

The Effectiveness of Using Twin Block Functional Appliances and Activators in Class II Malocclusion

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Abstract

Background: Malocclusion is a condition of mismatch in occlusion or a mismatch of the opposing teeth when the jaws are in contact. Clinically, it can be manifested in a variety of ways from simple rotation of the teeth, minor diastema to crowding, spacing, protrusion, and some combination. One of the most common malocclusions is class II malocclusion. Class II malocclusion is characterized by retrognathic appearance of the mandible. Class II malocclusions can be treated using several functional appliances such as Twin Blocks and Activators.

Objective: To analyze the effectiveness of using twin block functional appliances and activator in class II malocclusion.

Method: Data collection was carried out by searching and analyzing literature from the electronic data site Semantic Scholar, Science Direct and manual search in the publication period 2012 to 2022. Systematic data search using keywords: Twin Block, Activator, Malocclusion, Class II.

Conclusion: Both functional appliances, Twin Block and activator, are equally effective in treating patients with Class II malocclusion. The overjet angle, SNB, and ANB increased significantly in both groups.

Keywords: Twin Block, Activator, Malocclusion, Class II.

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INTRODUCTION

Malocclusion is defined as an abnormality that occurs in the teeth or dental arch abnormalities beyond the variation that is considered normal.⁽¹⁾ Although malocclusion is not life-threatening^(1,2) Malocclusion can be considered as a public health problem because of its high incidence.^(1,3)

Malocclusion has the 3rd highest prevalence of oral health problems in the world.^(1,2,4–7) Malocclusion has multifactorial causes which are classified into general factors and local factors.⁽⁴⁾

Edward Hingley Angle (1899) classified malocclusion in the mesio-distal relationship of the teeth. The classification is based on the maxillary permanent first molar.⁽⁸⁾

The normal pattern of skeletal malocclusion is Class I and is characterized by a straight facial profile^(6,8) with a molar relation, namely the mesiobuccal cusp of the upper permanent first molar occluded with the mesiobuccal groove of the lower first permanent molar.⁽⁹⁾ Class II is characterized by a convex facial profile^(6,8) with the relation of the upper permanent first molar, namely the distobuccal cusp occluded with the mesiobuccal groove of the lower permanent first molar.⁽⁹⁾ Class III is characterized by a concave facial profile⁽¹⁰⁾ with the relation of the lower first permanent molar located mesial to the upper permanent first molar.⁽⁹⁾

Class II malocclusion is one of the most common malocclusions in the world.^(11–14) The correct diagnosis to decide on the appropriate treatment plan should be considered. Treatment options for Class II malocclusion may include extraoral appliances, functional appliances, and fixed appliances.⁽¹²⁾

There are various functional tools that can be used for the correction of class II malocclusion, such as: Activator and twin block. According to Clark, the twin block appliance is the most widely used among other types of functional appliance.(15–17) Twin block is often used in patients who are in growth period. The design that is separated into two parts, the top and bottom on this appliance provides convenience in speaking and chewing.(16,18)

A clinical trial has shown that class II malocclusion can be corrected with an activator device. It has been reported that maxillary growth can be limited by the use of an activator. Activators can prevent the mesial movement of the maxillary molars expected during normal growth.(19)

These appliances work by stimulating mandibular growth, limiting maxillary growth further forward and improving skeletal relations in individuals with mandibular retrusion. In short term, removable functional appliances are effective in improving class II malocclusion.(20)

Method

Data Source

Data collection was carried out through searching and analyzing literature through electronic data sites in the form of Pubmed, Semantic Scholar, Science Direct, and manual searches where the data obtained was based on the publication time range from 2012-2022. The data obtained comes from the keywords Twin Block, Malocclusion, Class II, and Activator.

Search Criteria

Inclusion criteria: Articles published in the period 2012-2022, available online and related to the use of functional twin block appliances and activators in cases of class II malocclusion.

Exclusion criteria: Inaccessible articles, and articles published under 2012.

