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Orthodontic vs Orthopedic Treatment (Twin Block Example)

A Project Submitted to
The College of Dentistry, University of Baghdad, Department of Orthodontics in Partial Fulfillment for the Bachelor of Dental Surgery

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Certification of the Supervisor

I certify that this project entitled **“Orthodontic vs Orthopedic Treatment (Twin Block Example)**" was prepared by the fifth-year student **Zaman Jaafar** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

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DEDICATION

To my family:

Who have been my greatest supporters, they were my inspiration to apply for dental school and it's only because of them I'm able to reach this far.

To myself:

I would like to take a moment and appreciate myself, it's been long difficult years specially this finale stage, for that I'm proud of myself for having the patience to get all of that.

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List of Abbreviation

Acronym / Abbreviation	Meaning
RFA	Removable functional appliance
OHRQOL	Oral health-related quality of life
JJ	Jasper Jumper
PDL	Periodontal ligament
FA	Fixed appliance
TB	Twin Block
TMJ	Tempromandibular joint
OPG	Orthopantomagram

Introduction

Introduction

Orthodontics is the branch of dentistry concerned with facial growth, development of the dentition and occlusion, and the diagnosis, interception, and treatment of occlusal anomalies ***(Barberr & lura 2019)*.**

Orthodontic treatment is the treatment that aligns the teeth to achieve good aesthetic and occlusion function. The teeth can move in the alveolar bone due to orthodontic force, there is cellular and biochemical activity, accompanied by increased remodeling of the periodontal ligaments and alveolar bone, allowing tooth movement ***(Krishan and Davidovitch, 2006)*.**

It also requires repositioning of teeth by functional or mechanical means to establish normal occlusion and pleasing facial contours. The emphasis on the maintenance of oral, physical and mental health of the patient and also his/her esthetics has been recognized earlier than this definition ***(Bhalajhi, 2015; Mitchell et al., 2019; Phulari, 2011)*.**

The main benefits of orthodontics could be summarized in improving dental health, oral health-related quality of life (OHRQOL), aesthetics and function ***(Littlewood and Mitchell, 2019)*.**

Different orthopedic and orthodontic modalities can be utilized for interception and or correction of many orthodontic problems in growing patients and adults as well. Some of these appliances may utilize the intrinsic facial and masticatory muscles forces to modify the growth of jaw bones, named as orthopedic functional appliances such as Twin block. However, other orthopedic appliances are working through extrinsic forces such as headgear and chin cup ***(Clark, 2015)*.**

Aims of the study

To review different orthodontic and orthopedic functional appliance types, with focusing on twin block appliance as an example and show the various clinical applications and modifications of this appliance.

CHAPTER ONE

Review of Literature

Chapter One: Review of Literature

1.1 What is orthodontics?

Orthodontic treatment aims at improving the aesthetic and function of the orofacial region. Most of these changes are brought about by devices that move the teeth or modify the growth of the jaws. These devices are called Orthodontic Appliances. Orthodontic appliances are devices by means of which mild pressure may be applied to a tooth or a group of teeth and their supporting structures so as to bring about necessary changes within the bone, which will allow tooth movement**.** Orthodontic appliances have evolved steadily since the development of the specialty. Orthodontic appliances can be classified on the basis of many criteria; one of the most common is whether the appliance is Active or Passive. But, the simplest classification is probably based on the patient's ability to remove the orthodontic appliance. Based on this premise the appliances can be classified as removable, semi-fixed or fixed ***(Proffit et al., 2019; Singh, 2007)*****.**

1.1.1 Classification of orthodontic appliances

1) Passive appliance: Passive appliances are those that maintain the position of the teeth. These are commonly used for space maintenance after premature loss of deciduous teeth or for the maintenance of tooth position at the completion of active mechanotherapy. For example, space maintainers and retainers ***(Phulari, 2017)*****.**

2) Active appliance: active appliances are those which bring about movement of the teeth. These may either incorporate active forces within the appliance or transmit forces from another source, usually the muscles of mastication or the circumoral musculature. For example, all removable and fixed appliances that bring about active tooth movement ***(Phulari, 2017).***

1.2 Types of orthodontic appliance

Based on patient ability to remove the appliance from the oral cavity, the appliances can be divided into the followings ***(Phulari, 2017)*:**

A. Removable appliances

B. Fixed appliances

C. Semi fixed appliances

1.2.1 Removable appliances

They are those appliances that are fabricated mainly in acrylic and wire. They can be removed from the mouth by the patient. Removable appliances are used by orthodontists to achieve relatively simple tooth movements, often as an adjunct to fixed appliance treatment ***(Mitchell et al., 2019; Wilson and Dunne, 2018)*.**

1.2.1.1 Component of removable orthodontic appliance: (Figure 1)

The removable orthodontic appliances are made up of three components:

1) Force or active components—comprises of springs, screws or elastics.

2) Fixation or retentive components—usually include clasps.

3) Base plate or framework—can be made of cold cure or heat cure acrylic.

