

# Interceptive Ortodontics Using Growth Modification Method with Twin Block Functional Appliance: A Case Report

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**Abstract:** ***Introduction:** Class II Angle malocclusion is a condition which mandibular first molars occlude distally from the normal occlusion. Treatment modalities for class II malocclusion include interceptive orthodontics using growth modification. Interceptive orthodontics is a type of orthodontic treatment performed when signs of malocclusion are present. This method can treat class II malocclusion with retrognathic mandible, but it must be done before the end of growth spurt period. Twin block appliance is one example of appliance that commonly used in interceptive orthodontics. **Case report:** a 14-year-old boy came to the Department of Pediatric Dentistry at RSGM Universitas Padjadjaran with chief complaints of irregular teeth, protrusive, esthetic problem, and difficulty in brushing his teeth. The patient had an accident while playing basketball and hit his protrusive anterior teeth. **Discussion:** Twin block is the most popular functional appliance used for the management of mandibular retrognathia in growing patients. Twin block are designed to position the mandible down and forward to stimulate or accelerate mandibular growth, and its function to increase intermaxillary space in the anteroposterior and vertical dimensions, and eliminate abnormal and restrictive muscle activity that prevents abnormal development of the maxilla and mandible. **Conclusion:** Interceptive orthodontic treatment with growth modification using twin blocks is very effective to maximize the growth of the mandibular.*

**Keywords:** Interceptive orthodontics, growth modification, functional appliance, twin block

## 1. Introduction

Interceptive orthodontics is a type of orthodontic treatment performed when signs of malocclusion already appear which aims to prevent its worsening. In this type of treatment, orthodontic techniques mainly applied during growth spurt period with the aim of improving the jaw and teeth relationship to reduce the severity of malocclusion and improve facial profile. Thus increase patient confidence, eliminate bad habits, facilitate normal tooth eruption and improve growth patterns. According to Ghislanzoni (2011), applied treatment during growth and development period contributed dentoskeletal changes significantly. Growth period varies on gender, in women it begins at the age of 10 to 12 years and men between 12 and 14 years.<sup>1</sup>

Growth modification must be done before the end of growth spurt period. The ideal time of treatment is adjusted to individual skeletal maturation. Anterior-posterior and vertical jaw discrepancies can be corrected during early stage of mixed dentition development, but relapse can occur due to ongoing growth.<sup>2</sup>

Functional appliances are used for interceptive treatment in growth modification procedures by utilizing muscle function, jaw growth, and teeth eruption to correct malocclusion and to overcome jaw discrepancy.<sup>1</sup> Muscle strength is produced by changing the position of the mandible sagittally and vertically, resulting in orthodontic and orthopedic changes.<sup>3</sup> Types of functional appliances used to modify jaw growth varies subjected skeletal abnormality cases.<sup>4</sup> Functional appliances for class II malocclusion can be classified into two types; removable and fixed. Removable functional appliances include activators, twin blocks, Frankel functional regulator, and bionator. While Herbst and Jasper Jumper are examples of fixed functional appliances.<sup>1</sup>

Twin block is a popular functional appliance as it is more acceptable to patients. It was developed by Clark in 1977 as both removable or fixed appliance. This appliance consists of two components, upper and lower plate, which individually attached to the maxillary and mandibular teeth and alveolar bone. Twin block has been used extensively for class II malocclusion in repositioning the mandible forward, inhibiting maxillary growth, increasing the anterior and posterior facial height of maxillary molar, extrusion of mandibular molars and tipping of anterior incisors and supporting structures.<sup>5</sup>

## 2. Case Report

A 14-year-old boy came with his parents to the Department of Pediatric Dentistry at RSGM Universitas Padjadjaran with chief complaints of irregular teeth, protrusive, esthetic problem, and difficulty in brushing his teeth. The patient had an accident while playing basketball and hit his protrusive anterior teeth.