Search Method

Pubmed

Semantic Scholar

Science Direct

Manual/hand research

Search Details

Keywords: “Twin block” and “Activator” and “Malocclusion” and “Class II”

Data Collection and Data Analysis

The author retrieves articles through an electronic database according to keywords. The articles taken are articles from the last 10 years (2012 – 2022). The author evaluates the title and abstract of the research resulting from the search. The authors assessed the full-text articles to determine that the studies met the inclusion criteria. Research that meets the inclusion criteria is then assessed for quality and data extraction. Furthermore, the data obtained as follows:

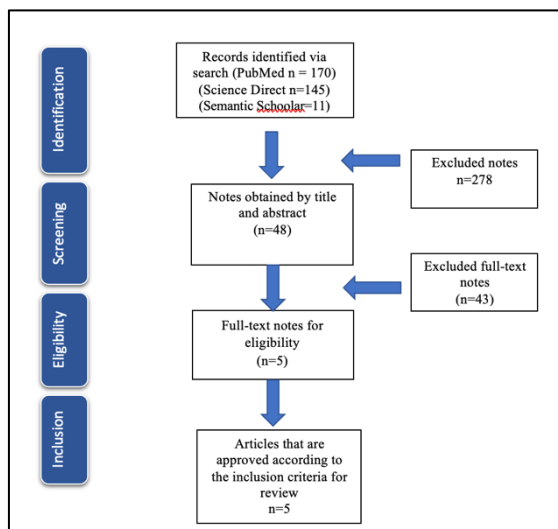


Figure 1: Screening Chart

No	year	Writer	Title	Purpose	Results
1	2020	Vivek Kumar Thakur, SM Londhe, Prasanna Kumar, Mohit Sharma, Amit Jain, Ishan Pradhan	Evaluation and Quantification of Airway Changes in Class II division 1 patients undergoing myofunctional therapy using twin block appliance	The purpose of the present study was to determine the airway changes in skeletal class II division 1 malocclusion patients with mandibular retrognathism, treated with Twin-Block appliance	Acquired data was subjected to appropriate statistical analysis. The paired 't' test was used to compare pre-treatment (T0) and after the positive pterygoid response (T1). TB appliance increased mean minimum airway area by 0.28 ± 0.25 cm ² and mean airway by 0.47 ± 0.44 cm ² with 95% CI. Posttreatment minimum airway and mean area changes were found to be statistically significant (P-value<0.01).
2	2020	Giulia Baccaglione, Elisa Rota, Maurizio Ferrari, Marcello Maddalone	Second Class Functional Treatment: Andrearsen Activator vs Twin Block	The purpose of this research is to analyze and compare the dental and skeletal changes induced by two functional appliances, Andrearsen Activator and Clark's Twin Block, on the sagittal and vertical plane, by means of cephalometric analysis, of the lateral cephalograms prescribed at the beginning and at the end of the treatment for a second skeletal class, first division with normal or deep bite.	In both of the two groups analyzed, all the sagittal and vertical, angular and linear, skeletal measurements appear to be increased in a statistically significant way, except SNA angle and the distance Sna-Snp. Regarding the dental parameters, in the group treated with Andrearsen Activator, only Overjet and Overbite showed statistically significant differences. On the other hand, twin block induced statistical changes about Overjet, Overbite and also U1/SnaSnp, but not about

					L1/GoGn. The advancement of the mandible determines a greater prominence of the chin and lower lip, an increment of the labial mental angle and a reduction of the convexity of the profile. Also, the decrease of the overjet and, accordingly, of the dental exposure improve the esthetic appearance of the patient's face.
3	2022	Mahamad Irfanulla Khan, Praveen Kumar Neela, Nayeem Unnisa, Ajit Kumar Jaiswal, Nadeem Ahmed, Abhik Purkayastha	Dentoskeletal effects of Twin Block appliance in patients with Class II malocclusion	The aim of this retrospective study was to evaluate the dentoskeletal effects produced by the Twin Block appliance for the correction of Class II division 1 malocclusion with retrognathic mandible.	The cephalometric analysis revealed that the Twin Block appliance stimulated mandibular growth and statistically significant differences were found between the two groups. Twin Block patients showed a statistically very high significant ($p < 0.001$) increase in mandibular length (6.02 mm) compared with the control group (0.3 mm). "Headgear effect" on the maxilla, increase in lower anterior facial height, significant reduction of overjet, overbite and Class I molar relationship were achieved in the Twin Block group. However, no significant changes appeared in the control group.
4	2017	Stephan Spalj, Kate Mroz Tranesen, Kari Birkeland, Visnja Katic, Andrej Pavlic, Vaska Vandeska-Redunovic	Comparison of Activator-Headgear and Twin Block Treatment Approaches in Class II Division 1 Malocclusion	The purpose was to compare the treatment effects of functional appliances activator-headgear (AH) and Twin Block (TB) on skeletal, dental, and soft-tissue structures in class II division 1 malocclusion with normal growth changes in untreated subjects.	Treatment with both appliances in significant reduction of skeletal and soft-tissue facial convexity, the overjet, and the prominence of the upper lip in comparison to untreated individuals ($p < 0.001$). Retroclination of maxillary incisors and proclination of mandibular incisors were seen, the latter being significantly more evident in the TB group ($p < 0.05$). Increase of effective mandibular length was more pronounced in the TB group.

