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Research Article

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Skeletal Effect of Modified Twin Block with Clear Plates Versus Conventional Twin Block in Class II Malocclusions – a Randomized Controlled Trial of Functional Appliances

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Abstract

Purpose: *The aim of this in-vivo study was to evaluate the skeletal changes of a modified Twin Block with clear plates versus a conventional Twin Block appliance in skeletal class II patients.*

Methods and Materials: *A total of 32 patients with skeletal class II malocclusion contributing to mandibular retrognathism were involved. The sample was divided into two groups: group A: 16 patients will undergo to orthodontic treatment with modified Twin Block with clear plates; group B: 16 patients will undergo to orthodontic treatment with conventional Twin Block appliance. After 12 months of treatment a cephalometric radiograph was taken in central occlusion to study skeletal changes. Independent sample T-test was used for studying significance between groups.*

Results: *There were significant differences in MP-SN; MP-SPP and SN-NPG values. While there were no statistically significant differences in SNA, SNB and ANB values. A significant difference was observed after 12 months of treatment for each group (P<0.05).*

Conclusion: *Modified Twin Block with clear plates is an effective alternative device to treat skeletal class II malocclusion with vertical growth pattern.*

Keywords: Twin Block, Clear Orthodontic, Functional Appliances, Class II Malocclusion

1. Introduction

Skeletal or dental Class II malocclusions are most commonly seen in orthodontic practice; they presenting with different clinical manifestations. Globally, an approximate estimation shows over 20% prevalence of Class II malocclusion [1]. In 1981, McNamara study found that 60% of the Class II malocclusion occurred in children having retrognathic mandible [2].

For many years, Functional appliances have been used; several varieties of removable functional appliances like Bionator, Activator, Frankel, and Twin Block are used for the correction of Class II malocclusions, to modify or redirect mandibular growth to correct a skeletal discrepancy [3,4]. Twin Block, a functional appliance developed by William J. Clark, is the most popular and widely used removable functional appliances for the correction of Class II malocclusion in growing patients due to increased patients acceptance and compliance, the separate upper and lower two-piece design of the appliance allows freedom of speech and mastication [5].

In recent years, increasing numbers of patients have a desire for esthetic and comfortable alternatives to conventional appliances [6]. Clear plates therapy continued to increase its scope from the simplest cases to malocclusions requiring orthodontic treatment, and nowadays also functional appliances for growing patients with class II malocclusion [7].

During orthodontic treatment, it is important to select the correct appliance that will acceptance by patients as much as possible. In view of this concern, the aim of this in-vivo study was to evaluate the skeletal changes of a modified Twin Block with clear plates versus a conventional Twin Block appliance in skeletal class II patients. The null hypotheses of this study: There were no significant differences in skeletal changes between different Twin Block appliances.

2. Methods

This study was approved by the Research Ethics Committee of the Faculty of Dentistry – University of Hama, Hama, Syrian Arab Republic. Written consent was obtained from the patients prior to participation.

2.1 Sample Size and Patient Selection

Sample size estimation was calculated using power and sample size calculation computer software (G*Power 3.1.9.7 software, USA). At $\alpha = 0.05$ and with a power of 0.95, a minimum of 16 patients per group was required. Consecutive patients referred for orthodontic treatment at the Department of Orthodontics, University of Hama, were recruited. All experimental phases took place in this center.

Inclusion criteria: Patients with mixed dentition at age 10-13 years, the patient has Skeletal class II malocclusion caused by mandibular retraction ANB > 5, 8 mm >O.J> 5 mm, SNB<78, angle (NSAr) ≥ ° 125 and normal placement of the upper jaw, the patient is willing to accept treatment with a removable device, No previous orthodontic treatment, the growth model is within the normal or horizontal maxillary opening angle of 30 >MM or angle of 400 > Björk, patients do not have an upper alveolar dental protrusion. Exclusion criteria: Periodontal disease, neuromuscular disorder, class I or III of malocclusion, temporomandibular joint disorder, skeletal open bite, poor oral and gingival health, presence of a unilateral or bilateral posterior crossbite, patients who have upper jaw stenosis and need to be prepared by expansion before functional treatment.