Extraoral, intraoral, radiographic examination and model analysis were done. Based on extraoral examination, the patient had a convex face profile with symmetrical mesofacial type, positive lip seal, and no TMJ abnormalities, body posture illustrating normal upright results with a balanced shoulder position, balanced and symmetrical head posture with suspected forward head posture (Figure 1A). Intraoral examination (Figure 1B) shows moderate oral hygiene, no caries as mouth preparation has been performed on teeth with caries, no abnormalities found on gingiva and mucosa; good oral hygiene; normal frenulum labii and tongue; normal palate, normal tonsils, mandibular median line 2 mm to the left; overbite 5.5 mm, overjet 11.5 mm; no crossbite and diastema; deep curve of spee on both sides; the

number of teeth is normal and teeth 18, 28, 38 and 48 have not erupted; mandibular and Temporo Mandibular Joint (TMJ) closure is normal. Analysis on panoramic and cephalometric x-rays reveal the shape and height of the condyle are considered normal and unbalanced through panoramic photos (Figure 2A). Cephalometric photographs were used to assess the Cervical Vertebrae Maturation Stage (CVMS), with the results of CS 4 maturation stages according to the CVM assessment standard (Figure 2B).

Model analysis shows an overbite of 5.5 mm; overjet 11.5 mm; and shifting the mandibular median to the left by 2 mm; deep curve of spee on both sides; class I right molar relationship and class II left molar relationships and Class II canine relations. Analysis of Arch Length Discrepancy (ALD) shows a deficiency of -4 mm space of maxillary space and -7 mm space of mandibular. Bolton's analysis showed a mismatch between the maxillary and mandibular in anterior and total ratio and showed a right proportion of maxilla and a wrong proportion of mandible. Howes analysis obtained a value of 42.59%, which refers to a questionable category between tooth extraction or jaw expansion. Pont analysis showed that the Pont index 14-24 was 45 mm while the Pont index 16-26 was 56.25 mm, which brings to the conclusion of constricted jaw arch. The results of the analysis of Steiner, Downs, Wits, and Jefferson showed that patients has Class II skeletal malocclusion.

Based on clinical and supporting examinations that have been carried out, the obtained comprehensive diagnosis of this patient is a class II skeletal malocclusion and dentoalveolar malocclusion class II division 1 with anterior and posterior crowding both in maxilla and mandible; anterior protrusion of maxilla; 11.5 mm overjet; 5 mm overbite; median line shift of mandible to the left 2 mm; deep curve of spee in right and left side of mandible; and a convex profile.

