

CLINICAL EFFECTS OF REMOVABLE FUNCTIONAL TWIN BLOCK APPLIANCE IN THE TREATMENT OF CLASS II/1 MALOCCLUSION

Assistant Professor Delia DARAGIU, Professor PhD Doina Lucia GHERGIC
 "Titu Maiorescu" University, Faculty of Dental Medicine

ABSTRACT. Sagittal mandibular deficiency is the most common cause of skeletal class II malocclusion. Treatment objective is to stimulate sagittal mandible growth. Twin block functional appliance use is beneficial for shortening the time required for treatment. *Case outline:* a 12 year old boy was referred to our Clinic by his dentist. Patient was subjected to the twin-block treatment for 9 month. Lateral cephalograms before and after the treatment were performed. Skeletal and dental changes were observed after treatment. A 12 year old Caucasian male presented with Class II/1 malocclusion, overjet of 10 mm. Treatment was commenced with TB functional appliance. The promotion of oral hygiene and fluoride use was performed because orthodontic treatment carries a high caries risk. *Conclusions:* TB was effective in correcting the molar relationship and reducing the overjet in class II/1 malocclusion

Keywords: twin block, malocclusion, functional appliance, prophylaxis

INTRODUCTION

Skeletal class II/1 malocclusion are common orthodontic irregularities (Bishara SE.). With successful treatment traumatic injuries of incisors, TMJ dysfunctions can be prevented and a better psycho-social adaptation of the child during personality development is accomplished (Azevedo A et al).

The treatment objective for skeletal class II malocclusions is to stimulate sagittal mandibular growth and establish a correct occlusal relationship and to improve facial aesthetics.

Some researchers claim that mandibular condylar growth can be stimulated by removable functional appliance treatment, while others state that changes in occlusion result in dento-alveolar remodeling processes [Harvold EP et al, Ahlgren A et al, Panchez H, Wieslander L, Lagerstrom L,]. Studies report that the correction from class II to class I relationship with TB treatment was achieved by 30% skeletal modification and 70% dentoalveolar changes [Sidlauskas A]

The TB appliance is removable functional appliance, which comprised of upper and lower bite-blocks that effectively modify the occlusal inclined plane. It induces favorably directed occlusal forces producing functional mandibular forward displacement and change from class II to class I jaw relationship.

In comparison to other removable functional appliances, these occlusal inclined planes like appliance give greater freedom of anterior movement and lateral excursion and cause less interference with normal function [Clark WJ].

TB has been widely accepted as a more competent class II corrector compared to earlier bulky monobloc appliances. Patients wear TB 24 hours per day and can eat comfortably with the appliances on place. Patients can

learn to speak normally with TB. The appliances are comfortable. The time needed for the therapy is relatively short (6-9 month), worn 24 hours a day.

Case outline: A 12-year-old Caucasian male was referred by a pedodontist to our Clinic. The patient complained that his "upper teeth stuck out". At initial examination his malocclusion was diagnosed as class II/1 (Figure 1) with an overjet of 10 mm. Extraoral analysis revealed convexity, an extruded upper lip, a mentolabial sulcus, and potentially competent lips. A lateral cephalogram analysis (Figure 3) confirmed the Class II sagittal skeletal relationship between the upper and lower jaws as a result of mandibular retrognathism. The protrusion of upper teeth was identified (Figure 4).

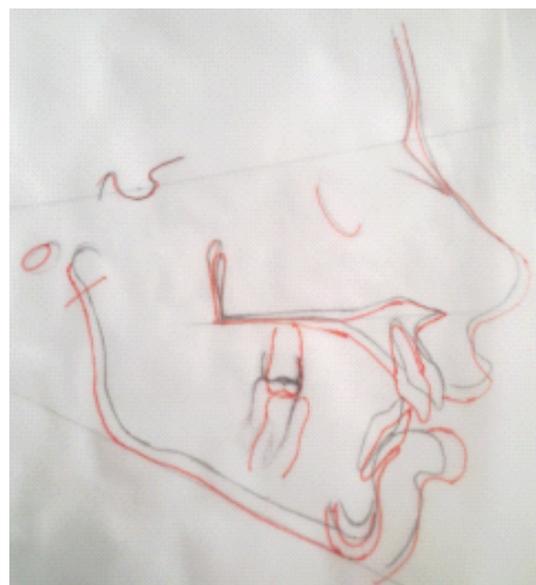


Fig. 1 Black line- before treatment, .
 Red line- after treatment with
 Twin block-superimposition on SN line

On examination he presented with a class II/1 incisor relationship on a class II skeletal base.

