ORIGINAL RESEARCH

RELATION BETWEEN SOFT PALATE ANATOMY AND NEED'S RATIO IN ASSESSING THE DENTURE RETENTION

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ABSTRACT

Aim- The present study aimed to investigate the variation of soft palate morphology in gender groups.

Materials & Methods- The correlations of radiographic velar length (VL), velar width (VW), pharyngeal depth (PD), and Need's ratio were determined. The study sample consisted of 20 subjects aged between 15 and 25 years. VL and PD were measured from a digital radiograph and the Need's ratio was calculated.

Results & Conclusion- The results obtained were subjected to statistical analysis to find the correlation of radiographic velar length (VL), velar width (VW), pharyngeal depth (PD), and Need's ratio with gender. The mean value of VL, VW values were higher in males. A significant correlation was observed between the mean VL, V and PD. Need's ratio was higher among female subjects. By this study, it has been concluded that with an increase in the angulation of soft palate there is a decrease in Need's ratio. It also has some correlation in assessing the retentive qualities of denture along with angulation of soft palate.

KEYWORDS
Denture retention , Need's ratio, Cephalographs , Dolphins software.

Introduction

The soft palate is the fibromuscular part of the palate that is attached to the posterior edge of the hard palate, sloping down and back between the oral and nasal parts of the pharynx. It participates in velopharyngeal closure, which is related to the normal functions of sucking, swallowing, and pronunciation.[1,2] The velopharynx is a roughly rectangular space that is bordered anteriorly by velum (soft palate), posteriorly by the posterior pharyngeal wall, and laterally by right and left lateral pharyngeal walls. The contractions of these structures assist in the closure of the velopharyngeal port during the acts of eating, swallowing and speaking whereas; their relaxation opens the port for breathing and in producing specific nasalized articulations. Close coordination of the soft palate with the posterior pharyngeal wall is important for pronouncing most of the vowels and consonants.[3] Soft palate anomalies are frequently seen in patients with cleft lip and palate, enlarged adenoids, obstructive sleep apnea syndrome (OSAS), snoring, poorly retained maxillary denture, and skeletal craniofacial malocclusion. Hence, the normal anatomy and any other anomaly of the soft palate can help in the diagnosis and successful treatment of some intricate cases.[1,2]

There have been studies on the dimensional analysis of the soft palate morphology and its surrounding structures, but little attention has been paid to the varied soft palate morphology and configuration. You et al classified the soft palate into six morphological types (Type 1: leaf-shaped; Type 2: rat tail; Type 3: butt like; Type 4: straight line; Type 5: S-shaped, and Type 6: crook shaped) by observing the image of the velum on lateral cephalograms.[1,2]

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Previous reports elucidated that the relationship between velar length (VL) and pharyngeal depth (PD) can be used to assess the velopharyngeal function. The ratio of PD to VL (PD/VL) was termed Need's ratio. Subtelny first reported that the Need's ratio ranged from 0.6 to 0.7 in normal subjects.[1,2,3]

The purpose of the present study was to evaluate the role of soft palate anatomy and Need's ratio in assessing denture retention by using lateral cephalometry and to determine the relationship between Need's ratio and gender-wise variations.

Materials and methodology

The study was carried out in the C.K.S Theja dental college. A total of 20 individuals in the age range of 15–25 years(10 males and 10 females), were selected for the study. Informed written consent was obtained from each individual. Lateral cephalograms of the patients within the age range of 15-25 years, having a normal speech function were included in the study. Radiographs of patients with a history of cleft palate, systemic diseases, syndromes, or fractures of the head and neck were excluded from the study.A lateral cephalometric analysis was performed to

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evaluate the velar and pharyngeal morphology as it is a relatively inexpensive method and provides a good assessment of the soft-tissue elements. All the lateral cephalograms were taken with the patients standing upright in a natural head position and were instructed to contact their molars and breathe through their noses (Figure 1). A tube potential of 82 kV, a tube current of 10 mA, and an exposure time of 500 ms were used to optimize the contrast of the digital images.

Figure 1: Lateral cephalogram taken with patient standing upright and in natural head position.

The digital radiographs were processed and viewed by Dolphins software. The VL was evaluated by measuring the linear distance from the posterior nasal spine to the tip of the uvula of the resting soft palate. The PD was noted as a linear distance from the posterior surface of the nasal spine marker to the posterior pharyngeal wall along the palatal plane. The VW measurement was taken at the thickest section of the velum.[1,2] The measurements were carried out for each digital radiograph and the Need's ratio was calculated by dividing the value of PD by VL (Figure. 2). All the measurements were done twice by the same examiner and the obtained mean value was considered.

