

Correlation of Morphological Variants of Soft Palate and Different Facial Divergence- a CBCT Study

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Abstract

Aim- To evaluate the correlation of morphological variants of soft palate in different facial divergence.

Methodology - 180 patients were selected in the study on basis of their growth pattern and divided into 3 groups with 60 samples in each group. The morphological variants of soft palate were assessed on CBCT and were allotted to one of the six patterns in the template.

Results- Of all the types of soft palates in the sample, rat tail shaped soft palate was most commonly found in the sample followed by leaf shaped soft tissue. It was observed that Type I (Leaf Shaped) soft palate was significantly more frequent among those with average growth pattern whereas, Type II (Rat tailed) was significantly more frequent among patients with horizontal and vertical growth patterns respectively.

Conclusion- There is a significant correlation between the variants of soft palate and the different facial divergence.

Keywords

Soft palate; growth pattern; CBCT

Introduction

Soft plate is a part of upper airway structure. It is located posterior to hard palate and in between oropharynx and nasopharynx.¹ Fusion of two palatal shelves and frontonasal process leads to formation of palate which later ossifies to form hard palate. The posterior most part of the palate remains unossified. This part of the palate is called soft palate. They help in multiple functions like swallowing, sucking, enunciation by playing a role in velopharyngeal closure².

Assessment of soft palate is best done with a CT scan as it has minimal superimposition and better visualization of the soft palate and adjoining structure. However, CT scans are not economical and produce increased radiation. Thus, lateral cephalogram and sagittal section of Cone beam computed tomography (CBCT) can be a better alternative for studying the soft tissue morphology.^{3,4}

Numerous studies have been carried out on assessment of soft tissue using lateral cephalograms but CBCT studies are limited. Shape of soft palate depends on the position of jaw and posterior teeth. Despite this, no study has been carried out relating the skeletal divergence and soft tissue morphology. The present study was designed to evaluate the correlation of morphological variants of soft palate in different facial divergence.

Methodology

180 patients were selected in the study on basis of their growth pattern and divide into average, vertical and horizontal growth pattern. Lateral cephalograms of the patients was assessed for the same. The parameters considered to decide upon the growth pattern were angular measurement from Sella-nasion to gonion- gnathion, frankfurt- mandibular plane angle, Y- axis and Jarabak's ratio

After determining the growth pattern of the patients the samples was divided into 3 groups with 60 samples in each group. The morphological variants of soft palate was assessed on CBCT as shown in figure 1 and were allotted to one of the six patterns described by You et al as shown in figure 2 and table 1⁶

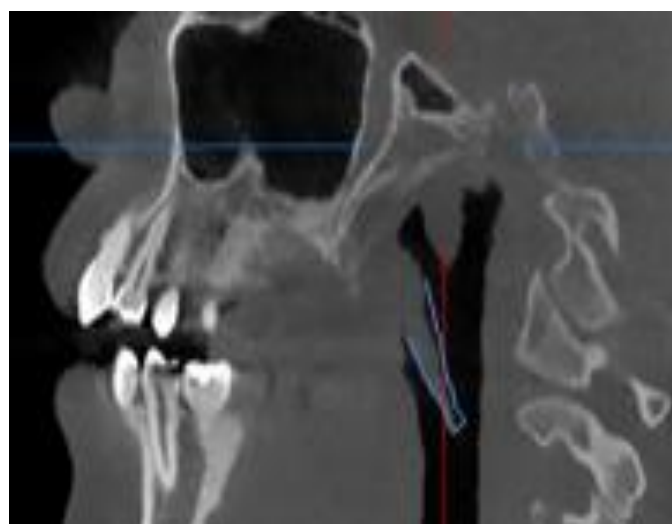


Figure 1- Assessment of soft tissue type on CBCT

Table 1- Morphological variants of soft tissue

TYPE	SHAPE	
I	leaf shaped	lanceolate shaped in which the middle portion of soft palate elevated to both naso and oro side
II	Rat tail shaped	when soft palate anterior portion is bulged and free margin has coarction
III	Butt like	shows shorter and flatter appearance and width has no distinct demarcation from anterior portion to free margin
IV	Straight line shaped	soft palate shows straight line
V	S-shaped	distortion of soft palate showing S shape
VI	Crook shaped	crook appearance revealed crook appearance in which posterior portion crook shaped anterosuperiorly