Intraoral examination

The patient was in the permanent dentition. He presented with an overjet of 10mm, and the overbite was increased, first molar relationship on the right side full class II relationship and on the left side class I relationship, the mandible shifts, laterodeviates to the right side on

closure with the left first mandibular premolar positioned lingually and mesiolinguo-rotated and totally lingualized relationship with contact with the antagonist premolar, canine class II relationship.

Dental examination revealed a restored permanent dentition without active caries lesions but with poor oral hygiene and gingivitis. Regular recall visits aimed at remotivating patients oral hygiene practices. (Figure 4, 5)



Fig. 4 Before treatment



Fig. 5 Before treatment

Radiographs

An orthopantomograph confirmed the presence of the unerupted third molars. The lateral cephalometric radiograph and analysis confirmed the class II skeletal pattern (ANB= 8.50). The maxillary incisors were proclined at 115.50, and lower incisors at 980.

Problem list:

- 1) Class II skeletal pattern
- 2) Increased overjet
- 3) Increased overbite
- 4) Scissor bite upper left first premolar
- 5) Laterodeviation of the mandible

6) Oral habit- he was sucking his thumb during the night – this habit persisted even at this age.

Treatment plan:

- 1. Fit TB to correct the sagittal discrepancy and achieve class I molars relationship and overjet reduction
- 2. Pre-adjusted edgewise appliance to align the arches , improve buccal segment occlusion

The first phase of treatment involved the use of TB to attempt some growth modification. TB were of a standard design. The patient was extremely co-operative and the overjet reduced substantially within a period of 6 month. (Figure 6)

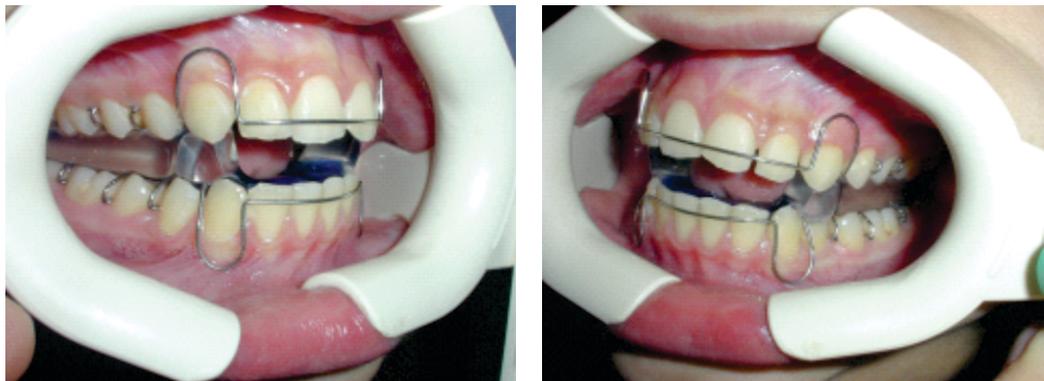


Fig. 6 With Twin block in place

Constructive wax bite impressions were taken with overcorrected molar relationship for class I.

On completion of the treatment , lateral cephalograms indicated correction of the mandibular position (Figure 1 and 3). The molars and incisors, as well as the skeletal inter-jaw relationship were corrected and confirmed by the

superimposition (Figure 1, 2, 3) and lateral cephalograms analysis before and after Twin block therapy (Table 1). Aesthetic improvements were observed with correction of the convex profile, retrusion of the upper lip and the reduction of the mentolabial sulcus (Figure 1,3). The lips become competent.

