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Evaluation of Airway Parameters In Skeletal Class II Subjects Treated With Twin Block Appliance

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I. INTRODUCTION

Functional appliances have been used since many decades for correction of mandibular retrognathism. When mandible is retrognathic, the space between cervical column and the mandibular corpus decreases and leads to a posteriorly postured tongue and soft palate; increasing the chances of impaired respiratory function,snoring, upper airway resistance syndrome and obstructive sleep apnea syndrome(1).

The growth and function of nasal cavities, the nasopharynx and the oropharynx are closely associated with the normal growth of skull(2). The size of nasopharynx increases in conjunction with the growth of the cranial base and forward development of mid face (3). Narrowing of the pharyngeal airway passage (PAP) and adaptations in the soft palate are common among subjects with retrognathic mandible (4, 5).As a result the space between the cervical column and the mandibular corpus decreases and leads to a posteriorly postured tongue and soft palate, increasing the chances of impaired respiratory function during the day and possibly causing nocturnal problems like snoring, upper airway resistance syndrome, and obstructive sleep apnea (OSA) syndrome (6, 7).

Functional appliances are used in cases of skeletal class II for mandibular advancement. Although there are numerous studies those have evaluated the nature of Class II correction by various functional appliances in growing skeletal Class II children, there are only a few studies that evaluates the airway dimension changes following functional appliance treatment. Thus the objective of this study is to evaluate the airway in skeletal class II subjects treated with twin block therapy.

II. MATERIALS AND METHODS

10 growing subjects with a mean age of 12.2±1.03 with retrognathic mandible on a class II skeletal base was selected for the study. The subjects had an orthognathic maxilla and a retrognathic mandible, with class II molar relationship, increased overjet and no crowing of the dention were selected. The exclusion criteria included subjects with a history of orthodontic treatment, anterior open-bite, severe proclination of the anterior teeth, and any systemic disease affecting bone and general growth. A lateral cephalograms was acquired (T1) before the treatment with patients in the standing position with Frankfort horizontal plane parallel to the floor and teeth in centric occlusion. The head of the patient was erect. All cephalograms were recorded in the same machine with same exposure parameters. The skeletal and the airway parameters were analysed using standard cephalometric protocol .The skeletal parameters measured were SNA, SNB, ANB, AO-BO, Co-ptA, Co-Gn. The airway was analysed as described by Otsuka et al(8) , i.e. SPAS-anteroposterior width of airway behind the soft palate along line parallel to B-Go line, MAS-anteroposterior width of airway along line parallel to B-Go line through P, where P is the most inferior tip of soft palate, AS-anteroposterior width of airway along line B-Go line.(figure 1)

