Original Article

COMPARISON OF DIFFERENT CRANIOFACIAL PATTERNS WITH PHARYNGEAL WIDTHS

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ABSTRACT

Objective: *The aim of this study was to compare different craniofacial patterns with pharyngeal widths.*

Material and Methods: *A total of 80 individuals (both males &females) in the age group of 16 to 20 years, having long and short faced individuals were selected. Patients with pharyngeal pathology, nasal obstruction , enlarged tonsils and common cold were excluded from the study. Lateral cephalograms were made for each selected individual. The subjects were divided into two groups according to their skeletal pattern in vertical plane based on SN-GoGn angleand Y axis (SN-Gn angle respectively. Upper and lower pharyngeal airways were measured using the cephalometric analysis McNamara. lateral cephalograms were made for each individual. The data were analyzed using SPSS 16.0 . One-way ANOVA test was used to make comparison of upper and lower airways measurement among different vertical pattern of malocclusion and t-test for comparison of upper and lower airways measurements between skeletal class I and II.*

Results: *Mean and standard deviation of the upper pharyngeal airway widths was 13.7±2.5 and 9.3±2.4 in Groups I and II respectively. Mean and standard deviation of the lower pharyngeal airway widths were 8.787±2 and 10.2±2 in Groups I and II respectively. Mann- Whitney U test (Z test) showed that the differences in the mean values between males in the groups were found to be very highly significant (p=0.00).*

Conclusions: *Upper pharyngeal airway width is narrower in long faces in comparison to short faces. The study has shown a significant correlation between upper and lower Oropharyngeal widths and facial skeletal pattern. This fact should be considered during diagnosis.*

Key words: ***Craniofacial patterns , pharyngeal widths, lateral cephalograms***

INTRODUCTION

Vertical malocclusions can be sourced as predominantly skeletal or dentoalveolar. Various etiologic factors, including dentoalveolar development, growth of the maxilla and mandible, function of the tongue and lips, and eruption of the teeth, may cause vertical malocclusion during the growth period[1]. Sagittal facial growth is seen as downward and forward growth[2,3]. Isaacson et al[3] and Schudy[4] indicated that vertical growth of condyles is lesser than vertical growth of facial sutures and alveolar processes, resulting in backward mandibular rotation and bite opening. On the contrary, if vertical growth of condyles is greater than vertical growth of facial sutures and molar areas, forward mandibular rotation and bite closing are seen. Therefore, the ultimate vector of mandibular growth is a consequence of the competition between horizontal and vertical growth[5]. An interaction occurs between respiratory function and the maxillary[6] and mandibular growth pattern[7].

Clinicians and researchers involved in the treatment of dentofacial deformities have sought to evaluate the determinants of facial morphology. The relationship between respiratory pattern disorders and changes in facial morphology has been extensively debated in the literature[8] and remains controversial. Conflicting opinions can be divided into two school of thoughts: One that considers breathing pattern an important etiological factor in producing the long face syndrome (LFS) and one which believes that LFS expresses an inherited pattern and breathing pattern

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would act only as an aggravating factor. Currently the prevailing view is that skeletal morphology is a result of genetically determined growth superimposed by the action of its functional matrix. And, according to this view, the action of soft tissue genotype would continue during growth. Several factors may be associated with mouth breathing, among which are constriction of the nasal passage, narrow or obstructed nasopharynx, hypertrophic nasal membranes, enlarged turbinates, hypertrophic palatine or pharyngeal tonsils, nasal septal deviation, choanal atresia and tumors in the nose or nasopharynx[9].

Some authors have associated mouth breathing and Class II malocclusion, and others have reported associations of vertical growth pattern with obstruction of upper and lower pharyngeal airways concurrently with mouth breathing. If this relationship actually exists, Class I malocclusions and vertical growth patterns must have natural anatomic predisposition factors. Among the predisposing factors for obstruction of the pharyngeal airways such as allergies, environmental irritants, and infections, which are amenable to adequate treatment, there is also the natural anatomic predisposition of narrower airway passages[10]. Many reports have demonstrated that a significant relationship exists between airway space and facial morphology[11-13]. Also, airway space may be affected by conditions such as functional anterior shifting head posture, sagittal skeletal relation, and vertical growth patterns. Thus the knowledge of the pharyngeal dimensions amongst the various sagittal and vertical facial types is very important and can help an orthodontist in various ways, especially during orthodontic diagnosis and treatment planning.

