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## ORIGINAL RESEARCH

### Effect of treatment with twin block appliances on pharyngeal dimensions in class II malocclusion patients

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#### ABSTRACT:

**Background:** Short and deficiency in the anteroposterior position of the mandible is very common in Class II malocclusion subjects. A small airway dimension during childhood may increase the risk of sleep-related breathing problems during adulthood secondary to fat deposition in the posterior pharyngeal region. The use of functional appliances for the correction of retrognathic mandible is very common in orthodontics. Similar appliances known as oral appliances are also frequently used in adults for the treatment of mild to moderate OSA. **Aim of the study:** To study effect of treatment with twin block appliances on pharyngeal dimensions in class II malocclusion patients. **Materials and methods:** The present study was conducted in the Department of Orthodontics and Dentofacial Orthopedics of the dental institution. For the study, we selected 50 subjects in the age range of 8 to 14 years with skeletal class II malocclusion associated with mandibular retrusion. The class II malocclusion in treatment group subjects was corrected by standard twin-block appliance. The pharyngeal airway passage (PAP) dimension was evaluated from lateral cephalograms. **Results:** A total of 50 subjects were included in the study. The age of subjects ranged from 8-14 years. Number of male subjects was 21 and female subjects were 29. We observed that DNP was increased by 0.78, HNP increased by 0.41 mm, DOP increased by 1.95 mm, DHP increased by 1.14 mm, SPL decreased by 0.86 mm, SPT increased by 0.31 mm and SPI decreased by 2.33 mm. **Conclusion:** Within the limitations of the present study, it can be concluded that twin block appliance can be successfully used for correction of sagittal dimensions of oropharynx and hypopharynx in growing age patients with class II malocclusion.

**Keywords:** Twin block appliance, class II malocclusion, functional appliance.

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#### INTRODUCTION:

Short and deficiency in the anteroposterior position of the mandible is very common in Class II malocclusion subjects. <sup>1</sup> As the mandible is more retrognathic in relation to the anterior cranial base, it decreases the space between cervical column and mandibular corpus and leading to posteriorly positioned tongue and soft palate. <sup>2,3</sup> As a result, there is an increase chance of impaired respiratory functions during the day and various sleep-related breathing problems during night. <sup>2,3</sup>

A small airway dimension during childhood may increase the risk of sleep-related breathing problems during adulthood secondary to fat deposition in the posterior pharyngeal region. Katyal et al. <sup>4</sup> concluded that the children with increased ANB angle have smaller airway dimensions and increased the risk of sleep-disordered breathing (SDB) problems compared with normal children. The use of functional appliances for the correction of retrognathic mandible is very common in orthodontics. Similar appliances known as

oral appliances are also frequently used in adults for the treatment of mild to moderate OSA.<sup>5</sup> Many previous studies reported improvement of PAP dimensions following functional appliance therapy in children and oral appliance therapy in adults.<sup>6</sup> Hence, the present study was conducted to study effect of treatment with twin block appliances on pharyngeal dimensions in class II malocclusion patients.

**MATERIALS AND METHODS:**

The present study was conducted in the Department of Orthodontics and Dentofacial Orthopedics of the dental institution. The ethical clearance of the study was obtained from the ethical committee of the institute before starting the study.

For the study, we selected 50 subjects in the age range of 8 to 14 years with skeletal class II malocclusion associated with mandibular retrusion. A written informed consent was obtained from the parents or guardians of the subjects after verbally explaining them the procedure of the study. The class II malocclusion in treatment group subjects was corrected by standard twin-block appliance. 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, especially during mealtimes and they were followed once in every 4 weeks. The pharyngeal airway passage (PAP) dimension was evaluated from lateral cephalograms. The variables evaluated were depth of the nasopharynx (DNP); height of the nasopharynx (HNP); depth of the oropharynx (DOP); depth of the hypopharynx (DHP); soft palate length (SPL); soft palate thickness (SPT); and soft palate inclination (SPI). The Lateral cephalograms with

teeth in occlusion were obtained for all subjects before the start of treatment and after a follow-up period of approximately 4 months in treatment.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