2.2 Orthodontic Treatment Protocol

Group A: 16 patients will undergo to orthodontic treatment with modified Twin Block with clear plates (Figure 1). This device consists of a soft clear plate with a thickness of 0.5 mm, on top of which an acrylic block is added that is a biting elevation level causing an anterior displacement of the lower jaw upon closing, similar to the elevation of the bite in the traditional device. The soft plate and the bite-enhancing acryl are pressed with a hard plate of 1 mm thickness (Figure 2).

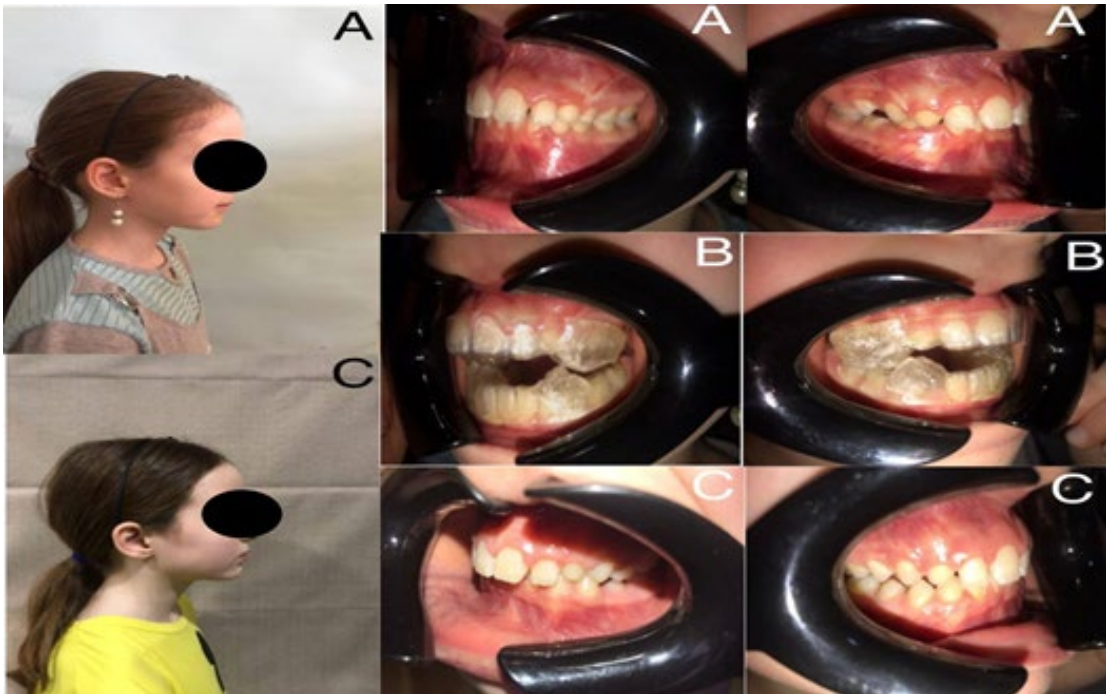

Figure 1: A Young Female Patient was Treated with Modified Twin Block with Clear Plates

Figure 2: The Modified Twin Block with Clear Plates

Group B: 16 patients will undergo to orthodontic treatment with conventional Twin Block appliance (Figure 3). Patients were treated with a conventional Twin Block device constructed following the design originally conceived by Clark [8]. The appliance was comprised of maxillary and mandibular plates that fit against the teeth, alveolus, and other supporting structures. Adams clasps were constructed on both sides to anchor the upper plate to the first permanent molars, and 0.030-inch ball clasps were positioned in the interproximal spaces anteriorly. The precise clasp arrangement depended on the state of the dentition at the moment of Twin Block construction. In the mandibular arch, ball hooks were placed in the interproximal areas between the canines and incisors (Figure 4).