4) Anchorage ***(Mitchell et al., 2019; Singh, 2007)*.**

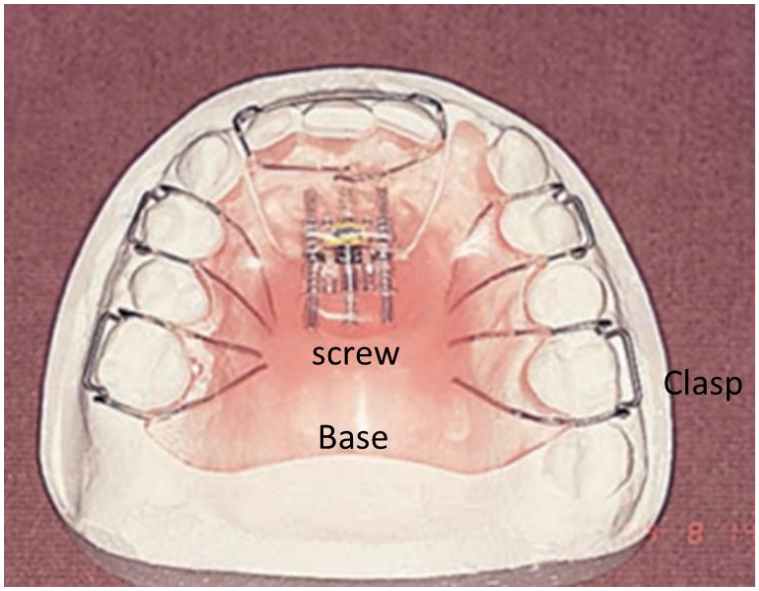


Figure 1: Removable Appliance *(Sandhya, 2008)*

1.2.2 Fixed appliances

These cannot be removed by the patient and consists of ***(Alam, 2011)***:

1) Bands- cemented on teeth (occasionally cast metal caps),

2) Attachments or brackets of different types attached on the bands or on teeth directly with bonding materials

3) Labial or lingual arches – These may themselves be active or passive and may carry auxiliary springs for movement of teeth. **(Figure 2)**.

Figure 2: Fixed Appliance. (A) Buccally attached, (B) Lingually attached *(Alam, 2011)*

1.3 Dentofacial orthopedics

Is directed primarily toward the correction of facial skeletal deviations influencing or associated with malocclusions. Orthopedic appliances are designed to transfer forces to facial skeletal appliances as directly as possible. These appliances effectively influence bone growth and sutural changes which when given in growing age favorably alters the continuing facial growth pattern. Some commonly used appliances include headgear, facemask and chin cup ***(Walia et al., 2021)***.

1.3.1 Clinical application of orthopedic forces *(Alam, 2011)*

A. For case with class II malocclusion:

1) High pull headgear is used to restrain the anterior maxillary vertical component **(Figure 3 A)**.

2) Cases with II malocclusions associated with maxillary prognathisrn can be

treated with cervical pull head gear **(Figure 3 B)**.

3) Class II malocclusion with mandibular retrognathism, associated with vertical growth pattern can be managed with activator & a headgear to control.
4) A combination of occipital pull and cervical pull can also be used to correct the class II malocclusion **(Figure 3 C)**.

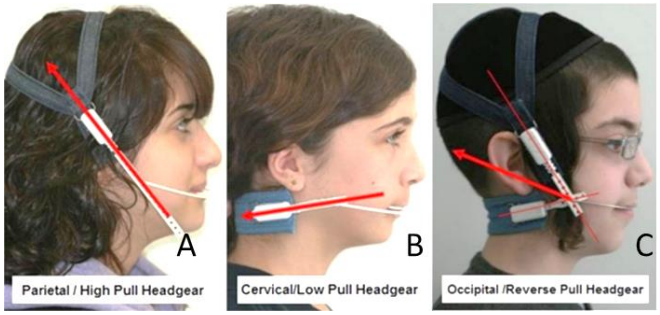


Figure 3: (A) High pull, (B) low pull headgear orthopedic appliance and (C) Combination high and cervical pull *(Alam, 2011)*

B. For class III malocclusions:

1) A chin cap is used restraining the forward growth of mandible.
2) Case of anterior cross bite, chin cap can be used along with removable orthodontic appliance for dental arch.
3) Reverse pull headgear can be given for the cases with the maxillary deficiency. **(Figure 4)** ***(Alam, 2011)***

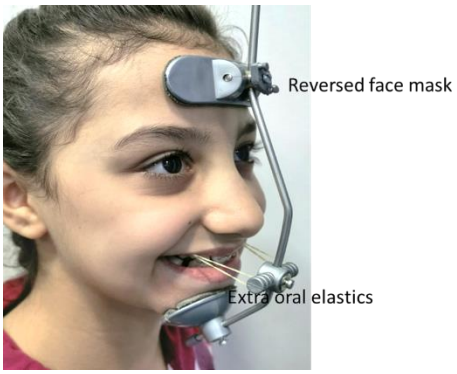


Figure 4: Reverse headgear orthopedic appliance *(Alam, 2011)*

4) Class III malocclusion with narrow maxilla, rapid expansion can be given for correction of posterior cross bite along with the chin cap.
5) Vertical pull headgear along with chin cap is used to prevent vertical growth tendencies and open bite. **(Figure 5)** ***(Alam, 2011)***

Figure 5: Vertical pull headgear along with chin cap (Alam, 2011).