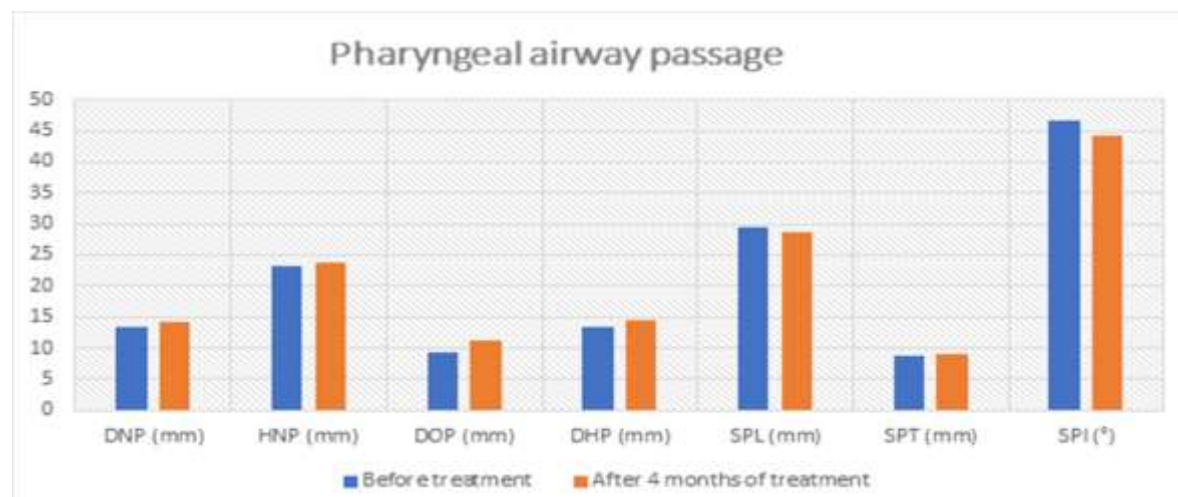
**RESULTS:**

A total of 50 subjects were included in the study. The age of subjects ranged from 8-14 years. Number of male subjects was 21 and female subjects were 29. Table 1 shows the mean measurement of pharyngeal airway passage (PAP) before treatment and after 4 months of treatment. We observed that DNP increased by 0.78, HNP increased by 0.41 mm, DOP increased by 1.95 mm, DHP increased by 1.14 mm, SPL decreased by 0.86 mm, SPT increased by 0.31 mm and SPI decreased by 2.33 mm. The results for DOP and SPT were statistically significant (p<0.05). [Fig 1]

**Table 1:** Mean measurement of pharyngeal airway passage (PAP) before treatment and after 4 months of treatment

Pharyngeal airway passage variables (PAP)	Before treatment	After 4 months of treatment	p-value
DNP (mm)	13.48	14.26	0.15
HNP (mm)	23.25	23.66	0.47
DOP (mm)	9.33	11.28	0.02*
DHP (mm)	13.42	14.56	0.4
SPL (mm)	29.42	28.56	0.2
SPT (mm)	8.68	8.99	0.6
SPI (°)	46.56	44.23	0.02*

**Fig 1:** Pharyngeal airway passage (PAP) before treatment and after 4 months of treatment



**DISCUSSION:**

In the present study, we observed that there is a significant increase in the change in dimensions of pharyngeal airway passage. The results were significant with respect to DOP and SPT. The results were compared with previous studies. Ghodke S et al evaluated the effects of twin-block appliance on pharyngeal airway passage (PAP) dimensions and posterior pharyngeal wall thickness (PPWT) in class II malocclusion subjects with retrognathic mandibles. Thirty-eight class II malocclusion subjects in the age range of 8 to 14 years with mandibular retrusion were divided into a treatment (n=20) and control (n=18) group. Mandibular retrusion in the treatment group subjects was corrected by twin-block appliance. The effect of twin-block appliance on PAP and PPWT dimensions were evaluated from lateral cephalograms recorded prior-to and after 6 months of appliance therapy in the treatment group subjects and the changes were compared with the changes in the control group subjects. Student's t-test was used for statistical analysis; P-value of 0.05 was considered a statistically significant level. The depth of the oropharynx was increased significantly in the treatment group subjects ( $P < 0.001$ ) as compared to the control group subjects ( $P < 0.05$ ). The depth of the hypopharynx increased significantly in treatment group subjects ( $P < 0.01$ ). The PPWT at the level of the nasopharynx, oropharynx, and hypopharynx were maintained in the treatment group subjects; whereas in control group subjects, the PPWT was further reduced although the changes were not statistically significant. They concluded that correction of mandibular retrusion by twin-block appliance in class II malocclusion subjects increased the PAP dimensions and maintained the pre-treatment thickness of posterior pharyngeal wall. Jena AK et al tested the hypothesis that twin-block and Mandibular Protraction Appliance-IV (MPA-IV) are not effective in improving the pharyngeal airway passage (PAP) dimensions among Class II malocclusion subjects with a retrognathic mandible. Eighty-three subjects ranging in age from 8 to 14 years were divided into four groups. Group I included 30 Class I malocclusion subjects (healthy controls); group II consisted of 16 Class II malocclusion subjects (Class II controls); group III had 16 subjects in whom Class II malocclusion was treated by MPA-IV; and the remaining 21 subjects formed group IV, whose Class II malocclusions were corrected by twin-block appliance. Lateral cephalograms recorded at the beginning of orthodontic treatment in group I subjects and at the beginning and end of follow-up/treatment with functional appliance in group II, III, and IV subjects were analyzed to determine the PAP dimensions. Paired t-test, one-way analysis of variance, and Tukey tests were applied for statistical analysis, and a P-value .05 was considered statistically significant.