Figure 3: A Young Female Patient was Treated with Conventional Twin Block Appliance

Figure 4: The Conventional Twin Block Appliance

2.3 Cephalometric Analysis

Skeletal changes were studied before and after treatment using software WebCeph version: 1.5.0. (WEBCEPH, Pangyoyeok-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea). A cephalometric radiograph was taken in central occlusion position and timed in two different phases:

T0: before the treatment.

T1: after 12 months of treatment.

2.4 Statistical Analysis

Data obtained were coded and transferred to MS-excel sheet. The data were verified and analyzed statistically using software IBM SPSS version 25 (SPSS, Inc., Chicago, IL, USA) with confidence level set at 95% ($p<0.05$) to test for significance. Independent sample T-test was used for studying significance between groups, while paired samples T-test was used to examine differences between phases.

3. Results

Table 1 and (figure 5) show the means and standard deviations of skeletal angles values for each group. However, the results of independent sample T-test were listed in (Table 2). The lowest value for SNA was recorded in T1 phase of group A, while the highest one observed in T0 phase of group B.

The results of independent sample T-test indicated that there were significant differences in MP-SN and MP-SPP values in T0 phase, and in SN-NPG value in T1 phase. While there were no statistically significant differences in SNA, SNB and ANB values. Examine differences between T0 and T1 using paired samples T-test for each group revealed that there was a significant difference between two phases ($P<0.05$).

Angle	Group A		Group B	
	T0	T1	T0	T1
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
SNA	82.33 (1.52)	82.20 (1.50)	82.52 (1.16)	82.39 (1.17)
SNB	75.33 (1.43)	78.78 (1.16)	75.58 (1.08)	78.92 (0.76)
ANB	7.01 (0.70)	3.42 (0.55)	6.93 (0.40)	3.47 (0.58)
SN-NPG	76.10 (1.22)	80.25 (1.22)	76.43 (0.82)	79.29 (0.76)
MP-SN	29.69 (1.92)	26.83 (1.60)	31.16 (1.69)	27.97 (1.88)
MP-SPP	26.34 (1.21)	25.11 (1.24)	27.20 (0.98)	25.21 (0.95)

Table 1: Means and Standard Deviations of Skeletal Angles Values Included in Current Study