The aim of this study was to compare different craniofacial patterns with pharyngeal widths.

METHODS AND MATERIALS

A total of 80 individuals (both males &females) in the age group of 16 to 20 years were selected as per the following criteria for subjects with different vertical growth patterns.

- Individuals in the age group of 16 to 20 years.
- Clinically obvious long and short faced individuals.
- Individuals with full complement of teeth up to 2nd Molar.
- Individuals willing to participate in the study.
- Presence of any pharyngeal pathology.
- Individuals with enlarged tonsils and patients with history of repeated common cold.
- Individuals with complaints of nasal obstruction.
- Any craniofacial syndromes/medically unfit.
- Patients with abnormal habits.
- Patients with history of previous orthodontic treatment and /or surgical treatment.

The subjects fulfilling the above criteria were requested to participate in the study. After obtaining the informed consent, lateral cephalograms were made for each individual. Lateral cephalometric radiograph of each individual was taken with a universal counter balancing type of cephalostat at Radiology Department of Khyber College of Dentistry, Peshawar. Kodak' X-ray films (10×12) were exposed to 70 KVp, 45 mA for an average of 1.8 sec, with a tube to film distance of 6 feet. All lateral Cepha¬lograms were placed on illuminator and determination of CVM stages were done by one postgraduate trainee.

The subjects were divided into two groups according to their skeletal pattern in vertical plane based on SN-GoGn angle and Y axis (SN-Gn angle respectively. Upper and lower pharyngeal airways were measured using The pathway analysis McNamara. Upper pharyngeal width was taken as the point of posterior edge of the soft palate at the closest point the posterior pharyngeal wall. The average nasopharynx is about 15 - 20 mm wide . A width of 2 mm or least in this region indicates respiratory failure. Lower width of the pharynx was measured from the point of intersection of the rear edge of the language and lower border of the mandible to the nearest point the posterior pharyngeal wall . The average measurement is 11 -14 mm, regardless of age. Higher than the normal value or anterior positioning language is either due to the enlargement of the tonsils or as result of posture.

The data were analyzed by using SPSS version 16.0. one –way ANOVA test was used to made comparison of upper and lower airways measurements among different vertical patterns of malocclusion and t-test for comparison of upper and lower airways measurements between skeletal class I and class II.

RESULTS

The present study was undertaken with the intention of evaluating & comparing the upper and lower pharyngeal airway in subjects with different vertical growth patterns.They were divided into two groups according to their skeletal pattern in vertical plane on the basis of 2 facial parameters; SN-GoGnand Y axis. The mean and standard deviation of the upper and lower pharyngeal airway widths were measured in Groups I and II. Mann- Whitney U test (Z test) was applied to test whether there were any differences between the groups for upper and lower pharyngeal widthsThe differences in the mean values between males in the groups were found to be very highly significant (p=0.00).

DISCUSSION

The cranio facial growth and development is very complex and multifactorial. As clinicians, Orthodontists should consider various factors that contribute to the craniofacial development. The relationship between airway patency and craniofacial development is highly controversial not only having academic implications but also having considerable clinical consequences. It can influence the orthodontist's decision on diagnosis and treatment planning. Individuals with dolichocephalic growth patterns are reported to have a tendency toward an obtuse cranial base angle. However, few studies reveal that the cranial base in the long face syndrome is essentially normal[14].

Table 1: Upper and lower Oropharyngeal widths in both the groups.

Pharangeal width	group	No of subjects	mean	Std dev	p-value
UOPW	Group I	40	13.57	2.54	.000vhs
	Group II	40	9.30	2.40	
LOPW	Group I	40	8.78	2.00	.020
	Group II	40	10.20	2.3	

Table 2: Distribution of subjects into groups.