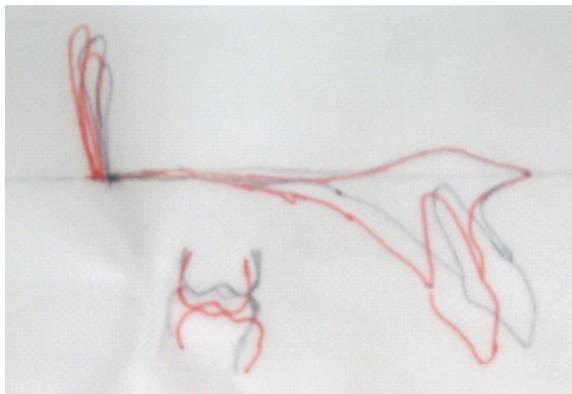


Fig. 2 Superimposition on maxilla - black line - before treatment, red line- after treatment with Twin Block



Fig. 3 Superimposition on maxilla - black line - before treatment, red line- after treatment with Twin Block

The short term treatment effects produced by TB appliance evaluates the dentoalveolar and skeletal cephalometric changes, the results indicated that, the mandibular incisors were tipped labially and the maxillary incisors were retroclined [O'Brien K et al, Toth LR, McNamara JA, Clark WJ, Lund and Sandler, O'Brien K et al, O'Brien K et al]. The patient ceased the oral habit of sucking his thumb.

RESULTS AND DISCUSSIONS

Mandibular base length increased by 3mm, which was measured from Ar-Pog, SNA was the same before and after treatment, SNB increased by 1.50, ANB decreased by 1.50, There was a significant decrease in the pre-treatment and post-treatment overjet, overbite and incisor inclination. AFH si PFH increased.

The patient was instructed to turn the maxillary expansion screw and the mandibular expansion screw one turn per week. The treatment duration lasted for 6 month plus 3 month retention. The pre and post treatment lateral cephalometric radiograph were obtained in centric occlusion under standard conditions and traced manually on matte acetate paper using a 0.5 mm pencil. The angular parameters measured were SNA, SNB, ANB, upper incisor to palatal plane and lower incisor to mandibular plane. The linear parameters included mandibular length, anterior facial hight, posterior facial hight, overjet, overbite.

Class I molar relationship was achieved partly because of the mandibular growth and partly because of the mesial movement of the mandibular first molar and slight distal movement of the maxillary molar. Antero-posterior relationship of the maxilla and mandible improved, as angle ANB decreased from 8.50 to 70. Maxillary forward movement was restrained and the mandibular apical base moved forward in relation to cranial base, which proved that TB produced head gear effect, like all the other functional appliances, but the maxillary restraining effect was to the lesser extent. Similar less restraining effect of the maxillary apical base have been reported by Tulloch et

al, Keeling et al, Trenouth, O'Brien et al, the former two did the study on bionator and the later two studied the effect on TB. Similar results in favour of TB appliance were reported by the Illing et al 18, who compared Bass, bionator and TB appliance with control group. They concluded that the TB and to a lesser extent bionator produced most effective sagital and vertical changes in the cass II malocclusionin mandibular retrognathic faces.

A postfunctional lateral cephalograms and analysis confirmed a reduction in ANB, and the cephalometric analysis demonstrated changes typically seen following TB treatment. The SNB angle increased with retroclination of the upper incisors and the proclination of the lower incisors.

In our orthodontic practice the most frequently used appliance for the therapy of class II malocclusion is Twin Block. In this case the successful treatment outcome resulted in both skeletal and dentoalveolar changes. The forward displacement of the mandible with remodeling of the TMJ and distalization of the upper molars resulted in an Angle Class I dentoalveolar relationship, the correction of incisal overjet and aesthetic improvement of the patient's profile. We want to overcome the shortcomings of the activator Andersen- dimension, long-term therapy (1.5-2 years), a reduced tongue space and speech difficulties. The ideal time for the use of this appliance is between 8-12 years of age. The question is : how to carry out orthodontic treatment in patients with class II diagnosis if they have already completed growth or are in the final phase of growing? Therapy with this appliance could be a good choice instead of camouflage orthodontics or orthognathic surgery.