1.4 Skeletal class II malocclusion

Skeletal class II malocclusion is described by an anteroposterior skeletal discrepancy with the mandible positioned excessively backwards in relation to the maxilla. This aberration results in an unfitting relationship between the jaws, which distorts the normal equilibrium of the face because of difficulties with dental occlusion and the temporomandibular joints ***(Greenberg, 2016)***. Extra-oral features such as the presence of a protrusive midface and/or a retrusive chin, hypotonic upper lip, hyperactive mentalis, and palatal interposition of the lower lip to the upper incisors, are clinical indicators of a possible Class II. Diagnostic aids such as cephalometric analysis, cast analysis, history, and photographic analysis are vital in confirming the diagnosis of true skeletal Class II malocclusion ***(Tehranchi Azita et al., 2016)***.

Most moderate cases are due to genetics and can be worsened by environmental factors including deleterious habits such as thumb sucking, tongue thrusting, and oral breathing. However, the latter can be eliminated through preventive or interceptive treatment at the appropriate time ***(Buschang, 2015)***.

It is necessary to correct malocclusions or attempt to alleviate them as they can have a detrimental impact on mastication (nutritional deficiencies), respiration (airway obstructions, sleep apnoea), speech, and even the TMJ. Studies have revealed that this type of individual is more prone to dental trauma, low self-esteem, and poor quality of life due to facial and dental esthetics. Furthermore,

they have a greater predisposition to dental caries, periodontal disease, occlusal trauma, and consequently, loss of tooth substance, reduced jaw function, and masticatory ability ***(Kharbanda, 2020)***.

Their management depends on the age of the patient, severity of the skeletal or dental malocclusion, patient's esthetics, growth potential, and the compliance of the patient with treatment ***(Pachori et al., 2012)***. Authors have noted that the ideal time to alter a skeletal class II is during the optimal maturation stage, at 12 years of age. The growth spurt commonly occurs in girls of 10 to 13 years of age, and in boys of 11 to 14 years of age ***(Lai et al., 2008)***.

1.4.1 Treatment objectives in a skeletal Class II

Treatment objectives are the modification of convex profile to orthognathic profile, the correction of Class II molar and canine relationship into a Class I malocclusion with proper functional normality and esthetic, and finally, the improvement of facial appearance by stimulating mandibular growth and inhibiting vertical maxillary growth ***(Patil et al., 2017)***. Patients tend to manifest lower anterior crowding, an overjet, and overbite, hence their alteration will also be targeted. Early therapy in severe cases, where overjet is greater than 7mm, helps decrease the risk of traumatic damage to the incisors. An increased overbite is also a sign to start treatment early since the bite can deepen with time and make later treatment more complicated. Overall, treatment should consist of restoring the balance in facial harmony and occlusion to improve the aesthetics, self-image, and social well-being of the patient.

1.5 Functional orthopedic appliances

The terms "functional appliance, myofunctional appliance, orthopedic functional appliance" refer to a variety of removable or fixed appliances, designed to alter the arrangement of various muscle groups that influence the function and position of the mandible in order to transmit forces to the dentition and the basal

bone. Typically, these muscular forces are generated by altering the mandibular position sagittally and vertically, which brings about Orthodontic and Orthopedic changes. Functional appliances have been used since the 1930s ***(Phulari, 2017)***.

1.5.1 Classification of functional appliances

Functional appliances are classified in a number of ways; a simple easily understandable classification is described below. Functional appliances can be divided into removable functional appliances or fixed functional appliances. Removable functional appliances can further be classified into removable tooth-borne functional (Bionator, Twin block appliance) and removable tissue-borne functional appliances (like Frankle functional regulators), the fixed functional appliances are tooth borne (Herbst appliances). ***(Akhoon et al., 2021)*.**

1.5.2 Mode of action

These appliances correct or at least reduce the anteroposterior skeletal discrepancy in a process known as growth modification or dentofacial orthopaedics by: ***(Phulari, 2017)***:

1) Forcing the mandible to posture forward to reduce overjet with a reciprocal restraining force on maxilla.
2) Stretching the soft tissues (muscles of mastication).
3) The force of stretched muscles is transmitted through the appliance to the teeth resulting in retroclination of upper anterior teeth and proclination of lower anterior teeth.
4) Increasing mandibular length by 2-4 mm due to forced translation of mandibular condyle forward which may encourage back compensatory growth of mandible.
5) Increasing lower anterior facial height (LAFH) by molar eruption and downward mandibular growth, this is remarkably in patients with deep bite.
6) Restraining the maxillary growth especially in combination with incorporation of headgear extraoral appliance.