Soft palate length was decreased significantly in group III ( $P < .05$ ) and group IV ( $P < .001$ ) subjects. Soft palate thickness in group IV subjects was increased significantly as compared to group II ( $P < .05$ ) and group III ( $P < .01$ ) subjects. The improvement in soft palate inclination in group III and group IV subjects was significant ( $P < .01$ ). The oropharynx depth was increased significantly in group III ( $P < .05$ ) and group IV ( $P < .001$ ) subjects. The depth of the hypopharynx was increased significantly ( $P < .01$ ) in group IV subjects. They concluded that the twin-block appliance was more efficient than the MPA-IV in the improvement of PAP dimensions among Class II malocclusion subjects with retrognathic mandible.<sup>7,8</sup> Burhan AS et al compared the dentoalveolar and skeletal changes resulting from treatment using two popular functional appliances: the Bite-Jumping Appliance (BJA) and the Twin-Block Appliance (TBA). Patients were screened from the patients who were seeking treatment at the Department of Orthodontics, Al-Baath University. Eligibility criteria included skeletal Class II division 1 malocclusion resulting from the retrusion of the mandible. A computer-generated randomization list was used to randomly divide the patients into two equal groups to be treated with either the BJA or the TBA. Blinding was applicable for outcome assessment only. Forty-four patients (22 male and 22 female) aged 10.2-13.5 years were randomized in a 1:1 ratio to either the BJA or the TBA groups, and four patients were lost to follow-up (two from each group). Lateral cephalometric radiographs were obtained before treatment and after 12 months of active appliance therapy. Forty patients (20 in each group) were available for the statistical analysis. Baseline characteristics were similar between groups. Similar changes were observed in the sagittal plane, including a significant increase in the SNB angle. No significant changes were observed in the maxilla. The lower incisors were significantly proclined, and the upper incisors significantly retruded. In the vertical plane, BJA induced mandibular clockwise rotation, and the SN:MP angle increased by  $2.14 \pm 2.97^\circ$  ( $P = 0.002$ ). Conversely, no significant changes took place in this angle in the TBA group  $0.75 \pm 2.37^\circ$  ( $P = 0.096$ ). Similarly, Jarabak ratio decreased significantly in the BJA group by  $-1.78 \pm 0.85\%$  ( $P = 0.002$ ) and increased significantly in the TBA group by  $1.26 \pm 0.76\%$  ( $P = 0.032$ ), with significant differences between the two groups ( $P \leq 0.001$ ). No serious harm was observed. They concluded that the BJA is recommended when clockwise rotation is desired, whereas the TBA is recommended to inhibit vertical development. Ali B et al evaluated the mean changes in the pharyngeal dimensions of children with mandibular deficiency treated with Clark's twin-block appliance (CTB) followed by fixed orthodontic treatment. Orthodontic

records of 42 children with mandibular deficiency were selected. Records comprised three lateral cephalograms taken at the start of CTB treatment, after CTB removal and at the end of fixed appliance treatment, and were compared with 32 controls from the Bolton-Brush study. Friedman test was used to compare pre-treatment, mid-treatment and post-treatment pharyngeal dimensions. Wilcoxon signed rank test was used to compare the airway between pre-treatment and post follow-up controls. Superior pharyngeal space ( $p < 0.001$ ) and upper airway thickness ( $p = 0.035$ ) were significantly increased after CTB, and the change in superior pharyngeal space remained stable after fixed mechano-therapy. They concluded that CTB can have a positive effect in improving pharyngeal space and the resultant increase in airway remains stable on an average of two and a half years.<sup>9,10</sup>

### CONCLUSION:

Within the limitations of the present study, it can be concluded that twin block appliance can be successfully used for correction of sagittal dimensions of oropharynx and hypopharynx in growing age patients with class II malocclusion.

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