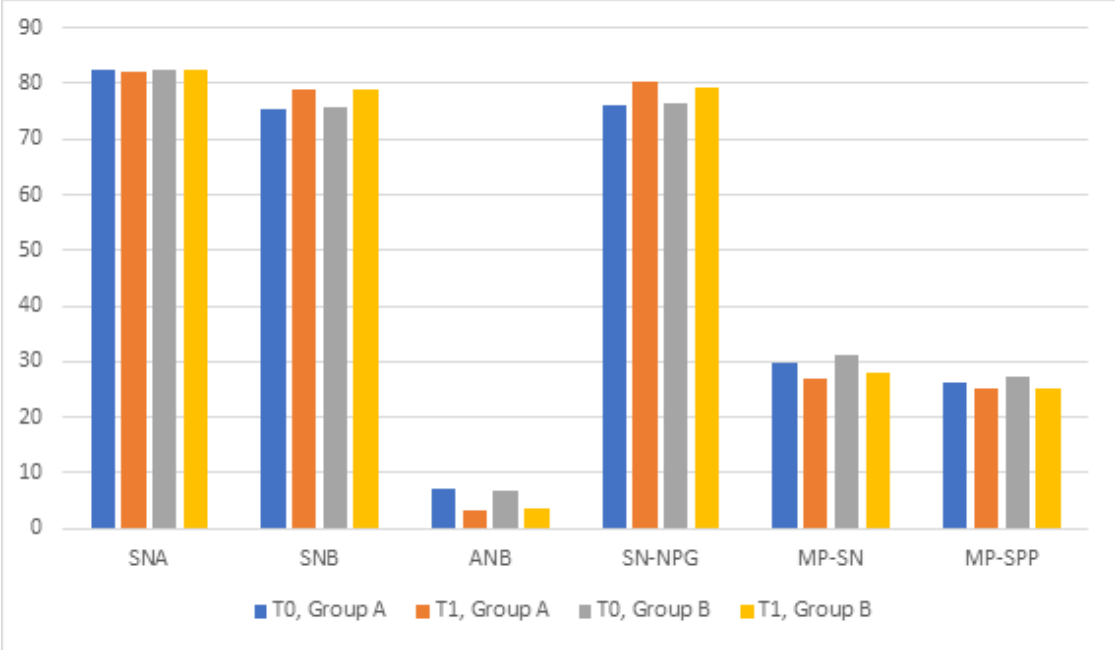

Figure 5: The Values of Skeletal Angles Included in Current Study

Angle	T0		T1	
	T-test	P-value	T-test	P-value
SNA	0.39	0.699	0.39	0.696
SNB	0.57	0.573	0.40	0.691
ANB	-0.40	0.694	0.24	0.813
SN-NPG	0.90	0.376	-2.67	0.012
MP-SN	2.30	0.029	1.85	0.074
MP-SPP	2.21	0.035	0.24	0.812

Table 2: The Results of Independent Sample T-Test

4. Discussion

32 patients were involved in current in-vivo study and divided into two groups according to Twin Block appliance type. Greater improvement was observed in SN-NPG in group A, while there were no statistically significant differences when comparing all others measurements between the two groups. Comparison between two phases within the same group revealed significant differences for all skeletal variables in each group.

Historically, functional appliances have been used for many years in the treatment of class II malocclusion with the aim of obtaining a skeletal correction of mandibular retrusion [9]. Several functional appliances exist for the treatment of class II malocclusions and among these, one of the most common is the Twin Block [10]. In recent years clear orthodontic extended its area of expertise including functional appliances for growing patients with class II malocclusions. Therefore, the present in vivo study aimed to compare the skeletal changes obtained by using the modified Twin Block with clear plates and the conventional Twin Block with the same type of malocclusion.

Both appliances are based on the same mechanism of action with inclined planes that induce the mandible to assume a forced anterior position, with subsequent neuromuscular adaptation. In the present study, the decrease of the ANB angle in phase T1 suggests the efficacy of both appliances when compared with an untreated class II (phase T0).

The result of the current study showed that the anterior-posterior position of the upper jaw changed in group A patients treated with modified Twin Block, as the SNA angle decreased in time T1 compared to time T0 with an average of 0.13 degrees. These results agreed with the work of Radwan et al. who compare skeletal, dentoalveolar, and soft tissue changes between Twin Block and early fixed orthodontic appliance for class II division 1 malocclusion treatment [11]. Previous studies reported that Twin Block is an effective device to correct the anterior-posterior position of the lower jaw [11,2]. These in accordance with current study, as the SNB angle increased in phase T1 with average 3.45 degrees.

In accordance with Babaki et al., the value of SN-NPG was increased, while MP-SN value decreased after 12 months of treatment [13]. The MP-SPP angle decreased in group A patients after 12 months of treatment.

With regard of comparison between modified Twin Block and conventional one, there were no significant differences in correction of the anterior-posterior position of the lower jaw. These in accordance with Golfeshan et al. With the respect of SN-NPG, the results of this study revealed that there were significant differences between the two devices [12].

Golfeshan et al. was compared dentoskeletal effects and patient's satisfaction with a modified Twin Block and classic one [12]. A total of 62 patients with skeletal class II malocclusion contributing to mandibular retrognathism with a minimum of 4 mm overjet were involved. The results of that study showed that there was no significant difference in MP-SN values between the two devices. These data disagree with current study as a significant difference was recorded between modified Twin Block and conventional one may be because of increasing vertical growth and stretching of the muscles, thus anterior rotation of the lower jaw.