7) The resultant correction in overjet is attributed to 70% tooth movement and 30% modification in maxilla and mandible growth (skeletal changes).

1.5.3 Advantages

Advantages of functional appliances are as follows ***(Phulari, 2017)***:

1) Functional appliances are effective in vertical control of increased overbite.
2) Can be used in the mixed dentition
3) In the presence of average to reduced lower anterior facial height.

1.5.4 Disadvantages

Disadvantages of functional appliances are listed below ***(Phulari, 2017)***:

1) The success of functional appliances therapy solely depends on patient cooperation.
2) Precise tooth movement is not possible with functional appliances.
3) Treatment duration of functional appliances is often prolonged.

1.5.5 Fixed Functional Appliance

Fixed functional appliances are generally selected over removable ones due to the “noncompliance” of the young patient. Due to their attachment to the teeth, all compliance-free Class II devices produce orthodontic movement and some are designed to obtain orthopedic results as well. If the patient is in his late stages of puberty or reports after the growth spurt, it will be wiser to choose a fixed functional appliance instead of a removable one ***(Koretsi et al., 2015)***. It is indicated in growing or young adult patients with a mild to moderate skeletal Class II discrepancy and suitable facial pattern.

It is suitable in cases of Class II with mandibular retrusion or maxillary protrusion. Its use will be restricted in patients with periodontal problems, tipped mandibular incisors, gummy smiles, open bite, and with thin gingiva in the anterior region of the mandible ***(Moro et al., 2018)***.

1.5.5.1 Advantages

Advantages of fixed functional appliances are as follows ***(Katole, 2020)*:**

1. Success of removable functional appliance therapy depends on the patient's compliance. In contrast, fixed functional appliances being fixed to the dentition is independent of uncooperative patients for its success.
2. Many removable functional appliances ex. activator are meant for night time wear. It may fail to achieve the best possible results, but the action is continuous for 24 hours of the day for fixed functional appliances.
3. Treatment duration required in removable functional appliance is around 2-3 years, whereas fixed functional appliances achieve the result in around 6-8 months.
4. It can be used successfully in post adolescent patients in whom little growth is remaining to work with.

1.5.5.2 Disadvantages

Disadvantages of functional appliances are as follows ***(de Almeida et al., 2008)*:**

1. Though treatment can be achieved within 6 - 8 months, retention of the result has to be maintained using removable functional appliance.
2. Risk of development of dual bite with attendant risk of TMJ dysfunction if treated inadequately.
3. Masticatory efficiency is reduced even after patient gets used to the appliance.
4. Most of the appliances are expensive or may require good laboratory support.

1.5.5.3 Herbst Appliance

It is a fixed appliance composed of section attached (banded or bonded) to the upper buccal molar teeth and a section attached to the lower premolar teeth. These sections are joined by a rigid arm that postures the mandible forwards, it removes

some (but not all) compliance factors and better tolerated than the bulkier functional appliances **(Figure 6)** ***(Foncatti et al., 2017)***.

Figure 6: Herbst Appliance ***(Foncatti et al., 2017)***

1.5.5.4 The Jasper Jumper (JJ)

Unlike the Herbst is considered as a fixed flexible functional device and was developed in 1987 by James Jasper. It has a similar mechanism to the Herbst but to minimize the problems produced by the rigidity of the latter it is composed of two flexible force modules that exert light and continuous force through mandibular advancement ***(Küçükkeleş et al., 2007)***.

More comfort is provided to the patient as he has autonomy over mandibular movements. Other advantages are its lower cost and shorter treatment period thanks to its association with fixed appliances ***(Henriques et al., 2018)***. Its flexible structure permits lateral jaw movements which is a disadvantage **(Figure 7).**

Figure 7: Jasper Jumper device ***(Henriques et al., 2018)***

1.5.6 Removable Functional Appliance (RFA)

Removable functional appliances are known to be more efficient in stimulating the mandible forward than fixed ones due to their greater contact area with lower teeth and lingual mucosa. They are indicated in Class II by mandibular retrognathism, to prevent and correct oral habits such as thumb and lip sucking, and mouth breathing. They are contraindicated in skeletal Class II by maxillary prognathism, when there is crowding and, or labial tipping of lower incisors. ***(Chowdhary, 2013)***.

All orthopedic devices require a minimum wear of 12 to 14 hours per day, mostly nocturnal, for about 10 to 12 months.

Table 1: Advantages and Disadvantages of removable functional appliances *(Foucher, 2021)*

ADVANTAGES	DISADVANTAGES
Offer immediate improvement in lip function	Designed for growing individuals only
Low risk of caries	Require good patient cooperation
Can be used in the mixed dentition	Limitation in the control of individual teeth
Predominantly used at night	Initial limited fixed appliance may be needed
Minimal chair time for adjustment	Often are bulky and interfere with speech
	Discouraged in mouth breathers

1.5.6.1 Monobloc Activator

The modern activators are descendants of the Monobloc designed by Robin in 1902. Andreson and Haupl developed their own mobile and loose-fitting version of the appliance in 1908 and gave it the name of "Activator" due to its capability to activate the muscle force ***(Kaur et al., 2017)***. **(Figure 8)**.

