

## ORIGINAL RESEARCH

### Effect on pharyngeal dimensions of class II malocclusion patients with Twin block appliance

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#### ABSTRACT:

**Background:** Class II division 1 anomalies result from mandibular inadequacy rather than from excess of maxillary development. Considering its effects on airway dimensions, correction of class II malocclusions is not only important in terms of aesthetics and function, but also in terms of increasing patient comfort. Studies have shown that if the skeletal Class II malocclusion is diagnosed at an early age, the best treatment option is the use of functional appliances, which allows the forward growth of the mandible and prevents upper airway collapse during sleep. **Aim of the study:** To study the effect on pharyngeal dimensions of class II malocclusion patients with Twin block appliance. **Materials and methods:** The present study was conducted in the Department of Orthodontics and Dento-facial orthopedics of the Dental institution. For the study, we selected 50 patients 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. 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. **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 24 and female subjects were 26. DNP was increased by 1.28 mm, HNP increased by 2.3 mm, DOP increased by 2.69 mm, DHP increased by 2.2 mm, SPL decreased by 2.11 mm, SPT increased by 0.86 mm and SPI decreased by 7.25 mm. **Conclusion:** Within the limitations of the present study, it can be concluded that treatment of class II malocclusion patients with twin block appliance leads to correction of sagittal dimension of oropharynx and hypopharynx.

**Keywords:** Twin block appliance, class II malocclusion, orthodontic treatment, functional appliance

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#### Introduction:

Class II division 1 anomalies result from mandibular inadequacy rather than from excess of maxillary development. Mc Namara Jr. reported that mandibular retrusion is the most common characteristic of this

anomaly. <sup>1</sup> In that case, treatment focuses on using mandibular advancement appliances. The functional treatments used for this purpose target the positioning of the mandible in the anterior and the correction of the retrognathic mandible with the adaptation of the chin to

this position. As class II malocclusions generally occur because of the tongue being positioned at the back and restricting the cervical region, respiratory function is interrupted in the larynx region; and therefore, abnormal swallowing and mouth breathing occur.<sup>2</sup> Considering its effects on airway dimensions, correction of class II malocclusions is not only important in terms of aesthetics and function, but also in terms of increasing patient comfort.<sup>3</sup> Many treatment modalities have been developed to treat Class II malocclusion with a retrognathic mandible. Functional appliances like mandibular advancement devices, activator headgear treatment, Twin block appliances, and fixed appliances like Forsus-fixed functional appliance and fixed appliance with activator headgear were used with or without surgical correction.<sup>4</sup> Studies have shown that if the skeletal Class II malocclusion is diagnosed at an early age, the best treatment option is the use of functional appliances, which allows the forward growth of the mandible and prevents upper airway collapse during sleep.<sup>5</sup> However, the functional appliance treatment requires patient cooperation in order to be effective, which is often a major problem. The Twin Block appliance (TBA) is one of the preferred removable functional appliances used in correcting retrognathic mandible in Class II malocclusion.<sup>6</sup> Hence, the present study was conducted to study the effect on pharyngeal dimensions of class II malocclusion patients with Twin block appliance.

**Materials and methods:**

The present study was conducted in the Department of Orthodontics and Dento-facial 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 patients in the age range of 8 to 14 years with skeletal class II malocclusion associated with mandibular retrusion. Subjects with history of orthodontic treatment, anterior open-bite, severe proclination of the anterior teeth, and any systemic disease affecting bone

and general growth were excluded from the study. 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.