The results of the present study showed that both the modified Twin Block and conventional Twin Block appliances are efficient in the management of class II malocclusion with a more relevant improvement of the profile induced by the modified Twin Block. The null hypothesis has been partially rejected that there were no significant differences in skeletal changes of class II malocclusion by different Twin Block appliances.

This study has some limitations such as short-term nature and the small number of patients involved. However, after the recent application of this new technique, further studies with larger sample size should be performed and to evaluate the stability of the results in the long term.

5. Conclusion

Under the limitations of the present study, it may be concluded that: modified Twin Block with clear plates is an effective alternative device to treat skeletal class II malocclusion with vertical growth pattern.

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Declarations of Interest

None

References

1. Bishara, S. E. (2001). Textbook of orthodontics. WB Saunders Philadelphia.
2. McNamara Jr, J. A. (1981). Components of Class II malocclusion in children 8–10 years of age. The Angle Orthodontist, 51(3), 177-202.
3. Graber, T. M., Rakosi, T., & Petrovic, A. G. (1997). Dentofacial orthopedics with functional appliances.
4. Lee, K. Y., Park, J. H., Tai, K., & Chae, J. M. (2016). Treatment with Twin-block appliance followed by fixed appliance therapy in a growing Class II patient. American Journal of Orthodontics and Dentofacial Orthopedics, 150(5), 847-863.
5. Baysal, A., & Uysal, T. (2013). Soft tissue effects of Twin Block and Herbst appliances in patients with Class II division 1 mandibular retrognathy. The European Journal of Orthodontics, 35(1), 71-81.
6. Rosvall, M. D., Fields, H. W., Ziuchkovski, J., Rosenstiel, S. F., & Johnston, W. M. (2009). Attractiveness, acceptability, and value of orthodontic appliances. American Journal of Orthodontics and Dentofacial Orthopedics, 135(3), 276-e1.
7. Krieger, E., Seiferth, J., Marinello, I., Jung, B. A., Wriedt, S., Jacobs, C., & Wehrbein, H. (2012). Invisalign® treatment in the anterior region. Journal of Orofacial Orthopedics/ Fortschritte der Kieferorthopädie, 1-12.
8. Clark, W., & Clark, W. J. (2014). Twin block functional therapy. JP Medical Ltd.
9. Franchi, L., Pavoni, C., Faltin, K., Bigliazzi, R., Gazzani, F., & Cozza, P. (2016). Thin-plate spline analysis of mandibular shape changes induced by functional appliances in Class II malocclusion A long-term evaluation. Journal Of Orofacial Orthopedics-fortschritte Der Kieferorthopadie, 325-333.
10. Sharma, A. K., Sachdev, V., Singla, A., & Kirtaniya, B. C. (2012). Skeletal and dentoalveolar changes concurrent to use of Twin Block appliance in class II division I cases with a deficient mandible: a cephalometric study. Journal of Indian Society of Pedodontics and Preventive Dentistry, 30(3), 218-226.
11. Radwan, E. S., Maher, A., & Montasser, M. A. (2023). Comparative Evaluation of Twin Block Appliance and Fixed Orthodontic Appliance in Early Class II Malocclusion Treatment: A Randomized Controlled Trial. The Journal of Contemporary Dental Practice, 23(11), 1111-1121.
12. Golfeshan, F., Soltani, M. K., Zohrei, A., & Poorolajal, J. (2018). Comparison between Classic Twin-block and a Modified Clear Twin-block in Class II, Division 1 Malocclusions: A Randomized Clinical Trial. The Journal

of Contemporary Dental Practice, 19(12), 1455-1462.
13. Ahmadian-Babaki, F., Araghbidi-Kashani, S. M., & Mokhtari, S. (2017). A cephalometric comparison of twin block and bionator appliances in treatment of class II malocclusion. Journal of clinical and experimental dentistry, 9(1), e107.