Figure 8: An example of the Andresen Activator *(Bilgiç et al., 2015)*

1.5.6.2 Bionator

The bionator was originally designed to modify tongue behavior, using a heavy wire loop in the palate. The lack of acrylic in the palate makes it easy to wear. A buccal extension of the labial bow holds the cheeks out of contact with the buccal segment teeth, allowing some arch expansion. **(Figure 9)**

Figure 9: Bionator appliance (Foucher, 2021)

1.5.6.3 Frankel Appliance

The Frankel Appliance **(Figure 10)** is a functional device established by Rolf Frankel in the 1950s. It is pressure of the cheeks can be held away by the acrylic shields to allow for passive expansion which theoretically stretching the periosteum to produce additional bony apposition laterally. This appliance is rarely used in contemporary orthodontic treatment because of several disadvantages such as difficulty in wearing and fabrication, and is troublesome to repair. ***(Kharbanda, 2020; Perillo et al., 2011)***.

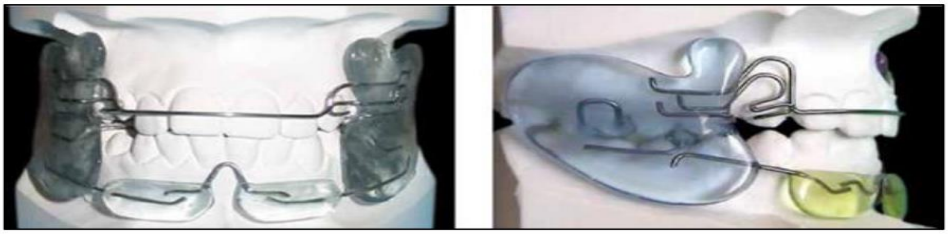


Figure 10: FR-2 Appliance *(Kharbanda., 2020)*

1.6 Twin Block Appliance

William Clark in Kirkaldy, Scotland developed an appliance system causing the mandible to posture forward in Class II. This was a two part appliance, which enabled the patient to wear it during eating. It is now known as the Clark Twin Block and is the most widely used appliance in the United Kingdom. The original appliance had shallow blocks with the upper and lower appliances set at 45 degrees to one another, a labial bow and a mechanism for the attachment of elastics from the lower appliances to a facebow to maintain a Class II effect during sleep. Clark subsequently modified the design to increase the depth of the blocks, which are now set at approximately 70 degrees, and no longer advocates the use of a labial bow ***(Raj and Kannan, 2020)*.**

Advantage : it is well tolerated by patients , it can be worn full time ,It is also possible to modify the appliance to allow expansion of the upper arch by incorporating expansion screw or may be adding artificial tooth replacement, is also easy to reactivate that's mean it is possible to modify the existing appliance rather than having to construct a new appliance. ***(Chowdhary., 2016)***.

Disadvantages: One of the side effects of this appliance is the residual posterior lateral open bites at the end of the functional phase, so the posterior teeth are prevented from erupting by the occlusal coverage of the bite blocks.

1.6.1 Indication of twin block applaince

The ideal indication for twin block appliance includes Class II div1 malocclusion with well aligned upper and lower arches, having overjet of 10-12 mm with a deep bite and horizontal growth pattern. Patient should preferably be in pubertal growth spurt ***(Raj and Kannan 2020)***.

1.6.2 Contraindications for twin block therapy

Factors that are unfavorable for correction by Twin Blocks include cases with verticalgrowth and crowding that may require extractions. Examination of the profile is the most important clinical guideline. If the profile does not improve when the mandible is advanced, this is a clear contraindication for functional mandibular advancement, and an alternative approach should be considered. ***(Clark, 2015).***

1.6.3 Components of Twin Block

1. A midline screw to expand upper arch to accommodate the mandibular changes that are caused during the advancement.
2. Occlusal bite blocks are placed at a 70° inclined plane for mandibular advancement as it gives maximum advancement without causing much discomfort to the patients.
3. Delta clasps on upper premolars and molars to improve the fixation of twin block, these clasps are better suited to take up the forces without breaking that is required during the twin block treatment.
4. Ball end clasps mesial to lower canine or in upper premolar or deciduous molar region to improve the retention of the appliance.
5. A labial bow is incorporated in the upper arch if there are severely proclined incisors that require uprighting. **(Figure 11)** ***(William, 2015).***

