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Growth Modification in Orthodontics

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Partial Fulfillment for the Bachelor of Dental Surgery

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Certification of the Supervisor

I certify that this project entitled **"Growth modification in orthodontics "** was prepared by the fifth-year student **Sara Salih Hassan** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Lecturer Dr. jinan E. Saloom

May, 2023

Dedication

To my beloved and greatest parants

Mother and father

To my sister and brother

For all support and kindness and lovely and care along this long journey

To my friends especially Rawan for all helpful and support

To my Supervisor dr. jinan for all support and all time that give for me

Acknowledgment

In the name of Allah, the Most Gracious and the Most Merciful. All praises to Allah for the strengths and His blessing in completing this project. Special appreciation goes to my supervisor **Lecturer Dr. jinan E. Saloom**, for her supervision and constant support. Her invaluable help of constructive comments and suggestions throughout the works have contributed to the success of this research. Sincere thanks to all my friends for their kindness and moral support during my study especially my perfect friend Rawan. Thanks for the friendship and memories. Last but not least, my deepest gratitude goes to my beloved parents and also to my brother and sister for their endless love, prayers and encouragements and support to get such success. To those who indirectly contributed in this research, your kindness means a lot to me. Thank you very much.

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List of abbreviations	
FR: Frankel Appliance	
Uk: United Kingdom	
FA: functional appliances	

Introduction

Growth modification (early treatment) is part of the first phase of two stage orthodontic treatment of children with malocclusion. Growth modification is only possible when bones are still growing. It is most effective during children's growth spurts. Orthodontists use growth modification devices appliances to change the position, shape, length, or width of the jawbone **(Alhammadi *et al*., 2018).**

The experts suggested advice for treatment of malocclusion during the growth time this appliance termed myofunctional appliance which refered to a variety of appliances designed to transmit forces to the dentition and to the basal bone in order to alter the function and position of the mandible **(Zhao *et al*., 2018).**

Myofunctional appliance utilizes forces of orofacial musculature to modify or change the direction of growth in still growing patients. It is generally only available to children up to the age of about 14 as they are most effective during active stages of growth and be either removable (Bionator, Twin-Block, Frankel and Activators) or fixed (Herbst, Forsus ,and Jasper Jumper) they tend to be used during pubertal growth in childhood **(Zhao *et al*., 2018).**

These are used to harness the growth of the jaws and improve the way the upper and lower teeth meet. They work by positioning the lower jaw in a forward posture which stretches the muscles of the face and helps to correct protruding teeth **(kumar *et al*., 2007).**

Aim of study

- In this project we recognize the growth modification in class II and III.
- Identify different types of myofunctional appliances that we can be used in child patients for early correction of skeletal and components of class II and III malocclusion.
- Discuss the indications & contraindications, advantages and disadvantages of each myofunctional appliance.

Chapter One

1.1 Growth modification

As part of the interceptive orthodontic process, growth modification treatment is utilized in the first phase of two-stage orthodontic treatment for children with misaligned teeth, jaw bones and bites. It is most effective during a child's growth spurts, when bones are still in the growing process, involve the use of myofunctional appliances to modify the growth of jaw bone **(Alhammadi *et al*., 2018).**

1.1.1 Growth modification of Class II

Class II malocclusion is the condition in which the mandibular first molars occlude distal to the normal relationship with the maxillary first molar. The etiology of class II malocclusion varied between skeletal, soft tissues, dental factors and habits. Skeletal class II could reflect maxilla-mandible skeletal disharmony with underdevelopment of mandibular growth and / or maxillary excess, leading to a convex soft tissue profile **(Rita and Sadat, 2014)**.