Figure 2: Digital radiographs taken for measurements

Results

Statistical software(IBM SPSS version 20.0) was used for analysis

Table 1: Descriptive statistics		N	Mean	Std. Deviation	Std. Error
VL	M	10	36.1471	4.28210	1.03856
	F	10	32.5870	3.01757	.62921
	Total	20	34.1000	3.97943	.62920
VW	M	10	7.5294	2.09516	.50815
	F	10	5.8043	1.55021	.32324
	Total	20	6.5375	1.97545	.31235
PD	M	10	26.2647	3.72541	.90354
	F	10	23.8913	2.66695	.55610
	Total	20	24.9000	3.33436	.52721
NR	M	10	.7247	.08726	.02116
	F	10	.7391	.06317	.01317
	Total	20	.7330	.07367	.01165
ANGLE	M	10	40.0282	7.11646	1.72599
	F	10	38.1009	5.10481	1.06443
	Total	20	38.9200	6.03391	.95405

The mean values obtained (Table 1) were VL=34mm, NR=0.7391, Angle=40.020, VW=7.52, PD=26.26 and was found to be greater in males than females. Thus, Need's Ratio was found to be somewhat higher in females when compared to males which are not so significant.

S.No	Variables	Gender	N	Correlation	Difference In Mean	P Value	Significance
				Table2: Statistical analysis of Need's Ratio and soft palate angulations			
1	NR – ANGLE	MALES	10	-0.220	-39.30353	<0.0001	VHS
2	NR – ANGLE	FEMALES	10	-0.366	-37.36174	<0.0001	VHS
3	NR – ANGLE	TOTAL	20	-0.292	-38.187	<0.0001	VHS

The difference in mean values of Need's Ratio and Soft palate angulations was found to be -38.187 which shows a very high significance and a negative correlation of 0.292 was found between Need's ratio and Soft palate angle. Thus, the angle will increase with a decrease in Need's ratio.

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.[5] To obtain good retention of upper dentures, the denture base should be well-fitting, correctly extended and have a good posterior palatal seal. The addition of a proper posterior seal transforms a base that has only adhesive retention into one which will resist tipping thrusts from all directions.[4]The diagnostic evaluation and placement of the posterior palatal seal are often given minor attention in complete denture construction. The posterior palatal area has definite anatomic and physiologic boundaries that once understood make the placement of the posterior seal a quick and easy procedure with predictable results. Physiologically, the vibrating line of the palate is the junction of the movable and immovable portion of the soft palate. This should not be confused with the anatomic junction of the soft and hard palate.[4]The velopharynx is a roughly rectangular space that is bordered anteriorly by velum (soft palate), posteriorly by the posterior pharyngeal wall, and laterally by right and left lateral pharyngeal walls.[3] The relationship between soft palate length (SPL) and nasopharyngeal depth (PD) can be used to determine the velopharyngeal function and is called the Need's ratio (PD/ SPL).[3] Acoording to Poonam et al the velopharyngeal insuffciency is significantly related to needs ratio which may lead to sleep disorders.[6]

In the present study, the role of soft palate anatomy and Need's ratio in assessing denture retention[7]was evaluated by using lateral cephalometry and the relation between Need's ratio and gender-wise variations were also determined. Lateral cephalometric analysis was performed to evaluate the velar and pharyngeal morphology using Dolphins software.[8] Need's ratio was calculated by the obtained values of PD and VL respectively. A similar study was done by You et al. where he reported that Velar length and Velar width were slightly higher in females than males and Need's ratio was greater in males than females, [1,2] which was incomparable with the present study as the VL and VD are slightly higher in males than females and

Need's ratio was higher in females. Comparative studies were conducted by Subtelny, Simpson& Colton and Hoopes et al. and they found that the normal ratio's to be 0.6 to 0.7,0.75 to 0.8 respectively, [1,2,3] in the present study Need's ratio was between 0.7-0.75. The present study highlighted that Need's ratio has some correlation for assessing the retentive qualities of denture along with angulations of soft palate.

Limitations
- The angle formed by the hard and soft palate bases, rather than the surfaces, is taken into account.
- A cephalogram was used to compare the hard and soft tissue landmarks.
- The sample size is small, with ideal occlusion (class I canine and molar relationship) and a range of ages of 18 to 25 years old.
- The comparison was done between angular measurement and linear measurement.

Areas of future research
- More research can be done with a larger sample size and with all sorts of occlusions, comparing the results with edentulous individuals, to see if the use of soft palate anatomy and Need's ratio in determining denture retention is more trustworthy.
- More study has to be done on those who have a cleft palate and are known to have velopharyngeal insufficiency.[9]
- Soft tissue procedures that alter the velar length to promote denture retention.[10]

Conclusion
- Males had somewhat longer velar length and width than females, while females had a greater Need's ratio than males.
- By this study, it has been concluded that with an increase in the angulation of the soft palate there is a decrease in Need's ratio.
- The angulation of the soft palate and the Need's ratio have a correlation for analyzing the retentive characteristics of dentures.

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Conflict Of Interest: All the authors declare no conflict of interest

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