Group	n	SN-G0Gn	Mean Y Axis (degree)
Group I	40	24.20	52.46
Group II	40	38.56	69.34

The present study measured and compared the upper and lower pharyngeal airway widths in subjects with horizontal and vertical facial skeletal patterns. 40 subjects with horizontal skeletal pattern (20 males, 20 females) and 40 with vertical skeletal pattern (20 males, 20 females) were selected as per the established indicators of facial pattern[11-13] Y axis and SN-GoGn . Pharyngeal measurements[4] were made based on McNamara analysis Significant difference was observed between upper and oropharyngeal widths and facial skeletal pattern. Subjects with vertical skeletal pattern have significantly narrower upper airways than those with horizontal skeletal pattern According to the present study, the Subjects with vertical skeletal pattern have significantly broader lower airways than those with horizontal skeletal pattern

Another study was performed with two dimensional cephalometric films to evaluate only pharyngeal airway width-not airway flow capacity, which would have required a more complex three-dimensional cone beam computed tomography (CBCT) and dynamic estimation. Cameron et al. in their study compared computed tomography (CT) and cephalometric films in subjects with skeletal malocclusion, found a significant positive relationship between nasopharyngeal airway size on cephalometric films and its true volumetric size as determined from CBCT scan in adolescents[13]. The present study used lateral head cephalometric films for

Table 3: Upper and lower oropharyngeal widths in males and females in both the groups.

Pharyngeal width	Gender	group	No.of subjects	Mean(mm)	Std.deviation	P
Uopw	Male	Group I	20	13.57	2.314	<.001
		Group II	20	9.00	2.211	
	Female	Group I	20	13.400	3.077	.003
		Group II	20	9.98	2.522	
LOPW	Male	Group I	20	10.44	2.777	.28
		Group II	20	9.5	2.444	
	Female	Group I	20	9.66	2.33	.03
		Group II	20	10.86	1.98	

pharyngeal airway width measurement, according to the findings of Boudara et al[15].

Several other researchers found that there is no relationship between upper airway space and the type of malocclusion[16,17]. Gwynne-Evans concluded that facial growth is constant regardless of mode of breathing. Leech[17] in a study of 500 patients with upper airway problems discovered that 60% of the mouth breathing patients were Class I and concluded that mouth breathing has no influence on craniofacial growth. However, in the present study no statistically significant difference was found in upper pharyngeal airway width between normodivergent and hypodivergent facial pattern of skeletal Class I and II subjects.

Kerr[18] reported that Class II malocclusion subjects showed narrow nasopharyngeal airway space compared with Class I and normal occlusion subjects[18]. However, in his study, the vertical skeletal pattern was not emphasized. In the present study, vertical pattern affected the upper airway space, and greater upper pharyngeal airway width was found in low angle subjects than in high angle subjects.

Memon et al[19] compare different craniofacial patterns with pharyngeal widths using pre-treatment records including orthodontic files and pre-treatment lateral cephalographs of 360 orthodontic patients. subjects were divided into 2 groups: skeletal Class I (n=180) and skeletal Class II (n=180) subdivided according to the vertical pattern into normodivergent, hyperdivergent and hypodivergent facial patterns. Upper and lower pharyngeal airways were measured using McNamara's airway analysis. Hyperdivergent facial pattern subjects belonging either to skeletal Class I or Class II malocclusion showed a statistically significant narrow upper pharyngeal airway width as compared to normodivergent and hypodivergent facial patterns. However, no statistically significant difference was found in lower pharyngeal airway widths in sagittal and various vertical facial patterns.

CONCLUSIONS

The findings generated from the present study partly support the hypothesis that upper pharyngeal airway width is narrower in long faces in comparison to short faces. The cause of such variation can only be speculated upon and a definite cause and effect relationship is yet to be demonstrated. The findings of this study have certain clinical implications. The study has shown a significant correlation between upper and lower Oropharyngeal widths and facial skeletal pattern. This fact should be considered during diagnosis.

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