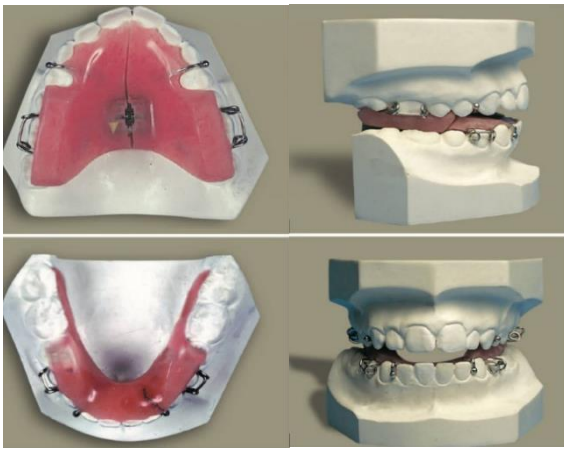
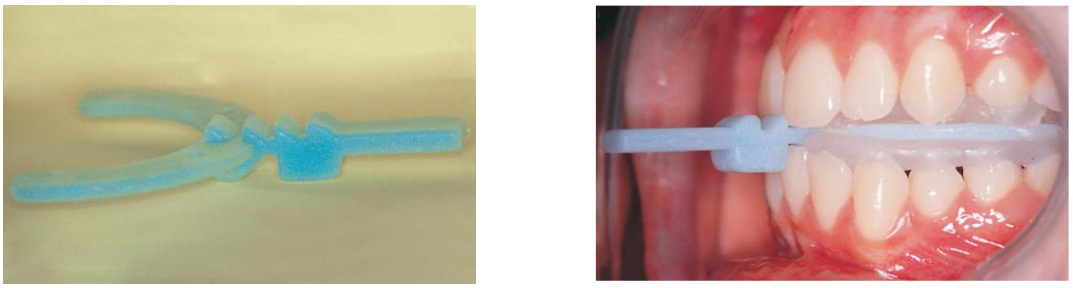


Figure 11: Twin Block Appliance (William, 2015).

1.6.4 Bite registration

The correct bite registration in deep bite cases is typically edge to edge with a 2 mm interincisal space, which is suitable for bite registration in most class II division 1 malocclusions with increased overbite. This is equivalent to an inter-premolar space of 5 to 6 mm. The resulting blocks are 5 to 6 mm thick in the first premolar region and 1 to 2 mm thick in the molar region. The important factor is to open the bite beyond the freeway space, so that the patient cannot retrude the mandible when in rest position, but to avoid making the blocks too thick so that the patient can eat and speak comfortably with the appliances in the mouth. **(Figure 12)** ***(Clark, 2015)***.



(A) **(B)**

Figure 12: (A) Projet Bite Gauge (B) The blue bite gauge registers 2 mm vertical clearance between the incisal edges of the upper and lower incisors. ***(Clark, 2015)*.**

The projet bite gauge is designed to record a protrusive bite for construction of TB and other functional appliances. The bite gauge has three grooves on one side and a single groove on the opposing side. The simplest method to register a protrusive bite is to select the appropriate groove for the upper incisors depending on the ease with which the patient can posture the mandible forwards. The lower incisors then bite down into the single groove to register the bite with 2 mm interincisal space. An edge to edge construction bite with 2 mm interincisal space is registered in the middle groove to correct an overjet of up to 10 mm for patients with good horizontal growth potential. The overjet is measured with the mandible retruded and in the position of maximum protrusion. The activation must not

exceed 70% of the total protrusive path in order to remain within physiological limits of movement of the mandible ***(Clark, 2015)***.

1.6.5 Support and retention Phase

Twin Blocks may be left out when the overjet and overbite are corrected and the molars have erupted fully into a class I occlusion. A fixed appliance may be used to level the lower arch and complete treatment if required, or alternatively an appliance with an anterior inclined plane may be fitted for support and retention **(Figure 13)**. A simple retainer with an anterior inclined plane may be used to support the corrected incisor and molar relationship while the premolars and canines erupt into occlusion. In mixed dentition treatment, Twin Blocks may continue to be worn at night to retain the corrected occlusion. ***(Lee et al, 2016)***.

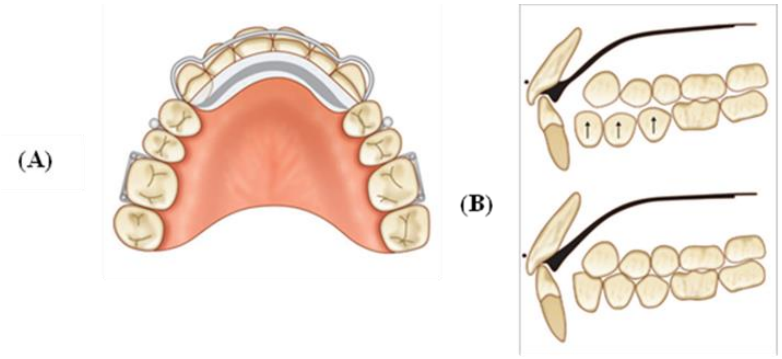


Figure 13: (A) and (B) Support phase - anterior inclined plane. ***(clark, 2015)***

1.6.6 Modification of twin block functional appliance

The various modification allow independent control of upper and lower arches, (**figures 14, 15, 16)**