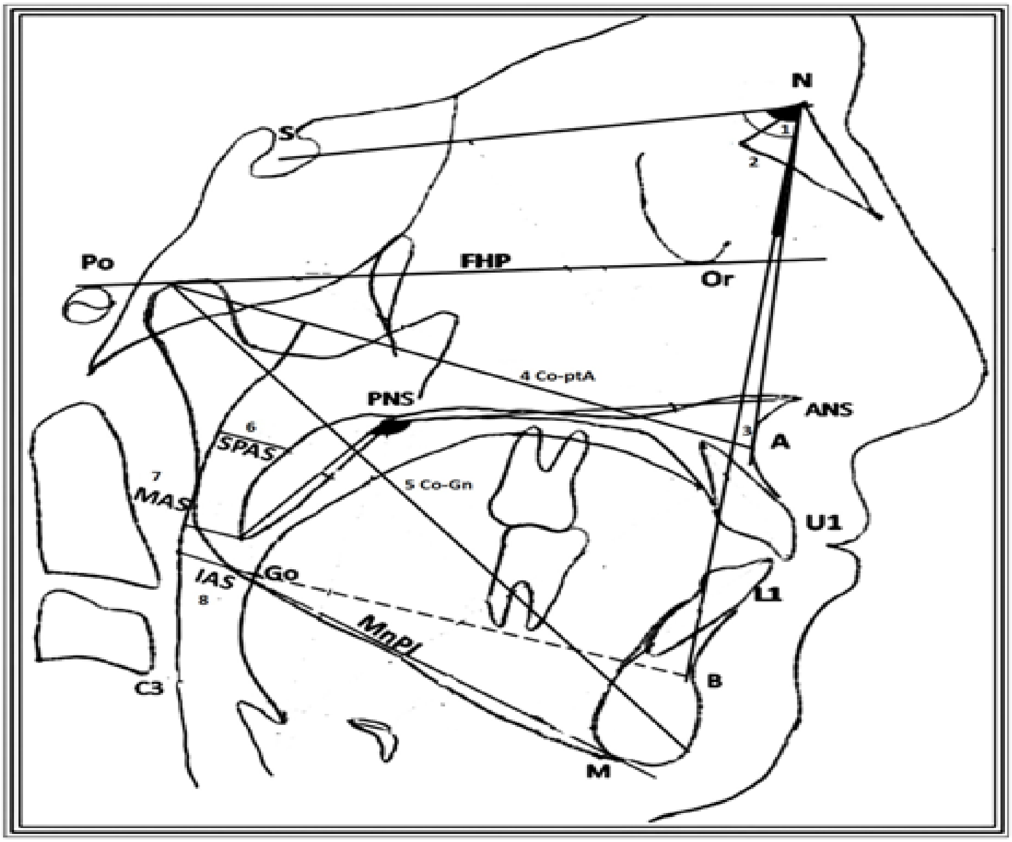

Figure 1: Skeletal parameters:(1)SNS,(2)SNB,(3)ANB,(4)Co-ptA,(5) Co-Gn

Airway parameters:(6) Superior Posterior Airway Space (SPAS)-anteroposterior width of airway behind the soft palate along line parallel to B-Go line, (7) Middle Airway Space (MAS)-anteroposterior width of airway along line parallel to B-Go line through P, where P is the most inferior tip of soft palate, (8) Inferior Airway Space (IAS)-anteroposterior width of airway along line B-Go line

The class II malocclusion was corrected by twin-block therapy. One-step mandibular advancement was carried out during the wax bite registration. An edge-to-edge incisor relationship with 2- to 3-mm opening between the maxillary and mandibular central incisors was maintained for all subjects. The patients were instructed to wear the appliance 24 h/day, and they were reviewed once a month. After the completion of the twin block therapy a second lateral cephalograms was acquired (T2) and the parameters were traced using the same protocol

III. STATISTICAL ANALYSIS

The statistical analysis was carried out using SPSS software. Paired t test was use to compare the Pre-treatment parameters (T1) and the post functional appliance parameters (T2). The P-value of 0.05 was considered as level of significance.

IV. RESULTS

The mean age group of the subjects included in the study was 12.2±1.03 years. The mean and standard deviation of skeletal changes are given in table 1.

The change in sagittal position of the mandible (SNB angle) was statistically significant. The change in the mandibular length (Co-Gn) was increased significantly post treatment. The maxillomandibular discrepancy also reduced significantly. The maxillary length (Co-ptA) showed a significant increase. There was no statistically significant change in the sagittal position of the maxilla (SNA).A statistically significant reduction in the ANB angle was also seen (figure 2)

	N	Pre-treatment(T1)		Post-treatment(T2)		p Value
		Mean	SD	Mean	SD	
SNA	10	82.80	1.87	83.20	2.35	.343
SNB	10	74.80	2.57	77.20	3.19	<0.001
ANB	10	8.00	1.94	6.10	1.97	.003
Co- ptA	10	93.00	6.67	95.20	6.34	0.019
Co-Gn	10	108.50	5.04	114.00	5.40	0.001
S PAS	10	21.40	3.53	23.90	3.63	<0.001
IAS	10	15.60	2.76	18.00	2.49	<0.001
MAS	10	18.70	2.16	21.40	2.55	<0.001

Table 1: The pre (T1) and post (T2) treatment parameters

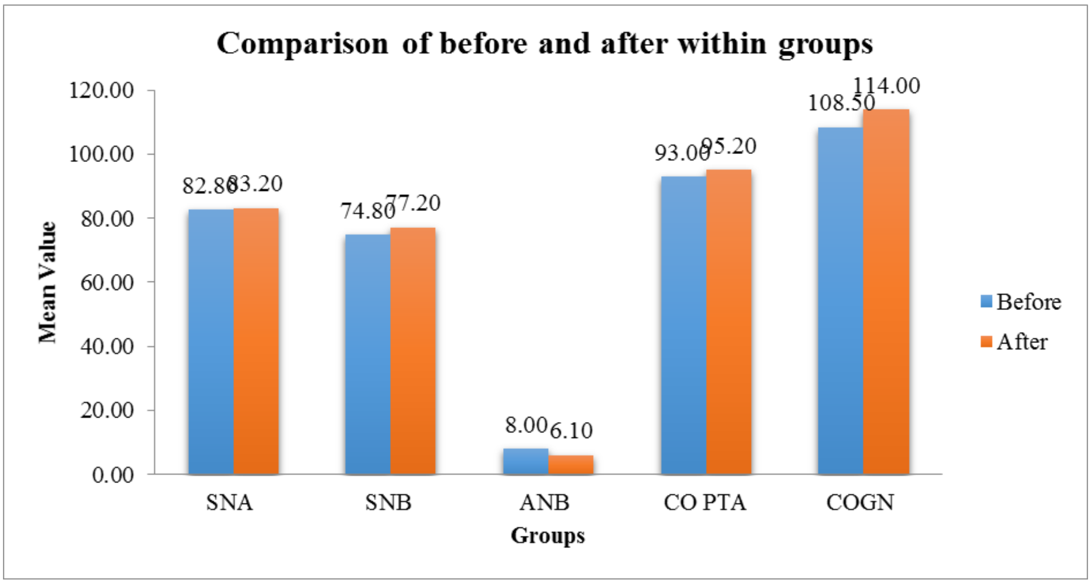

Figure 2:Comparison of skeletal parameters from T1 to T2

The mean and standard deviation of airway parameters are given in table 1. There was statistically significant increase in the airway parameters SPAS, MAS and IAS after the twin block appliance therapy as given in figure 3

