Morphological evaluation of soft palate in normal individuals using lateral cephalogram

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Abstract:

The soft palate is known as velum or muscular palate, a posterior fibromuscular part ofpalate that is attached to posterior edge of hard palate. Functions of soft palate are sucking, swallowingand pronunciation. The classification system of soft palate can be important for the assessment ofvelopharyngeal closure and in diagnosing obstructive sleep apnea individuals.The aim of our study wasto investigate various shapes of soft palate in normal individuals.

Methods: *The study comprised of 200 individuals without any speech abnormality, whose age rangedfrom 20-35 years. Velar shape was examined on digital lateral cephalograms and was allocated to one of the six patterns as described byYou M et al. The difference in proportion of each type and also difference between genders were studied.*

Results: *The normal soft palate can be classified into six types based on its shape. Type 1- leaf shape is most common in males while Type 2- Rat tail shape was more common in females. There is no significant difference in proportion of various shapes of soft palate between genders.*

Conclusion: Soft palate may have variable morphology. Knowledge of varied spectrum of velar morphology may help in successful functionaland structural repair in cleft palate cases, and shed some light towards the causes of obstructive sleep apnea and related disorders.

Keywords: Soft palate, Lateral cephalograms.

INTRODUCTION

The oral cavity is a complex form with advanced details and varied functions. It is limited by the palate, the floor of mouth, the cheek, and the lips, as well as by uvula and the palatine arches on each side of uvula.[1]The soft palate is also known as the, velum, or muscular palate, is a muscle & connective tissue structure that forms the vault of the posterior (rear) part of the oral cavity. Soft palate is considered to be mobile part situated posterior to hard palate which is fibromuscular in nature. The salient feature of soft palate is that it helps in palatopharyngeal closure and thus

aid in normal physiologic function like sucking, deglutition, pronunciation, phonation and respiration.[2]Many studies have evaluated the dimensional analysis of the soft palate, but few have shed knowledge on the variations of soft palate morphology and configuration.[3]You Met al al[4]documented the variation in normal velar morphology andclassified them.Cephalometric analysis is one of the most commonly accepted techniques for evaluating the various shapes of soft palate that presents in six different forms in both normal individuals and in those with cleft lip and palate.[5]Various other modalities to evaluate the morphology of soft palate are Computed Tomography, Cone Beam Computed Tomography and Magnetic Resonance Imaging.

The aim of our study was to investigate various shapes ofsoft palate on lateral cephalograms in normal individuals.

MATERIAL AND METHODS

The present study was conducted in the Department of Oral Medicine and Radiology, Rama Dental College-Hospital and Research Centre, Kanpur after obtaining ethical clearance from the institutional ethical committee.The entire procedure was explained to the patients and an informed consent was obtained from the patients selected among the ones visiting the department.

A total of 200 participants (100 males and 100 Females) in the age range of 20-35 years were included in the study; a detailed case history was recorded for the selected patients.

Patients with normal speech function were considered for the study.Radiographs of patients with any historyof cleft palate or systemic diseases, or any diseases orfracture of the head and neck were excluded from the study.Digital radiographic machine (Carestream CS 8000 C digital panoramic and cephalometric machine, New York), was used to take the radiographs. tube voltage: 60–90 kV, tube current:

2–15 mA, tube focal point: 0.5 mm, total filtration:>2.5 mmEq. Al, and exposure period: 0.10–14.9s).

The radiographs were viewed using the available software and classified according to You Met al[4]as follows:

1. Type 1- “Leaf –shape” (lanceolate)(figure 1)
2. Type 2- “rat-tail shaped, (figure 2)
3. Type 3- “butt-like shaped,(figure 3)
4. Type 4- “straight line shaped;(figure 4)
5. Type 5- distorted soft palate, which presents the “Sshape;” (figure 5)
6. Type 6- “crook-shaped” (figure 6)

Figure 1- “Leaf Shape”Figure 2- “Rat Tail”