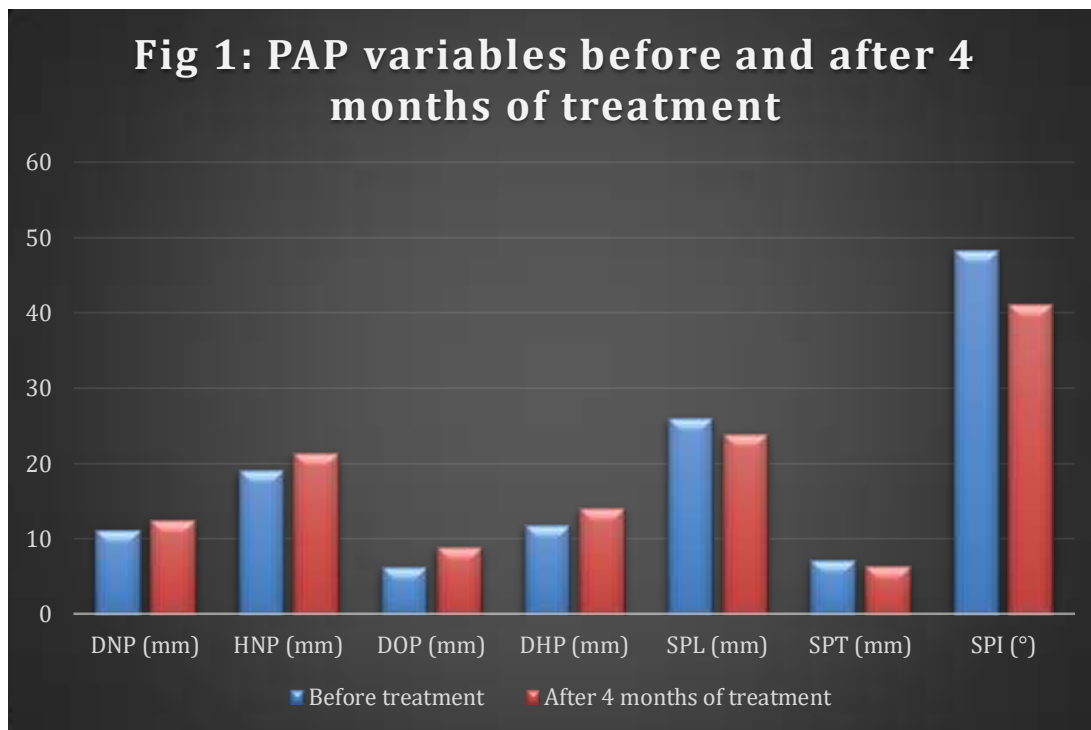
The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

**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 24 and female subjects were 26. Table 1 shows the comparative analysis of pharyngeal airway passage variables (PAP) before treatment and after 4 months of treatment. We observed that DNP was increased by 1.28 mm, HNP increased by 2.3 mm, DOP increased by 2.69 mm, DHP increased by 2.2 mm, SPL decreased by 2.11 mm, SPT increased by 0.86 mm and SPI decreased by 7.25 mm. The results for DOP and SPT were statistically significant (p<0.05).

**Table 1: Pharyngeal airway passage variables (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)	11.23±1.82	12.51±2.02	0.14
HNP (mm)	19.12±3.22	21.42±2.8	0.13
DOP (mm)	6.23±2.22	8.92±1.33	0.001*
DHP (mm)	11.81±1.34	14.01±1.80	0.41
SPL (mm)	26.12±3.1	24.01±3.11	0.45
SPT (mm)	7.22±2.41	6.36±1.8	0.22
SPI (°)	48.36±3.4	41.11±2.4	0.03*



**Discussion:**

In the present study, we observed that there was significant increase in the dimensions of pharyngeal airway pressure variables with twin block appliance over treatment duration. We observed that changes in dimensions of DOP and SPT were statistically significant. Significant changes in other parameters were also observed. Overall, twin block appliance not only improves the malocclusion, but also improves pharyngeal passage. The results were consistent 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. The depth of the oropharynx was increased significantly in the treatment group subjects as compared to the control group subjects. The depth of the hypopharynx increased significantly in treatment group subjects. 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. Soft palate length was decreased significantly in group III and group IV subjects. Soft palate thickness in group IV subjects was increased significantly as compared to group II and group III subjects. The improvement in soft palate inclination in group III and group IV subjects was significant. The oropharynx depth was increased significantly in group

III and group IV subjects. The depth of the hypopharynx was increased significantly 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>

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. Mann-Whitney U test was applied to compare the mean changes in pharyngeal dimensions between treatment group and controls from T2 to T0. Post-hoc Dunnett T3 test was used for multiple comparisons of treatment outcomes after CTB and fixed appliances, taking a p-value of  $\leq 0.05$  as statistically significant. 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. Vinoth SK et al evaluated changes in airway with twin block therapy. Cephalometric assessment of airway was done in 25 growing children in the age group of 11-13 years with Class II skeletal pattern. All the patients were treated with twin block appliance. Pre and post treatment lateral cephalograms were taken to evaluate the changes in different airway and craniofacial dimensions during the treatment period. The average treatment duration was 14.5 months. A significant increase was observed in upper and lower pharyngeal width and area of bony nasopharynx. Craniofacial dimension: There was a significant increase in effective mandibular length, ramal length and mandibular plane angle. There was an increase in SNB angle, which resulted in decreased ANB angle.

They concluded that there was a definite improvement in airway dimension following twin block therapy.<sup>9,10</sup>

#### Conclusion:

Within the limitations of the present study, it can be concluded that treatment of class II malocclusion patients with twin block appliance leads to correction of sagittal dimension of oropharynx and hypopharynx.

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