5	2021	Cinzia Maspero, Lucia Giannini, Guido Galbiati, Laima Kairyte, Giampietro Farronato	Upper airway obstruction in class II patients. Effects of Andresen activator on the anatomy of pharyngeal airway passages. Cone beam evaluation	The aim of this study is to assess the response and changes on pharyngeal airway passage (PAP) to class II Andresen appliance in class II growing patients with obstructive sleep apnea syndrome (OSAS).	The change in ANB, SNB, MP-H, PNS-U, PAS was significantly more in the patients undergoing treatment as compared to the control group. The improvement of DOP and DPH among the treatment group subjects was significantly more compared to the control group subjects.
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Systematic Review

Malocclusion

Malocclusion is defined as the presence of malrelation in occlusion between arches where there are anomalies in tooth position, number, shape, and position of tooth development that are outside normal limits. Clinically, it can be manifested in a variety of ways from simple rotation of the teeth, minor diastema to crowding, spacing, protrusion, and a combination of more severe conditions.(21)

Several local factors, such as poor oral habits, dental anomalies, shape and position of developing teeth can cause malocclusion.(22) The occurrence of malocclusion in a person can affect the health of the individual(23) and its management is associated with improving quality of life.(24,25)

There is evidence that children from low socioeconomic backgrounds are more likely to have bad habits associated with malocclusion. Children with uneducated mothers may ignore exclusive breastfeeding which is associated with malocclusion in primary teeth.(23)

Class II malocclusion is a condition that is often associated with one of the following: mandibular retrognathism, maxillary anterior displacement, increased posterior maxillary vertical dimension, mandibular fossa in a posterior position, maxillary narrowing and a combination of factors. In general, the maxillary and mandibular incisors were in good position, but the maxillary incisors tended to be protrusive. In Class II skeletal malocclusions, mandibular retrognathism appears to be the main causative factor.(26)

Treatment may involve early intervention during mixed dentition (phase I) usually followed by second appliance therapy during early adolescence (phase II). Proponents of the 2-phase treatment theory state that there are significant benefits to early intervention including:

Normalization of patterns and skeletal growth

Reduction of the duration of subsequent phase II treatment

The future course of orthodontic treatment is simpler and faster

The need for permanent tooth extraction in the future is reduced

The chances of a traumatic dental injury are also significantly reduced.(11)

There are three types of orthodontic appliances used for growth modification of Class II skeletal problems, namely extraoral force appliances, functional appliances and interarch elastic traction. The ideal indication for a skeletal Class II malocclusion with a retrognathic mandible is a functional appliance.(18)

Functional appliances have been used for many years in the treatment of Class II malocclusions with the aim of obtaining bone correction of the malocclusion. The use of these appliances should support an increase in the position and growth of the mandible along with changes in the tooth-muscle relationship.(27)

In growth-phase patients with skeletal Class II malocclusion with mandibular retrusion, Twin block appliances and activators can be used to stimulate and promote mandibular growth.(27)

Twin Block

Twin Block appliances have been used in clinical orthodontics since 1977, for the treatment of Class II Skeletal malocclusions.(28)

Twin block appliances are useful in cases where the sagittal and vertical relationships are abnormal. Twin block can be used as a treatment option because of its simple, comfortable, and aesthetic design so that it can be used throughout the day. Class II malocclusion with large overjet in children who are still growing can use functional equipment as an orthodontic interceptive treatment, one of them is a removable twin block appliance.(15,27)

Twin block can advance the mandible so that it is in line with the maxilla. This allows for additional mandibular length by stimulating the growth of the condylar cartilage and limiting maxillary growth. Distraction of the mandibular condyle of the glenoid fossa reduces pressure on the actively growing condylar cartilage. Changes in condylar muscle tension promote endochondral growth. The twin block consisted of separate maxillary and mandibular acrylic sets with blocks on the occlusal segments of the posterior teeth. The block serves to position the mandible forward. Over time, the mandible will maintain that position permanently.(29,30)



Image: Twin Block Appliance

Many studies have shown that twin block can be one of the most efficient treatment modalities for upper airway repair for growing patients with skeletal Class II malocclusion.(31) However, controversy still exists regarding measurable changes in upper airway dimensions. Recent studies by Khalil et al support that Twin Block has a positive effect on the airway and position of the hyoid bone.(32)

The results of Thakur et al's study also validated the significant positive effect of twin block on airway dimensions with an increase in the minimum upper airway area.(33)