In this case the successful treatment outcome resulted in both skeletal and dentoalveolar changes. The forward displacement of the mandible with remodeling of the TMJ and distalization of the upper molars resulted in an Angle I class dentoalveolar relationship, the correction of incisal overjet and aesthetic improvement of the patient's profile (Figure 7).

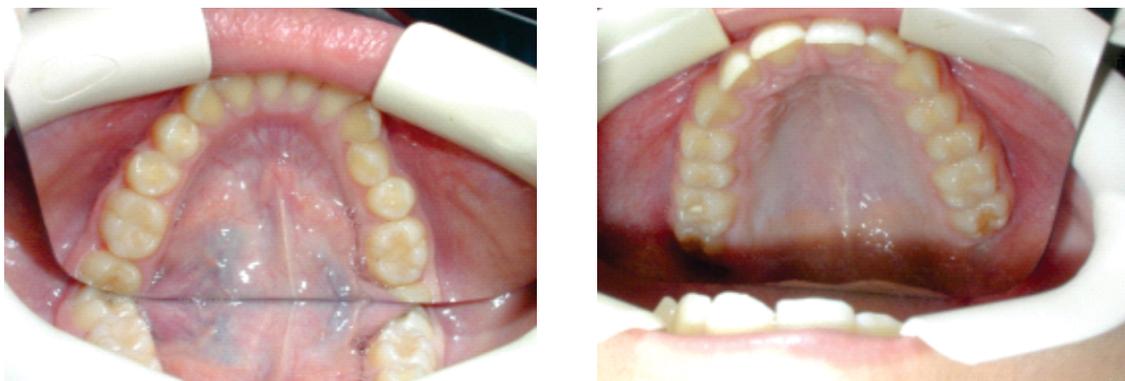


Fig. 7 After treatment with Twin block



Fig. 8 After treatment with Twin block

It can be concluded that TB appliance therapy is effective in the treatment of dental and skeletal irregularities Class II/1 after a short treatment period.

This case presented with a class II/1 incisor relationship on a class II skeletal base. The use of TB efficiently reduced the overjet and changed a class II buccal relationship on class I. The overbite and overjet reduced significantly, and improved interdigitation in the buccal segments. Cephalometric superimpositions reveal that sagittal correction was achieved by an increase in the SNB angle

The patient had no TMJ dysfunctions either before or after treatment.

CONCLUSIONS

The TB appliance due to its acceptability, adaptability,

versatility, efficiency, and ease of incremental mandibular advancement without changing the appliance has become one of the most widely used functional appliance in the correction of Class II malocclusion.

The principal advantage of functional appliances in Class II therapy is that they not only correct the malocclusion, but are also effective in improving the soft-tissue profile and the intermaxillary relationship. Early treatment can eliminate etiologic factors such as sucking habits, restoring normal growth and reducing the severity of skeletal abnormalities. Once the growth period has ended, the treatment options become more limited. Mixed-dentition therapy can. Therefore, help create a more stable and esthetic occlusion than if treatment is delayed until the permanent dentition.

Pretreatment and posttreatment cephalometric readings

Table 1

Variable	Pre-treatment	Post-treatment	Changes
SNA	82°	82°	-
SNB	73.5°	75°	1.5°
ANB	8.5°	7°	1.5°
Maxillary Incisor Angle	115.5°	104°	11.5°
Mandibular Incisor Angle	98°	100.5°	2.5°
AO-BO Witts	+7 mm	+4 mm	3 mm
Ar-Pog	101 mm	104 mm	3 mm
Ar-A	91.5 mm	93 mm	1.5 mm
Ar-B	93 mm	96 mm	3 mm
Overjet	10 mm	3.5 mm	6.5 mm
AFH (anterior facial height)	60 mm	65 mm	5 mm
PFH (posterior facial height)	38 mm	39 mm	1 mm

ACKNOWLEDGMENTS

This work was cofinanced from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/CPP107/DMI 1.5/S/77082, "Doctoral Scholarships for eco-economy and bio-economic complex training to ensure the food and feed safety and security of anthropogenic ecosystems".

