Evaluation of Pharyngeal Space in Different Combinations of Class II Skeletal Malocclusion

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INTRODUCTION

✓ The potent pharyngeal airway is needed for the normal growth and development of craniofacial region which is composed of three parts: the nasopharynx, oro-pharynx, and hypopharynx[1]. The upper airway include the nasopharynx and the oropharynx controls the vital functional like swallowing, phonation, and contributes to the development of overall facial morphology and the ideal occlusion[2-5]. It is a well known fact that the pathological alteration of the airway patency can lead to altered craniofacial development.

✓The airway had been evaluated using several diagnostic methods, but the lateral cephalometric method has been the simple and the reproducible method for the evaluation of the airway space[10]. The relationship between the airway anatomy and the severity of malocclusion is a proven fact [2-4, 10] and the airway obstruction is particularly associated with the class II malocclusions [11].

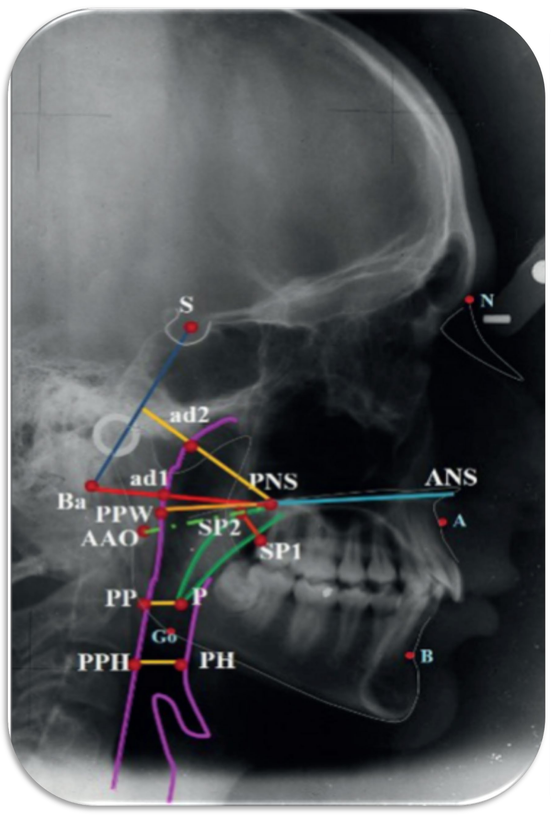
✓The study was aimed to evaluate the pharyngeal airway linear measurements of untreated skeletal class II subjects with normal facial vertical pattern in prognathic maxilla with orthognathic mandible and orthognathic maxilla with retrognathic mandible.

METHODS & MATERIAL

✓ The sample comprised of lateral Cephalograms of two groups (30 each) of class II malocclusion variants.
✓ **Group 1** comprised of class II malocclusion with prognathic maxilla and orthognathic mandible with the mean age of 19.45 ± 2.37 years, whereas **Group 2** comprised of class II malocclusion with orthognathic maxilla and retrognathic mandible with the mean age of 20.95 ± 2.99 years [1-4].
✓Each group was traced for the linear measurements of the pharyngeal airway like the oropharynx, nasopharynx and soft palate (Fig:-1). The obtained data was subjected to independent t test and the Mann Whitney test to check the difference between the two groups and within the groups respectively.

Inclusion criteria's pre-treatment lateral Cephalograms records	Exclusion criteria's pre-treatment lateral Cephalograms records
• Age: greater than 18 years • Skeletal Class II malocclusions confirmed after cephalometric tracing • ANB angle more than 4°. • Normal vertical facial pattern.	• The syndromes' patients • Facial asymmetric • The orthodontically treated cases

Cephalometric Landmarks & Parameters



✓**S (Sella):** Point representing the midpoint of the pituitary fossa (sella turcica).
✓ **N (Nasion):** The most anterior point of the front nasal suture in the median plane.
✓**Point A:** The point at the deepest midline concavity on the maxilla between the anterior nasal spine and prosthion.
✓ **Point B**: The point at the deepest midline concavity on the mandibular symphysis between infradentale and pogonion.
✓**Gn (Gnathion):** Most antero-inferior point on the symphysis of the chin.
✓ **Go (Gonion):** Constructed point of intersection of the ramus plane and the mandibular plane.
✓**ANS:** Anterior Nasal Spine; PNS: Posterior Nasal Spine.
✓ **Ba (Basion):** The median point of the anterior margin of the foramen magnum.

✓ **ad1:** The intersection point of the posterior pharyngeal wall and the line from PNS to Ba.
✓**ad2:** The intersection point of the posterior pharyngeal wall and the line from the midpoint of the line from sella (S) to Ba to PNS.
✓**AAO :** Anterior point of atlas vertebra.
✓**PPW:** Posterior pharyngeal wall along the palatal plane line.
✓**P:** Tip of soft palate.
✓**PP:** Horizontal counterpoint of tip of soft palate on the posterior pharyngeal wall.
✓**PPH:** Horizontal counterpoints of the anterior pharyngeal wall on the posterior pharyngeal wall at its narrowest section.
✓**PH:** Horizontal counterpoints of posterior pharyngeal wall on the anterior pharyngeal wall at its narrowest section.
✓**SP1:** Superior most point on the upper surface of the soft palate.
✓**SP2:** Inferior most point on the lower surface of the soft palate.

RESULTS

There was significant difference between all the linear measurements at the soft palate region and the distance between the tip of soft palate to its counter point on the pharyngeal wall in oropharynx region (p-ppm).