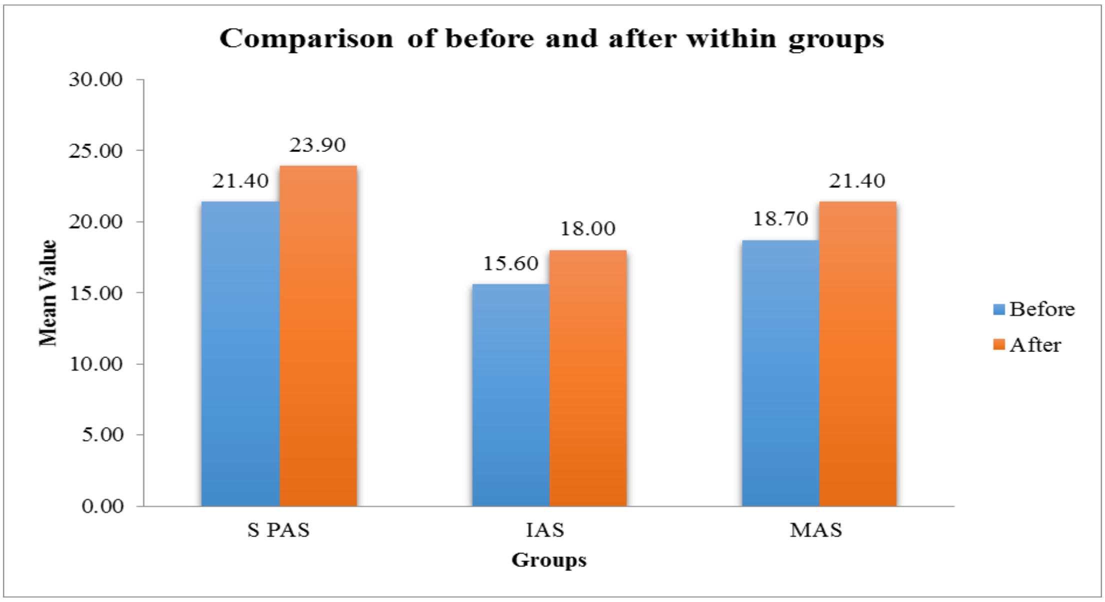

Figure 3:Comparison of airway parameters from T1 to T2

V. DISCUSSION

In cases of skeletal class II, twin block given by William Clark is the most common functional appliance for treatment, which effectively modifies the occlusal inclined plane to induce favourably directed occlusal forces by causing functional mandibular displacement. The mean age group was 12.2±1.03 years was included in this study because this age group represented a period of active growth and development of craniofacial complex, which is a foremost requirement for the Twin block therapy. In this study statistically significant difference in the sagittal jaw relationship was seen. Statistically significant change was seen in the SNB angle whereas SNA angle was not statistically significant. As the mandible is postured forward by twin-block appliance, a reciprocal force acted distally on maxilla, restricting its forward growth and stimulating and favouring the forward mandibular growth. Many studies have reported the same observation following the twin block appliance therapy [9-11]. Trenouth et al [12] also observed increase in SNB angle. Reduction in ANB value was significant because, the advancement of mandible with Twin block increased the value of SNB. Effective increase in the maxillary (Co-ptA) and mandibular (Co-Gn) length was also seen in cases treated with twin block, which shows the effect of twin block in the forward growth of the mandible.

On evaluation of airway in pre cephalograms and post cephalograms after twin block therapy, superior posterior airway space, middle airway space and inferior airway space has significantly increased, as a result of forward posturing of the mandible which is denoted by the increase in the SNB angle. The change in superior posterior airway space from pre-treatment to post treatment was 2.5mm. The change in middle airway space was 2.4mm and the change in inferior airway space was 2.7mm.Schutz et al [13] found that after class II correction, the anterior displacement of the mandible and the hyoid bone caused an anterior traction of the tongue, which increased the posterior airway space by 3.2 mm. Jena et al [14] also reported increase in the pharyngeal airway passage dimension following twin-block therapy among subjects with retrognathic mandible. Bonham et al [15] reported a mean increase of 2.76 mm in the superior airway space after modified functional appliance therapy. Ghodke et al [16] observed significant improvements in the depth of the oropharynx and hypopharynx, and inclination of the soft palate following correction of mandibular retrusion in class II malocclusion subjects. When the mandible was displaced anteriorly by the twin-block appliance, it influenced the position of the hyoid bone and consequently the position of the tongue and thus improved the morphology of the upper airway. Class II correction by twin-block appliance during childhood might help to eliminate the predisposing factors to OSA and may serve to decrease the risk of OSA development in adulthood.