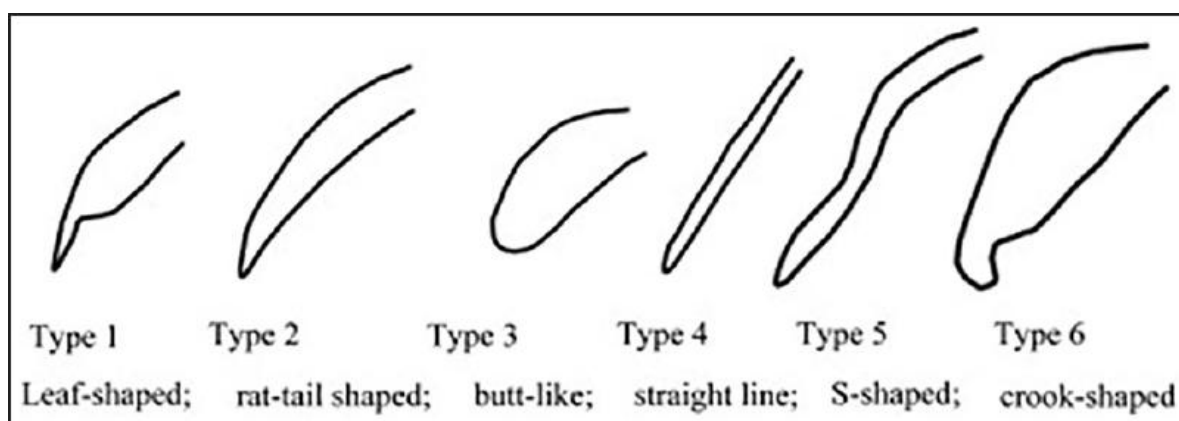


Figure 2- Morphological variants of soft tissue

Statistical Analysis

All the collected data were analyzed using the SPSS Statistics 16.0. A cross-tab was composed by dividing the individuals based on the type of growth pattern and the morphology of soft palate. Chi-square test was used to evaluate the relationship among the variables in the cross-tab.

Results

The Cone Beam Computed Tomography were divided into three categories: average growth pattern, horizontal growth pattern and vertical growth pattern. Of all the types of soft palates in the sample, rat tail shaped soft palate constituted around (39.4%) followed by leaf shaped (28.9%). Only 1% had S-shaped soft palate while butt-shaped were 6.1%, straight and crook shaped were around 9.4%, and 15.6%, respectively

It was observed that Type I (Leaf Shaped) soft palate was significantly ($P = 0.001$) more frequent among those with average growth pattern (41.7 percent) whereas, Type II (Rat tailed) was significantly more frequent among patients with horizontal (43.3 percent) and vertical growth patterns (38.3 percent) respectively as shown in table 2.

Table 2- Soft tissue pattern in different growth pattern

Type of Soft Palate	Growth Pattern			Frequency N, (%)	χ^2 value	P value
	Average	Horizontal	Vertical			
Leaf Shaped	41.7 (25)	18.3 (11)	26.7 (16)	52 (28.9)	29.92	0.001*
Rat Tail Shaped	36.7 (22)	43.3 (26)	38.3 (23)	71 (39.4)		
Butt Shaped	0	5 (3)	13.3 (8)	11 (6.1)		
Straight Line Shaped	5 (3)	6.7 (4)	16.7 (10)	17 (9.4)		
S Shaped	0	1.7 (1)	0	1 (0.6)		
Crook Shaped	16.7 (10)	25 (15)	5 (3)	28 (15.6)		

Level of significance at $P < 0.05$, N – Frequency ; % Percentage

*Statistically significant

Discussion

Recent advances in diagnostic aids like CBCT has helped us greatly in clinical application for patients as well as educational programs.¹³ Karjodkar & Mosby found that soft tissue can be assessed with the use of conventional radiographs and advanced imaging. CT scan is an important imaging aid to analyze morphology of soft palate.⁴ So this present study had used CBCT for the analysis of soft palate variant.

In the present study, Type 2, that is rat tail type was the most frequent morphology, which was in accordance with study done by Samdani⁹ and Agarwal *et al*¹⁰. Jayaprakash *et al*¹² in his study found that Type I leaf-shaped soft palate is the most common shape of soft palate; Crooked shaped soft palate was commonly seen in vertical growth pattern as they are commonly associated with velopharyngeal insufficiency and obstructive sleep apnea.

Chandan *et al*¹¹ in his study stated that rat type soft palate is most prevalent which was also seen in our study. Pepin in his study stated that S shaped velum is most commonly seen in obstructive sleep apnea patients. Hook shaped soft palate leads to reduction of oropharynx dimension. In the present study, only one subject has S-shaped

Various studies on lateral cephalogram have put forward that 'Leaf' type soft palate is the most common^{6,15,16} but in the present study rat tailed was the most common. Praveen *et al*¹⁷ study was in accordance with present study as the rat tailed was most common in his study.

The results of this study demonstrated variable radiographic appearances of the soft palate using CBCT in different facial divergence pattern. Assessment of soft palate is very important in diagnosis and treatment plan of various disorders like cleft lip and palate, obstructive sleep apnea and snoring.

Conclusion

It was observed that rat tailed shaped soft palate was the significantly and most frequently observed type of soft palate. Type II (Rat tailed) was significantly more frequent among patients with horizontal and vertical growth patterns. Hence there is a significant correlation between the variants of soft palate and the different facial divergence.

Acknowledgement

Nil

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