REFERENCES

- Bishara SE. Textbook of orthodontics. Philadelphia: WB Saunders Company; 2001. p.324-351
- Azevedo A, Janson G, Henriques J, De Freitas M. Evaluation of asymmetries between subjects with class II subdivision and apparent facial asymmetry and those with normal occlusions. *Am J Orthod Dentofac Orthop* 2006; 129:376-83
- Harvold EP, Vargervik K. Morphogenetic response to activator treatment. *Am J Orthod*. 1971; 60:478-90
- Ahlgren J, Laurin C. Late results of activator treatment : a cephalometric study. *Br J Orthod*. 1976;3: 181-7
- Pancherz H. A cephalometric analysis of skeletal and dental changes contributing to Class II correction in activator treatment. *Am J Orthod*. 1984; 85:125-34
- Wieslander L, Lagerstrom L. The effect of activator treatment on class II malocclusions. *Am J Orthod*. 1979; 1:20-6
- Sidlauskas A. The effects of the Twin block appliance treatment on the skeletal and dentoalveolar changes in Class II division 1 malocclusion. *Medicina (Kaunas)*, 2005; 41(5), 392-400
- Clark W.J "The Twin block technique . A functional orthopedic appliance system" *Am J Orthod Dentofac Orthop*. 93 (1988)1.
- Sittipornchai A, Charoemratrote C, Mandibular growth stimulation produced by modified Twin blocks in skeletal class II retrognathic mandibular patients. Rajamangala University of Technology Isan. 23-24 December 2011, The 23rd National Graduate Research Conference , 276-281.
- K O'Brien, J Wright, F Conboy, S Chadwick, I Connolly, P Cook, et al, "Effectiveness of early orthodontic treatment with the Twin block appliance : a multicentre, randomized, controlled trial. Part 2: Psychosocial effects" *Am J Orthod Dentofac Orthop* 124 (2003) 488
- Toth LR, McNamara JA, "Treatment effects produced by the twin block appliance and the FR2 appliance of Frankel compared with an untreated Class II sample" *Am J Orthod Dentofac Orthop*. 116 (1999) 597
- Lund DI, Sandler PJ, "The effects of Twin Blocks : a prospective controlled study", *Am J Orthod Dentofac Orthop*. 113 (1998) 104
- O'Brien K, Wright J, Conboy F, Sanjie Y, Mandall N, Chadwick S et al., "Effectiveness of treatment for Class II malocclusion with the Herbst or Twin block appliances: a randomized, controlled trial", *Am J Orthod Dentofac Orthop*. 124 (2003)128
- O'Brien K, Wright J, Conboy F, Sanjie Y, Mandall N, Chadwick S et al., "Effectiveness of early orthodontic treatment with the Twin block appliance: a multicentre, randomized, controlled trial. Part 1: Dental and skeletal effects", *Am J Orthod Dentofac Orthop*, 124 (2003) 234
- Tulloch JFC, Philips C, Proffit WR, Benefit of early Class II treatment: Progress report of a two-phased randomized clinical trial. *Am J Orthod Dentofacial Orthop*. 1998; 113:62-72
- Keeling SD, et al., Anteroposterior skeletal and dental changes after early Class II treatment with bionators and headgear. *Am J Orthod Dentofac Orthop*. 1998; 113: 40-50
- Trenouth MJ, Cephalometric evaluation of the Twin Block appliance in the treatment of Class II division 1 malocclusion with matched normative growth data. *Am J Orthod Dentofac Orthop*. 2000; 117: 54-59
- Illing H, Morris DO, Lee RT, A prospective evaluation of bass , bionator and twin block appliances . Part 1: hard tissues, *European Journal of Orthod*, 1998; 20: 501-516