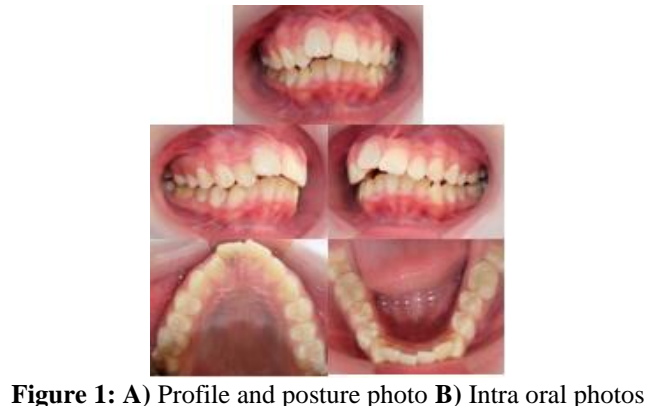


Figure 1: A) Profile and posture photo B) Intra oral photos

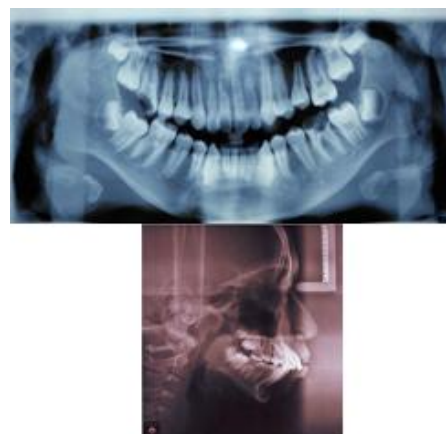


Figure 2: A) Panoramic radiograph B) Cephalometric radiograph

### 3. Treatment

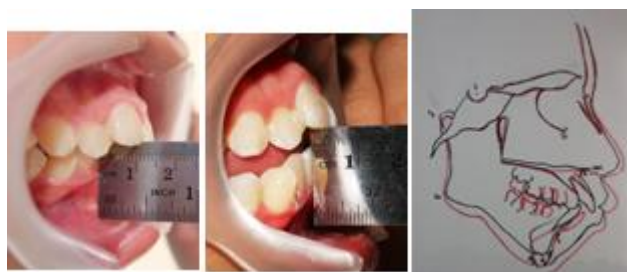
Treatment plan for this patients includes a mouth preparation and use of a two-stage orthodontic appliance. The first stage was orthopedic stage with twin blocks to modify the growth of the jaw and improving the occlusion of the maxilla and mandible to Class 1 relationship. The second stage was orthodontic stage by insertion of fixed orthodontic to maxilla and mandible with the aim of correcting tooth malposition on both arch. Two-way expansion screws were used for both arch included in twin block appliance design. The use of twin blocks in this patient was planned for 5 months period. After using twin blocks and Class 1 molar relationship achieved, fixed orthodontic treatment can be done and the overjet is possibly decreased from 11.5 mm to 3 mm.



Figure 3: Twin block insertion



**Figure 4:** A) Intra oral photos of patients when finished twin block treatment. B) Intra oral photos of patients after 9 months of fixed orthodontic insertion.



**Figure 5:** A) Overjet before and after using twin blocks. B) Superimposed cephalometric tracing before (black) and after (red) treatment.

**Table 1:** Analysis results before and after twin block treatment

STEINER ANALYSIS		
	Before	After
∠ SNA	88 <sup>0</sup>	87 <sup>0</sup>
∠ SNB	79 <sup>0</sup>	81 <sup>0</sup>
∠ ANB	90	60
∠ I - NA	34 <sup>0</sup>	31 <sup>0</sup>
I - NA(mm)	13mm	11mm
∠ I - NB	320	360
I - NB(mm)	10 mm	13mm
∠ I - I	107 <sup>0</sup>	1030
Pg - NB (mm)	1 mm	2 mm
∠ GoGn - SN	330	370
∠ Bid Occ -SN	200	190

WITS ANALYSIS		
	Before	After
AO-BO	4 mm	1 mm
DOWNS ANALYSIS		
SKELETAL		
	Before	After
∠ Facial N-Pog	800	820
∠ convection	100	70
∠ AB plane	100	70
∠ FHP - mandibular plane	310	320
Y / Y axis	680	670
DENTAL		
	Before	After
∠ occlusal plane	190	160
∠ I - I	1070	1030
∠ Imandibular - mandibular plane	90	100
∠ Imandibular - occlusal plane	300	230
∠ -AP Plane	17 mm	19 mm
JEFFERSON ANALYSIS		
	Before	After
Classification	IIB	I

#### 4. Discussion

Class II malocclusion is the most common orthodontic problem found in children. It is characterized by anteroposterior differences in the teeth and often combined with skeletal problems caused by retrognathic mandibular, maxillary protrusion, or a combination of both. The treatment approach in this patient was to change the amount and direction of mandibular growth by performing interceptive orthodontic treatment so that it can reduce the severity of malocclusion and improve facial profile. Many functional appliances are available to help interceptive orthodontic treatment to correct skeletal disharmony.<sup>6</sup> The ability of functional appliances to reduce overjet is by modifying the teeth relationship (angulation and position of the incisors).<sup>5</sup>

Growth modification should be carried out at the optimal time for patient treatment with skeletal Class II malocclusion therapy which can be initiated at the cervical vertebrae maturation CS3 or CS4 to maximize the treatment effect.<sup>5</sup> In this case report treatment was carried out in CS4 stage so that skeletal changes can be seen.

In this case report, twin block appliance as interceptive orthodontic for growth modification was used with specific design consist of Adam clasp in the maxillary first molar and premolar mandible, and expansion screws in the maxilla and mandible to modify lateral growth. Labial bow was placed on the incisors and canines to improve inclination of the anterior teeth, and facilitate the insertion of appliances.

