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Original Research Article.

A Lateral Cephalometric Study to Evaluate Relation of Oro-Facial Structures with Pharynx in Bengali Population

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ABSTRACT

Background: The relationship between respiratory disorders and changes in craniofacial morphology has been extensively debated in the literature. Hence we planned to assess relation of oro-facial structures with pharynx in the present study.

Materials & Methods: The present study included assessment of relation of oro-facial structures with pharynx in Bengali population. A total of 30 males and 30 females of Bengali ethnicity were included in the present study. Lateral cephalogram was obtained in all the patients. Separate calculation of airway areas of the nasopharynx and oropharynx was done.

Results: Significant results were obtained while comparing the mean distance between Ho perpendicular and ANS-PNS plane, Ba-PNS, t-ppw, distance between anterior and posterior pharyngeal wall and the distance between hyoid bone and anterior pharyngeal wall between Bengali male and female.

Conclusion: Cautious evaluation of airway space might deliver valuable evidence in relation to potential malocclusion.

Keywords: Cephalometric, Oro-facial, Pharynx.

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INTRODUCTION

The beginning of lateral cephalogram in 1931 by Broadbent in US and Hofrath in Germany gave both a clinical and a research tool to measure the underlying skeletal disproportions. Since then Orthodontists have explored it widely to analyze dentofacial deformities.[1,2] However, lateral cephalogram falls short in measuring the right and left sides of the cranial structure individually, due to overlapping of both the sides and interference of superimposed images appearing on the lateral cephalogram.[3] The relationship between respiratory pattern disorders and changes in craniofacial growth has been extensively debated in the literature. Neuromuscular adaptations, nasopharyngeal obstruction, growth, breathing, and speech are affected seriously by airway function. Any variation in oropharyngeal airway space may show its effect on dental or skeleton component. Abnormal pharyngeal airway space may lead to various types of malocclusion. Also, Upper airway dimensions have been considered contributing factors to obstructive sleep apnea.[4-6] Careful assessment of pharyngeal airway space helps in the determination of skeletal malocclusion Hence; we planned the present study to assess relation of oro-facial structures with pharynx.

MATERIALS & METHODS

The present study was conducted in the department of orthodontics and dentofacial orthopaedics, Dr R Ahmed Dental College and Hospital, Kolkata. A total of 30 males and 30 females were included in the present study.

Inclusion Criteria

- Subjects within the age group of 13 to 23 years,
- Subjects with negative history of any other systemic illness,
- Subjects with negative history of any musculo-skeletal deformity
- Subjects with class I molar relationship,
- Subjects with negative history of presence of mouth breathing,

Ethical approval was obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. Lateral cephalogram was obtained in all the patients. In all participants, lateral cephalogram was obtained using cephalostat machine operating at 30 mA and 70 kVp. The Frankfort horizontal plane was kept parallel to the floor and mid-sagittal plane, perpendicular to the floor in each subject.

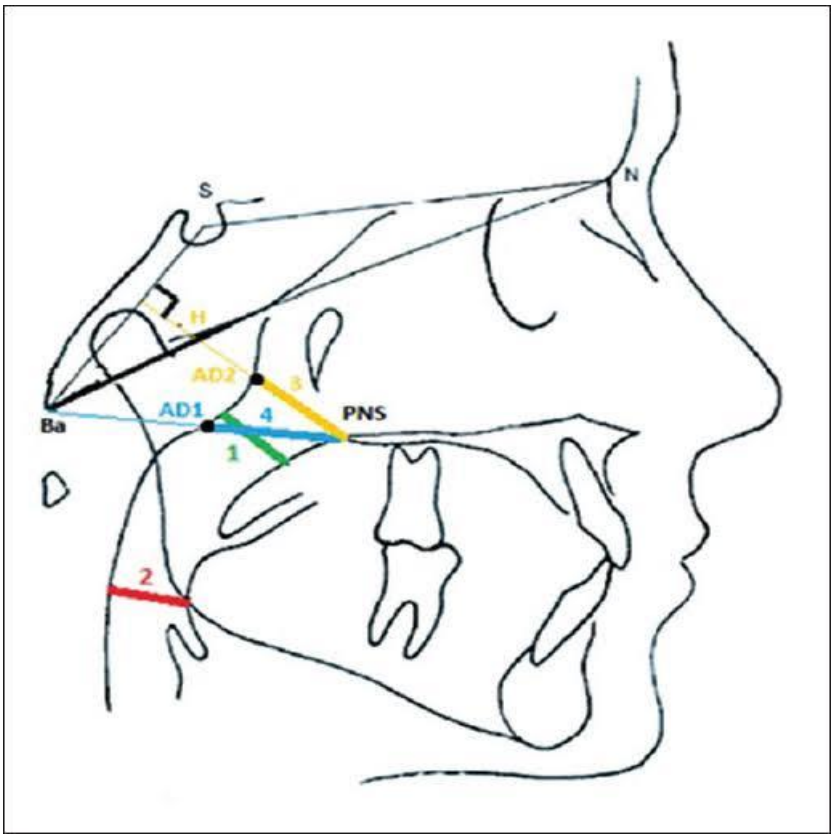

Fig 1: Landmarks on lateral cephalogram

Separate calculation of airway areas of the nasopharynx and oropharynx was done. Assessment of following landmarks on lateral cephalogram was done (Fig 1):

- Ptm: Pterygomaxillary point
- ANS: Anterior nasal spine
- PNS: Posterior nasal spine
- Cv3ia: Infero-anterior point on the body of the third cervical vertebra.
- Hy: Hyoid bone
- Ba: Basion, the lowermost point on foramen magnum,
- Ho: Hormion, inferior most point of spheno - occipital synchondrosis,

The anterior border of the nasopharyngeal airway was marked by Ptm vertical. The ANS-PNS plane was considered as the lower border. The same plane was used as the upper border of oropharyngeal air passage and the hy-cv3ia line was the lower borders of oro-pharyngeal air passage. All the results were analyzed by SPSS software.