The limitation of this study is that the airway is a 3 dimensional space, whereas the lateral cephalograms is the 2 dimensional representation of 3 dimensional space. Cone beam computerized tomography, Computerized tomography can give a more accurate picture of the airway. Moreover, these newer imaging techniques would require the patient to be exposed to more ionizing radiation which would have been undesirable and unethical. However the results of this study might provide insight into the importance of airway changes associated with twin block appliance.

VI. CONCLUSION

The results clearly shows that sagittal advancement of mandible with twin block appliance has a close association between the pharyngeal airway space and significant increase in the superior posterior airway space, middle airway space and inferior airway space is seen. Twin block also enhances the growth of mandible, providing adequate airway space in class II skeletal pattern. Effective increase in the maxillary and mandibular length is achieved with twin block appliance with a reduction in the ANB angle. The use of twin block during the growth period helps in correction of class II skeletal discrepancy and also eliminates the predisposing factors to obstructive sleep apnea in adulthood.

REFERENCES

[1]. Arens R, Marcus CL ,Pathophysiology of upper airway obstruction: a developmental perspective Sleep 2004, 27: 997-1019

[2]. Preston CB, Lampasso JD, Tobias PV. Cephalometric evaluation and measurement of the upper airway. Seminar in Orthodontics. 2004;10:3–15

[3]. Rosenberger HC. Growth and development of nasorespiratory area in childhood.Am Otolaryng. 1934;43:495–512.

[4]. Kirjavainen M, Kirjavainen T. Upper airway dimensions in class II malocclusion. Effects of headgear treatment. Angle Orthod. 2007;77:1046–1053.

[5]. Jena AK, Singh SP, Utreja AK. Sagittal mandibular development effects on the dimensions of the awake pharyngeal airway passage. Angle Orthod. 2010;80:1061–1067.

[6]. Schafer ME. Upper airway obstruction and sleep disorders in children with craniofacial anomalies. Clin Plast Surg. 1982;9:555–567

[7]. Ozbek MM, Miyamoto K, Lowe AA, Fleetham JA. Natural head posture, upper airway anatomy and obstructive sleep apnea severity in adults. Eur J Orthod.1998;20:133–143.
[8]. Otsuka Ryo,Almeida Fernanda, Lowe A Alen, A comparison of responders and nonresponders to oral appliance therapy for the treatment of obstructive sleep apnea,Am J Orthod Dentofacial Orthop 2006;129:222-9
[9]. Lee RT, Barnes E, DiBiase A, Govender R, Qureshi U (2014) An extended period of functional appliance therapy: a controlled clinical trial comparing the Twin Block and Dynamax appliances. Eur J Orthod 36: 512-521
[10]. Mahamad IK, Neela PK, Mascarenhas R, Husain A (2012) A comparision of Twin-block and Forsus (FRD) functional appliance—a cephalometric study. Int J Orthod Milwaukee 23: 49-58
[11]. O'Brien K, Wright J, Conboy F, Sanjil Y, Mandall N et al. Effectiveness of early orthodontic treatment with the Twin-block appliance: a multicenter, randomized, controlled trial. Part 1: dental and skeletal effects. Am J Orthod Dentofacial Orthop. 2003,124: 234-243.
[12]. Trenouth MJ. Proportional changes in cephalometric distance during twinblock appliance therapy. Eur J Orthod 2002;24:485-91.
[13]. Schutz TCB, Dominguez GC, Hallinan MP, Cunha TCA, Tufik S. Class II correction improves nocturnal breathing in adolescents. Angle Orthod. 2011;81:222–228.
[14]. Jena AK, Singh SP, Utreja AK. Effectiveness of twin-block and mandibular protraction appliance-IV in the improvement of pharyngeal airway passage dimensions in class II malocclusion subjects with a retrognathic mandible. Angle Orthod. 2013;83:728–734.
[15]. Bonham PE, Currier GF, Orr WC, Othman J, Nanda RS. The effect of a modified functional appliances on obstructive sleep apnea. Am J Orthod 1988;94:384-92
[16]. Ghodke et al, Effects of twin-block appliance on the anatomy of pharyngeal airway passage (PAP) in class II malocclusion subjects,Progress in Orthodontics 2014, 15:68

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