Twin block is the most commonly used functional appliances because it is more acceptable to patients. The basic philosophy of twin block is the inclined occlusal plane which acts as a guiding mechanism that causes the mandible to move down and forward. Twin blocks have the advantage of design flexibility. The design can be adapted for various types of malocclusion in individuals.<sup>6</sup> To treat Class II patients in growth period, functional appliances are often applied in the late stages of mixed teeth or early permanent teeth to reduce overjet by stimulating mandibular growth.<sup>7</sup>



Modification of growth is highly recommended for class II anteroposterior and vertical skeletal growth resulting in dentoalveolar changes to improve molar relations and reduce overjet and overbite.<sup>6</sup>

The method of growth modification in class II malocclusion called functional jaw orthopedics (FJO), is a type of treatment aimed at improving class II malocclusions that focus on the mechanics that affect the mandibular dentition and mandibular growth.<sup>8</sup> Functional appliances are designed to position the mandible down and forward to stimulate or accelerate mandibular growth, and its function to increase intermaxillary space in the anteroposterior and vertical dimensions. Functional appliances eliminate abnormal and restrictive muscle activity that prevents abnormal development of the maxilla and mandible. Mandibular repositioning stimulates proprioceptive responses to masticatory muscles. The aim is to encourage bone growth by maintaining the mandible in an advanced position and corrected for a sufficient period of time to allow for skeletal changes in response to functional stimuli.<sup>9</sup>

Twin blocks are designed to be used 24 hours per day to utilize all the functional strengths of teeth, including the strength of mastication.<sup>10</sup> Fareen et al. said that patient compliance is an important factor when treating patients with functional appliances.<sup>11</sup> In this case report, the patient was highly cooperative so Class I molar occlusion is reached within 5 months. Continued fixed orthodontic treatment was done to maximize leveling and aligning to reach normal occlusion for this patient. Twin block appliance was broken once in the middle of the treatment due to sport accident when the patient played basketball, but the plate can still be relined. The patient admitted he did not use the plate for about 3 days, but there was no severe relapse. The patient's treatment was continued with fixed orthodontic appliance after there was a Class I molar relationship and the overjet was reduced from 11.5 mm to 3 mm. A fixed orthodontic was targeted to align both arches. This stage has several advantages such as removing crowding efficiently, creating symmetrical overjet, and increasing patient confidence.

Skeletal changes are indicated by the comparison of the cephalometric analysis values before and after treatment in Table 1. There have been changes in Steiner, downs, and wits analysis with the addition of SNB angles, reduction of SNA, ANB and I-NA angles, and analysis of wits based on AO-BO value also decreased by 3 mm.

The overjet reduction was achieved due to favorable growth of the mandible to carry mandibular incisors forward and dentoalveolar effects for retroclination of maxillary incisors. The anteroposterior relationship of the maxilla and mandible increases, because the ANB angle decreases from 9° to 6°. The maxillary forward movement is retained, and the apical base of the mandible moves forward in relation to the cranial base, which proves that the twin block produces an effect similar to a headgear, like all other functional tools. ANB decreased by 3°, indicating favorable jaw growth which resulted in a reduction in anteroposterior skeletal discrepancy. This is confirmed by a reduction in the analysis of wits from 4 mm to 1 mm.<sup>6, 7</sup>

At present, the patient is still in the period of fixed orthodontic treatment for the stage of completing his teeth aligning and will receive a retention phase for at least 6 months. Long-term evaluation is required after overbite and overjet positive corrections for better results.

## 5. Conclusion

Interceptive orthodontic treatment with growth modification using twin blocks is very effective to maximize the growth of the mandibular towards the anteroposterior. This will reduce the severity of malocclusion and can prevent jaw disharmony. Twin blocks have many advantages and scored good clinical results. The effect depends on patient compliance and case selection. Of all functional appliances, twin block is the most popular functional appliances used and its use during the growth phase with good patient cooperation can produce more on the skeletal effects and effects of several teeth.

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