Figure 14: Fixed Blocks integrated with fixed appliances ***(Clark, 2015)*****.**

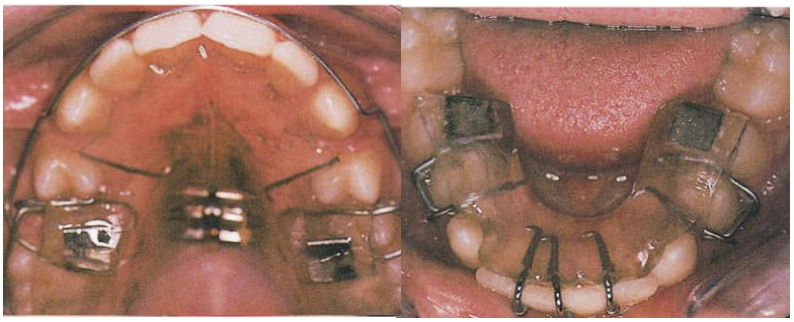


Figure 15: Occlusal view of magnetic Twin Block *(Clark, 2015)*.

Figure 16: Buccal view of reverse Twin Block for class III correction *(Clark, 2015)*.

1.7 A Clinical case of Twin Block:

The following is a case report of a 13-year old male patient treated by a Twin Block functional appliance in combination with fixed appliance to manage his class II malocclusion.

1.7.1 Diagnosis and etiology

The patient had a mild class II skeletal pattern with average Frankfort-mandibular planes angle and lower anterior face height. There was no facial asymmetry, and the lips were incompetent with the lower lip trapped at rest behind the upper central incisors. In the intra-oral assessment, the oral hygiene was fair but needed improvement prior to orthodontic treatment **(Figure 17)**. ***(O'Brien et al., 2003)***.

All teeth from the permanent second molars have erupted in both the upper and lower arches. The maxillary arch was spaced with a midline diastema. Furthermore, there was mild lower labial crowding (4 mm). The incisor relationship was class II division 1; the overjet was (8 mm) whereas the overbite was increased and complete to the palate.

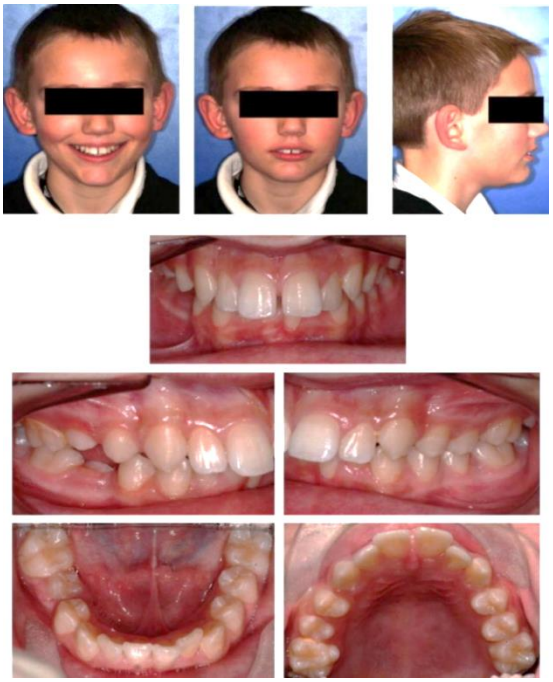


Figure 17: Pre-treatment clinical photographs ***(O'Brien et al., 2003)***

Pre-treatment dental panoramic tomograph (right). Note that the deciduous right lower second molar has exfoliated since that radiograph was taken and the lower right second premolar had erupted before the start of treatment **(Figure 18)**.

Figure 18 Pre-treatment OPG ***(O'Brien et al., 2003)***

1.7.1.1 Objectives

The main objectives for phase I of the treatment were as follows:

1) Reduce the overbite and overjet.

2) Achieve class I molar relationship and gain anchorage.

In phase II of the treatment, the aims were:

1. Relieved lower arch crowding.

2. Level and align the arches.

3. Close upper labial segment space.

4. Achieve class I canine and incisor relationship.
5. Long term retention with upper and lower vacuum formed retainers *(O'Brien et al., 2003)*.

1.7.2 Treatment rationale: *(O'Brien et al., 2003)*.

Phase I of treatment involved the use of functional appliance (Clark Twin Block appliance), the design of the upper component of the twin block involved an acrylic baseplate which covers the palate and occlusal surfaces of the first molars and second premolars. There was an inclined plane at the end of the mesial end of the acrylic block. A labial bow was used for anterior retention of the appliance. A midline screw was also included. The lower component consisted of a lingual acrylic baseplate covering the edge of the lower incisors. Both blocks had Adams clasps on the first molars and first premolars to provide posterior retention. This phase was followed with upper and lower fixed appliances (0.022″ slot brackets) to close spaces, detailing and finishing of the case **(Figure 19)**.

Figure 19: Twin Block appliance design *(O'Brien et al., 2003)*.

