prosthetic treatment. Border seal/peripheral seal is required so as to promote atmospheric pressure between the soft tissue and the denture.[10] Retention of upper denture requires an adequate posterior palatal seal.[11] The posterior palatal seal depends on the amount of displacement of the soft tissues. Previous study have shown that a V shaped palate is associated with angulation of soft palate to hard palate almost at a right angle. This results in a highly movable soft palate which decreases the displacability of the soft palate during denture placement. This ultimately causes decrease in the retention of the prosthesis.[12]

The study intended to measure the angle of the soft palate in a Nepalese population. The soft palate angle is defined as the angle between the extension of the nasal floor and the uvula tip. This was carried on the radiographs of patient seeking orthodontic treatment. Various previous studies have discussed about the angulation of the soft palate in other population.[8,13-15] The degree of variation in the angle provides the clinician about the prognosis of the prosthetic therapy.

The study showed that the greatest percentage of patient had skeletal Class II base (57.67%) (Class I, Class II- 31.33%, 11% respectively). This may be due to the fact that patient seeking the orthodontic treatments had skeletal Class II problem. These findings were similar to the study conducted in mid-western Nepal.[16]

Mandibular plane angle was measured to determine type of growth pattern. The result showed that 143 patient were horizontal grower, and least was vertical grower . Comparing the growth patterns with the jaw base, horizontal grower was prevalent among the three skeletal jaw base.

Among the various study done in relation to softpalate morphology and its correlation to growth pattern in one of the study it has been found that vertical growth pattern has the highest susceptibility to velopharyngeal insufficiency and speech and sleep apnea disorder.[17] Hence these study has clinical importance in diagnosis as well as prognosis.

In the study done by Samdani et al. Angle's class II malocclusion was the most common followed by class I whereas class III was found to be least prominent type in both gender, which is similar to our study.[18] In their study they have correlated it with different shapes of soft palate in lateral cephalogram whereas we have seen the distribution of different soft palate angulation in different malocclusion.

The mean angulation of the soft palate was found to be 47.05±7.74°. Class II soft palate angle was found to be most common. The skeletal class I and II patient had Class III soft palate, however Class II was prevalent in skeletal class II patient.

Whereas this study was conducted in patients who visited in our hospital only so to represent Nepalese population a large scale study can be conducted in different areas which is the limitation of our study.

CONCLUSION

It can be stated that all types of palatal throat form are normal variants visible on lateral cephalogram. Based on the results the Nepalese population had a mean of 47.05±7.74° of angulation of soft palate from the hard palate. The gender and type of skeletal base had no significant correlation with the angulation of the soft palate. It was also observed that the common skeletal malocclusion in Central Nepal was found to be Class II. According to the mandibular plane angle, horizontal growth pattern was prevalent. All these knowledge about distribution of palatal throat forms helps us to achieve success during fabrication of our maxillary denture.

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