Parameters for sagittal and vertical relationship	SNA	Angle formed by Sella – Nasion (S-N) plane to point A
	SNB	Angle formed by S-N plane to point B
	ANB	Angle formed by Subtracting SNA and SNB
	Sn to Go-Gn	formed by lines drawn between Gonion (Go) and Gnathion (Gn) to the S-N plane
Parameters for naso-pharynx	ad1-PNS(mm)	The distance of ad1 to the posterior nasal spine (PNS)
	ad2-PNS(mm)	The distance of ad2 to PNS
	ANS-PNS to PPW(mm)	nasopharyngeal space, PNS to posterior pharyngeal wall along the palatal plane line.
Parameters for Oro-pharynx	AAO-PNS(mm)	The distance of the most anterior point of atlas vertebra (AA) to PNS.
	P-PP(mm)	The distance between the tip of soft palate (p) and horizontal counterpoint on the posterior pharyngeal wall.
	PH-PPH(mm)	The distance of horizontal counterpoints on anterior and posterior pharyngeal wall in the oropharynx at its narrowest area
Parameters for Soft palate	ANS-PNS to P°(angle)	The angle, anterior nasal spine (ANS) to PNS to tip of soft palate (p).
	PNS-P(mm)	The distance of PNS to point p.
	SP1-SP2(mm)	The thickest cross-section of the soft palate.

Table 1. Cephalometric parameters

Parameters	Group	Mean	Std. Deviation	Std. Error Mean	p-value
ANB Angle	GROUP – 1	6.4000	1.35336	.30262	1.000
	GROUP – 2	6.4000	1.18766	.26557	
Sn to Go-Gn	GROUP – 1	30.7000	1.17429	.26258	.235
	GROUP – 2	31.1500	1.18210	.26433	
SNA°	GROUP – 1	86.5000	1.50438	.33639	<.001
	GROUP – 2	81.2000	1.15166	.25752	
SNB°	GROUP – 1	80.1000	1.29371	.28928	<.001
	GROUP – 2	74.8000	1.43637	.32118	

Table 2. Comparison of various sagittal parameters for segregating the groups.

✓**Table 1** shows the comparison of the cephalometric parameters for the segregation of the group 1 and group 2. The results showed significant difference for SNA and SNB between the two groups.
✓ The pharyngeal airway comparison between the two groups is depicted in the **Table 2**. The results showed significant difference for the parameters like P-PP (mm), ANS-PNS to P° (angle), PNS-P (mm) and SP1-SP2 (mm).

Parameters for naso-pharynx	Group	Mean	Std. Deviation	Std. Error Mean	p-value
ad1-PNS(mm)	GROUP – 1	29.9000	3.24281	.72511	.063
	GROUP – 2	28.2750	1.98332	.44348	
ad2-PNS(mm)	GROUP – 1	25.4750	3.64719	.81554	.846
	GROUP – 2	25.6750	2.76384	.61801	
ANS-PNS to PPW(mm)	GROUP – 1	31.8000	3.31821	.74197	.611
	GROUP – 2	32.3750	3.76226	.84127	
Parameters for oro-pharynx					
AA-PNS(mm)	GROUP – 1	39.3000	1.89459	.42364	.585
	GROUP – 2	38.9750	1.83873	.41115	
P-PP(mm)	GROUP – 1	14.2000	1.64157	.36707	<.001
	GROUP – 2	9.6500	1.54834	.34622	
PH-PPH(mm)	GROUP – 1	11.9250	2.37462	.53098	.004
	GROUP – 2	10.1250	1.03714	.23191	
Parameters for Soft palate					
ANS-PNS to P°(angle)	GROUP – 1	134.25E2	2.33678	.52252	<.001
	GROUP – 2	141.30E2	2.65766	.59427	
PNS-P(mm)	GROUP – 1	32.5250	1.59337	.35629	<.001
	GROUP – 2	37.4500	1.63755	.36617	
SP1-SP2(mm)	GROUP – 1	11.1750	1.51549	.33887	<.001
	GROUP – 2	8.1000	1.08337	.24225	

Table 3. Comparison of the different pharyngeal parameters for Group1 and Group2. P <.001- Significant

Statistical analysis

✓Statistical analysis has been done using the SPSS software 15.

✓ Independent t-test was used to check the statistically significant difference between the means in two unrelated groups.

✓ Mann Whitney Test was used within the groups to compare differences between two independent groups when the dependent variable is either ordinal or continuous, but not normally distributed

	ANB Angle	Sn to Go-Gn	SNA°	SNB°	ad1-PNS (mm)	ad2-PNS (mm)	ANS-PNS to PPW (mm)	AA-PNS (mm)	P-PP (mm)	PH-PPH (mm)	ANS-PNS to P° (angle)	PNS-P (mm)	SP1-SP2 (mm)
0Mann-Whitney U	193.500	166.000	.000	.000	125.000	192.000	197.000	179.500	.000	92.500	3.500	.000	18.500
Wilcoxon W	403.500	376.000	210.000	210.000	335.000	402.000	407.000	389.500	210.000	302.500	213.500	210.000	228.500
Z	-.183	-.992	-5.463	-5.458	-2.053	-.217	-.082	-.566	-5.452	-2.970	-5.343	-5.440	-4.940
p-value	.855	.321	.000	.000	.040	.828	.935	.572	.000	.003	.000	.000	.000

Table 4. Comparison of the different parameters within the group. P <.001- Significant

✓The Mann Whitney test results for the statistical difference for the different parameters within the group showed no significant difference and the same is shown in the **Table 3**.
✓ **Table 4**. showed comparison of the different parameters within the group. P <.001- Significant.

DISCUSSION & CONCLUSION

The pharyngeal airway for class II malocclusion with various combination in an average growth pattern adult showed significant difference. The present results suggested that the pharyngeal airway space might be the etiological factor for different Sagittal growth pattern of the jaws and probable usage of different growth modification appliance can influence the pharyngeal airway.

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