In the study conducted by Khan et al, cephalometric findings showed that there was a significant reduction in overjet and overbite observed in patients using Twin Block. For skeletal effects, a statistically significant increase in mandibular length (6.02 mm) and SNB angle (2.3°) was observed in the Twin Block group compared to the control group of 0.3 mm and 0.3°, respectively. The Twin Block group experienced a "Headgear effect" resulting in a slight inhibition of sustained maxillary growth as evidenced by the decrease seen in the SNA angle (-0.7°) compared to the small increase seen in the SNA angle in the control subjects.(34)

In the Twin Block group, the maxillary incisors retroclined, extruded, and tipped distally, while the mandibular incisors were proclined, intrusive, and labial tipped. The maxillary molars were distalized (1 mm) and extruded, on the other hand, the mandibular molars moved mesially (4.5 mm) and extruded whereas in the control group the maxillary molars were distalized (0.3 mm), and the lower molars moved mesially. (0.5mm). Significant reductions in overjet (5.72 mm) and overbite were observed at the end of treatment in Twin Block patients compared to untreated Class II controls.(34)

Activator

The Andreasen activator, which is still widely used today, was one of the first functional appliances designed to stimulate mandibular growth. This appliance has a good effect on the skeletal system, although it has the disadvantage that because the upper and lower parts of the device are joined, the patient cannot have normal phonetic and functional activities while wearing it, thereby reducing the time to use the appliance.(27)



Figure 2: Activator Appliance

The activator in the treatment makes changes by linking three components, which are muscle action, changes in the position of the jaw and teeth in achieving occlusion. The activator can be modified by adding multiple active elements and extraoral orthopedic planes.(35)

Activators affect facial skeletal structure during growth and development, maxillary incisor retroclination, mandibular incisor proclination and mandibular arch position. Many previous studies have suggested that activators can inhibit excessive maxillary development. Another opinion states that the activator stimulates the growth of the condyle and affects the glenoid fossa.(35)

The activator can inhibit maxillary horizontal growth, also causing an increase in mandibular growth(36) and causes anterior relocation of the glenoid fossa.(37)

Harvold & Vargervik demonstrated that at the end of the activator treatment, the height of the posterior mandibular alveolar process increased and a consequent rotation of the posterior mandible occurred. Significant reduction in overjet is seen with forward mandibular growth & less change in teeth.(38)

Activator mechanisms in correcting Class II malocclusion include: maxillary growth retardation, mandibular growth drive, maxillary lingual incisor tipping, mandibular incisor labial tipping & remodeling changes in the temporomandibular joint.(38)

The study conducted by Maspero et al showed that the sagittal jaw relationship was significantly increased in the treatment group subjects. The Andresen Activator device acts to position the mandible forward and creates a reciprocal distal force on the maxilla, limiting forward growth and stimulating forward mandibular growth.(39)

Discussion

The results of treatment of the Andresen activator functional appliance and twin block seem to obtain very good results, more skeletal than dental changes, when treatment of class II malocclusion is performed on a patient at the peak of pubertal growth.(27)

Both the Twin Block and Activator functional appliances were successful in reducing the severity of class II malocclusion with a combination of tooth and bone changes. The overjet angle, SNB, and ANB increased significantly in both groups. All these changes were significantly different with untreated patients, the control group showed a positive treatment effect with functional equipment.(40)

Both seem very effective and efficient. Quantitatively, the results are excellent, although qualitatively it appears to require management through fixed orthodontic treatment, in order to make the occlusion more stable.(27)

Patients treated with twin block showed more statistically significant changes in the SNB and ANB angles. Comparison between the group given the Andresen activator and the group with twin block showed that the two appliances studied provided the same effectiveness on SNA parameters.(27)

The twin block is able to manage the inclination of the upper incisors better towards the prespinal plane: compared to the 0.7° reduction provided by the Activator. Also the gear parameters of Ovj and Ovb have experienced a greater improvement than

twin block appliances (difference between the two appliances, respectively, 1.1 mm and 0.2 mm). On the other hand, the activator device induces a more significant maxillomandibular divergence and allows for better control of the inclination of the lower incisors with respect to the mandibular plane. In the maxilla, the reduction in the SnaSnp induced by this appliance was greater than 0.4 mm compared to the twin block. At the end of therapy, Co-Go and Go-Gn parameters were slightly higher (+0.2 mm in both data) in patients treated with activator compared to twin block.(27)

Conclusion

Both functional appliances, Twin Block and activator, are equally effective in treating patients with Class II malocclusion. The overjet angle, SNB, and ANB in both the Twin block and activator groups showed an increase and could move the mandible to anterior significantly.

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