Table 1: Demographic variables

Variable	Males	Females
Number	30	30
Mean age (years)	15.4	14.9

Table 2: Pharyngeal variables

Variables	Males		Females		p- value
Ba – PNS	**Mean**	**SD**	**Mean**	**SD**	0.02*
	52.01	3.22	46.18	3.37	
Mean distance between Ho perpendicular & ANS-PNS plane	21.36	2.67	18.97	2.18	0.03*
Mean Ptm-ad1 distance	21.25	2.47	21.12	2.41	0.22
Ptm – ad2 distance	14.28	2.98	14.01	2.67	0.14
t-ppw	20.98	2.67	17.89	2.76	0.01*
apw2-ppw2	16.01	3.56	13.98	3.56	0.01*
hy-apw2	23.78	3.78	20.89	2.96	0.04*
PNS-ppw1	27.01	3.88	25.65	3.87	0.6

*: Significant

RESULTS

In the present study, a total of 60 subjects of Bengali origin were analyzed. There were 30 males and 30 females. Mean age of the males was 15.4 years and of the females was 14.9 years **(**Table 1). Statistical results showed that mean distance between Ho perpendicular and ANS-PNS plane among males was 21.36 and females was 18.97 respectively (Table 2). Significant results were obtained while comparing the mean distance between Ho perpendicular and ANS-PNS plane. Similarly, distance between Basion and posterior nasal spine (Ba–PNS), distance between tongue and posterior pharyngeal wall (t–ppw), distance between anterior and posterior pharyngeal wall (apw2-ppw2) and the distance between hyoid and anterior pharyngeal wall (hy–apw2), showed significant difference between Bengali males and females. Whereas parameters like distance between posterior nasal spine and posterior pharyngeal wall (PNS-ppw1) and mean Ptm –ad1 distance was found to be statistically nonsignificant in males and females.

DISCUSSION

Radiographic cephalometry is an essential clinical and research tool for diagnosing skeletal imbalance and for assessing skeletal growth and development. Lateral and frontal cephalograms have been well established and have resulted in several large databases of clinically normal and treated patient populations.[7]

In the present study, there were 30 males and 30 females. Mean age of the males was 15.4 years and mean age of the 14.9 years. Significant results were obtained while comparing the mean distance between Ho perpendicular and ANS-PNS plane. Bronoosh P et al assessed correlation between the area and the volume measurements of pharyngeal airway size in a lateral cephalogram and a 3-dimensional (3D) cone-beam computed tomography (CBCT) scan in adolescent subjects. CBCT scan and a lateral cephalogram of 35 subjects were taken. Strong correlation was found between lateral cephalogram and CBCT measurements of pharyngeal airway. Pharyngeal airway area on a lateral cephalogram is correlated strongly with volumetric data on CBCT images.[8]

Chokotiya H et al evaluated the upper and lower pharyngeal airway dimensions were affected by different skeletal malocclusions. Lateral cephalograms of 120 subjects were used to measure the pharyngeal airway and were divided into three groups (each group included 40 subjects) according to ANB angle: Class I (ANB angle 2° ≤ ANB ≤ 4°), Class II (ANB angle (ANB ≥ 6°), and Class III (ANB angle ≤ 0°). PNS-ppwl ($p < 0.001$) and McNamara' lower pharynx dimension ($p < 0.05$) showed a statistically significant difference between the groups. Two out of 14 variables ie Ba-PNS and t-ppw showed a statistically significant difference between male and female. In both measurements, the difference is significant only in the Class II group with the level of significance being ($p < 0.001$) in Ba-PNS measurement, and ($p < 0.05$) in t-ppw measurement. Vadher V et al determined the correlation between orofacial structure and oropharyngeal airway space. It comprised of 160 individuals aged 14–24 years, in which digital lateral cephalograms were taken. Linear and cephalometric analyses were performed. Ba–PNS, apw2–ppw2, hy–apw2, distance between tongue and posterior pharyngeal wall (t–ppw), and Hormion perpendicular and anterior nasal spine-posterior nasal spine (ANS-PNS) showed significant difference between males and females ($P < 0.05$). Other distances such as Ba–ad1, Ba–ad2, Ptm–ad1, Ptm–ad2, PNS–ppw1, and apw4–ppw4 were statistically nonsignificant. Linear and cephalometric measurements showed that Ba–PNS, t–ppw, Hy–ppw2, distance between Ho perpendicular and ANS-PNS plane, and apw2–ppw2 were higher in males as compared to females.[10]

CONCLUSION

Authors concluded that males had comparatively higher distance between Ho perpendicular and ANS-PNS plane in comparison to females. Similarly a significantly higher value of distance between Ba–PNS, t–ppw, Hy–ppw2, and apw2–ppw2 were obtained in males as compared to females. Results indicated that cautious evaluation of airway space might deliver valuable evidence in relation to potential malocclusion and hence evaluation of airway space must be carried out while examining a patient. The present study was done with a limited number of Bengali samples. For standardization of result, further extensive study is necessary with greater number of samples and meticulous sample selection.

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