1.7.2.1 Treatment progress: *(O'Brien et al., 2003)*

The aims of the functional treatment phase were achieved successfully due to good patient compliance. This phase of treatment was completed over 9 months. The upper incisors were retroclined by 9° while the lower incisors proclined by 4°. This resulted in reduction of the overjet **(Figure 20)**. The patient was instructed to activate the midline screw twice a week and was reviewed every four weeks.

Figure 20: Post-functional photographs ***(O'Brien et al., 2003)***

The second phase of treatment with the fixed appliances aimed to close the remaining spaces and finish the case which lasted 12 months **(Figure 21)**. The upper posterior teeth were tied together with stainless steel ligatures during canine traction to reinforce anchorage.

Figure 21: Mid-treatment photographs. ***(O'Brien et al., 2003)***

1.7.2.2 Treatment results

The treatment objectives were achieved. The profile of the patient has improved after the treatment **(Figure 22)** the lower arch crowding was relieved by proclination of the lower incisors. The spaces of the upper arch were closed with the use of closing coil spring during the fixed appliance phase of treatment.

The incisor, canine and molar relationships were class I at the end of treatment. The overbite and overjet were reduced to the average values ***(Chowdhary., 2016)***.

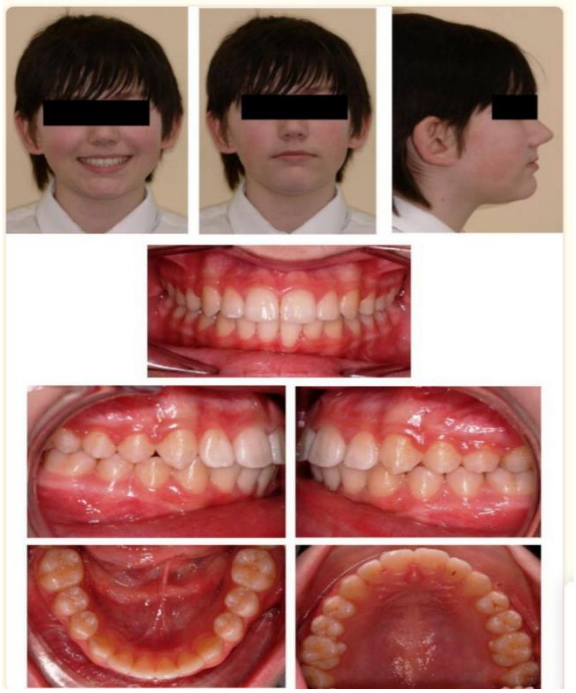


Figure 22: Post-treatment clinical photographs *(Chowdhary., 2016)*.

CHAPTER TWO

Discussion

Chapter Two: Discussion (Clark W, 2014)

Clark's Twin block is a functional appliance which effectively modifies the occlusal inclined plane to induce favorably directed occlusal forces by causing a functional mandibular displacement. It is allow masticatory function and has the advantage of fulltime wear.

Several studies have documented the ability of the twin block to induce significant skeletal as well as dentoalveolar changes, which in combination, bring about correction of the Class II relationship, also we can use the fixed appliances were placed once all premolars had erupted to complete alignment the teeth with normal occlusion.

Hence, identifying and understanding the etiology and cause of class II malocclusion and identifying differential diagnosis is helpful for its correction and put a good and suitable treatment plan for patients. Twin block functional appliance has several well - established advantages including the fact that it is well tolerated by the patients , well accepted, repaired easily, and it can be used in mixed and permanent dentition.

There are potential disadvantages such as proclination of lower incisors and development of posterior open bite. The selection of appliance is dependent on several factors which can be categorized in patient factors such as age and compliance.

The overall treatment time for successful results was 24 months, i.e., 12 months of functional appliance wear and 12 months of fixed appliance treatment.

The size of this appliance is easy to use by the patient so that speech interference could be minimized and treatment purposes can be achieved due to the patient's cooperation.

CHAPTER THREE

Conclusion and Suggestions

Chapter Three: Conclusion and Suggestions

3.1 Conclusions

1) The orthodontic treatment has advantages and disadvantages, but its advantages is more than the disadvantages; as sometimes the orthodontic treatment become a life changing treatment that make a huge difference to the face and function, and most of the disadvantages is temporary and become less with time.
2) The orthodontic appliances are complementary to the orthopedic treatment that we use during the period of growth , it's force is applied to the bone and is high in relation to the force used in orthodontic appliance , which is less and directed to the teeth (PDL).
3) Whether functional appliances or orthopaedic forces can stimulate or diminish the condylar growth is still an academic issue. However, it can be stated that mandibular displacement through orthopaedic appliances initiates remodelling activity within the TMJ and alters the condylar growth direction, particularly in an actively growing individual.

3.2 Suggestions:

1. Survey study for functional appliance-needs in school age children.
2. Survey study for frequency of functional appliance use in under/post graduate clinics in the College of Dentistry/ University of Baghdad.

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