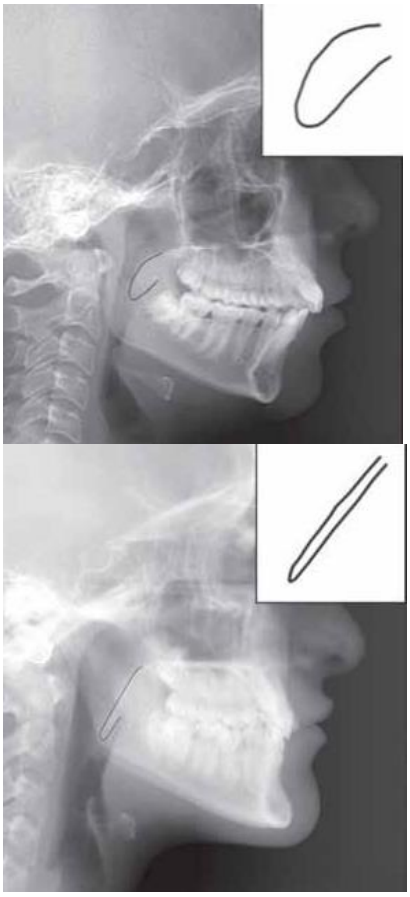


Figure 3- “Butt- Shape”Figure 4- “Straight line shape”

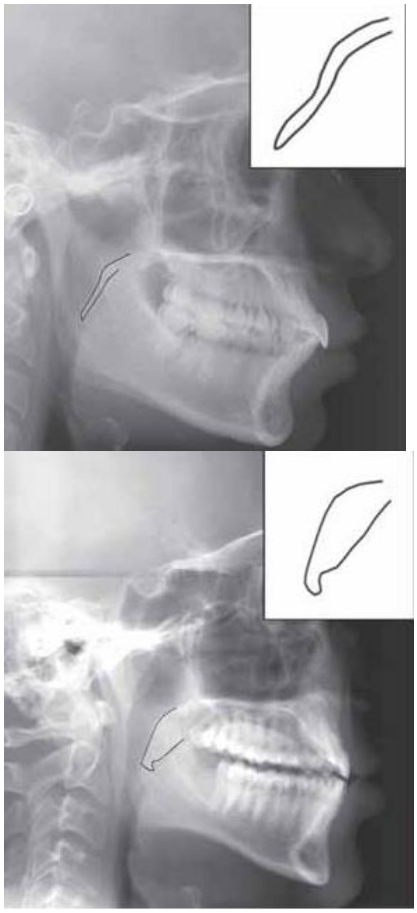


Figure 5- “Distorted/ S-shape”Figure 5- “Crooked shape”

The radiographic images were magnified to an extent that the soft palate was clearly visualized and were observed by two radiologists independently and classified as described above.

STATISTICAL ANALYSIS

All the analysis was done using statistical package for the social sciences (SPSS) version 18. A p-value of < 0.05 was considered to be statistically significant. Comparison of variation of soft palate morphology between males and females was done using Chi-square test.

RESULTS

In the present study a total of 200 subjects participated, out of which 100 were males and 100 were females.

Type 1 was the most common type observed in 84 cases (42%) followed by type 2 in 64 cases (32%), type 3 in 20 cases (10%), type 4 in 18 cases (9%),type 5 in 10 cases (5%),Type 5 and 6 were the least common types of soft palate found among the individuals. (Table 1)

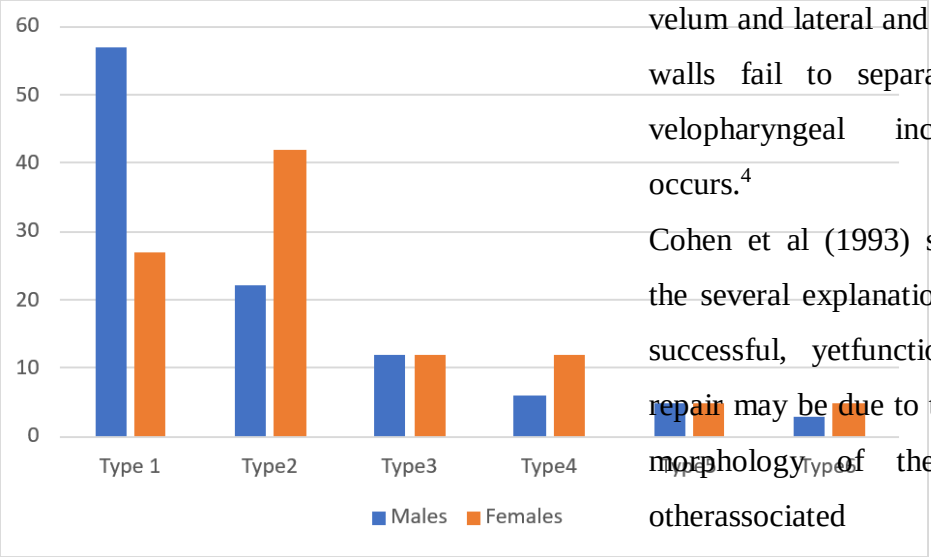
The table shows overall distribution of various shapes of soft palate in individuals:

TYPES	SHAPES	MALES (100)	FEMALES (100)	TOTAL (200)	PERCENTAGE
1	Leaf	57	27	84	42%
2	Rat Tail	22	42	64	32%
3	Butt	12	12	24	10%
4	Straight	6	12	18	9%
5	Distorted S	5	5	10	5%
6	Crooked	3	5	8	4%

Distribution of soft palate morphology types with respect to gender. Statistical analysis: Chi-square test, Statistically, significant if P <0.05, Chi-square test, P value = 0.490; not significant

Type 1 (42%) was seen in 57 males and in 27 females, type 2 (32%) was seen in 22

males and 42 females,type 3 (10%) was seen in 12 males and 12 females; type 4 (9%) 6 males and 12 females; type 5 (5%) was seen in 5males and 5 females.type 6 (4%) was seen in 3 males and 5 females. (Table 1)



Type 1 was more commonly seen in males in 57 individuals (57%) as compared to females,seen inonly 27(27%) individuals.Type 2 was more commonly seen in females in 42individuals(42%) as compared to males,seen inonly22(22%)individuals. However, this finding was not found to be statistically significant.The other typesi.e.type 3-6 were seen similarly in both the genders.

DISCUSSION

The soft palate plays a large role in velopharyngeal closure, which refers to the normal apposition ofthe soft palate with the posterior and lateral pharyngeal walls. It is primarily a sphincteric mechanism consistingof velar and pharyngeal components. The movement separates the oral cavity from the nasal cavity duringdeglutition and speech. When the velum and lateral and posterior pharyngeal walls fail to separate the twocavities, velopharyngeal incompetence (VPL) occurs.[4]

Cohen et al (1993) suggestedthat one of the several explanations for the surgically successful, yetfunctionally compromised repair may be due to the differences in the morphology of the soft palate and otherassociated structures.[6]Hence, presurgical evaluation of soft palate morphology will aid in the success ofsurgery. Over many years, the variation in the velar morphology was analysed by many and very few havecategorised them into various shapes.

In the present study, the most common type of soft palate was type 1 which was seen in 42% of cases.Type 1 soft palate was seen in 57 % of males and 27% of females. The findings of the present study was in accordance with the study by Tanya Khaitan et al[7] where type 1 was seen in 47.5% of cases,which wassimilar as well to the other studies by Kumar &Gopal[8]and Guttal et al.[9] However, our results were

contraryto the study conducted by Praveen et al (2011) who observed type 2, rat- tail shaped soft palate as themostcommon type (55%).[10]The next most common type was the type 2(32%) followedby type 3 (10%) and thentype 4(9%).Theseresults were similar to studies done by You et al and Kumar et al.[4,8]

The hooked appearance of the soft palate was found by Pepin et al (1992) which was described asdistorted shape (S-shape or type 5) by You et al.[4,11]This variant was present in only 10 cases (5%) in thepresent study. This was in accordance with studiesdone by Tanya.K et alwherein it was present in 1.5%, You et al wherein it was seen in 1.5 %,Kumar et al wherein it was seen in 3%of cases andGutt et al seen in 6.5%. [4,7, 8, 9]

Studies reveal that there is an increase in length,thickness and sagittal area of soft palate with age, inboth the genders but increase in soft palate area was significantly more in males. In our study type 1was themost common found in males, that is in 57% of cases as compared to females that was present in 27% whereastype 2 was the most common type found in females in 42% of cases where as in males only 22% of cases it waspresent. However, these findings were in contrary to study done by BN Praveen et al (2011) where there was nosignificant difference between types of soft palate present between males and females.[10]

In our study, there was no much difference between gender in comparison to the proportion of thevarious morphology of soft palate that is(type 3 to type 5) present.

CONCLUSION

It can be stated that all the six types of soft palate are normal variants identifiable on lateral cephalometric radiography. Knowledge of varied spectrum of velar morphology may help in successful functional and structural repair in cleft palate cases, and may also be used in our drive for research into the cause of OSA and related disorders.

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