Patients with a Class II growth pattern have some combination of deficient forward mandibular growth and excessive maxillary growth that is more likely to be downward than forward. The treatment modalities of any skeletal problem include growth modification, dental camouflage and orthognathic surgery, the optimal time for treatment of patients with class II malocclusion by growth modification should be initiated at the beginning of cervical vertebrae maturation stage CS3 to maximize the treatment effect. Age of treatment is approximately 8-14 years. For growing patients, stimulation of forward mandibular growth or restraint of maxillary growth in both directions would be ideal treatment. Alternatively, if the facial appearance is acceptable except for protruding maxillary incisors, mild or moderate class II skeletal relationships can be accepted and the teeth moved with or without extraction to fit together, this is a

solution more often chosen in slow or non-growing adolescent or postadolescent patients **(Proffit, 2019).**

1.2 Myofunctional appliances

Myofunctional appliances use the facial muscles and masticatory muscles to produce changes in the relation of teeth or arches. This means that these appliances aim to utilize, eliminate or guide the forces arising from muscle function, tooth eruption and growth in order to alter skeletal and dental relationships **(Singh, 2007).**

1.2.1 Basic classification of myofunctional appliance (Proffit, 2019):

1. Removable FA'S: They are FA'S that can be removed and inserted into the mouth by a patient at his will.e.g. activator, bionator, and Frankel.
2. Fixed FA'S: They are FA'S that are fitted on teeth by the operator and cannot be removed by the patient at will.
3. Both removable and fixed: These appliances are available as both fixed or removable types ,e.g. twin block, Herbest etc.
4. Semi-fixed functional or Removable-fixed appliances: They are FA'S with some components fitted on to while some components are detachable. e.g. Denholtz, Bass appliances ,etc .

1.3 Intra oral appliances

1.3.1 Removable intra-oral appliance

1.3.1.1 Activator

This removable appliance was developed by Andresen in 1908 and subsequently popularized as the Andresen–Häupl appliance.

The original Andresen activator was rigid, tooth-borne and loosely fitting. It was a bulky appliance, with acrylic blocks covering the palate and both arches as shown in figure1. It was constructed to hold the mandible in a protrusive position, or to cause the mandible to occlude in a protrusive position **(Toffol *et al.*, 2008).**

The most combined is the Activator appliance with the headgear due to the fact that combined therapy offers grander cumulative skeletal benefits than a single appliance alone. Together, the Activator and Headgear retrude upper incisors, protrude lower incisors, distalize upper molars, and cause extrusion of the lower molars. This allows the improvement in sagittal relationship, overjet and overbite **(Mizrahi *et al.*, 2009).**

Figure1: The activator (Sing, 2007)

- **Indications (Phulari, 2017)**

1. Class I malocclusion with deep.
2. Class II Div 1.
3. Class II Div 2 after alignment of anteriors.
4. For crossbite correction.

- **Contraindications (SpaLj *et al*., 2017)**

1. Crowded arches/Proclined lower anteriors/ Retroclined upper anteriors.
2. Extreme Vertical mandible growers.
3. Increased lower anterior facial height.
4. Patients with nasal stenosis/nasal insufficiency/mouth breathers.
5. Non Growing patients.

Mechanism of action

Andersen stated that the appliance has a stimulating effect on joint development in Class II malocclusion when the mandible is brought forward to Class I relationship, there is a stimulation of protractor (lateral pterygoid) and elevators (masseter, medial pterygoid and temporalis) with stretching of the retractors resulting in the change of the functional pattern of the muscles. This brings about change in the bone structures as they adopt a new functional environment **(Premkumar, 2009).**

1.3.1.2 Twin-block appliance

The twin-block appliance is the most popular functional appliance in the UK. The reason for its popularity is that it is well tolerated by patients as it is constructed in two parts. The upper and lower parts fit together using posterior bite blocks with interlocking bite-planes, which posture the mandible forwards. as shown in figure 2. The blocks need to be at least 5 mm high, which prevents the patient from biting one block on top of the other. Instead the patient is encouraged to posture the mandible forwards, so that the lower block occludes in front of the upper block **(Gill, 2005 and Dolce *et al*., 2007).**

Figure 2: Twin-block appliance is retained on the teeth with conventional clasp **(Proffit, 2019**)

- **Advantages (O'Brien, 2009):**

1. The functional mechanism is very similar to that of the natural dentition.
2. The occlusal inclined planes give greater freedom of movement in lateral and anterior excursion and cause less interference with normal function.
3. Appearance is noticeably improved.
4. Less bulk, therefore, better patient compliance.
5. The appliance can be cemented in mouth, without disrupting the normal oral functions, to improve patient compliance.

- **Indications** (**Singh, 2007)**

1. Angle's Class II Division 1 malocclusion with good arch form.
2. A lower arch that is uncrowded or decrowded and aligned.
3. An upper arch that is aligned or can be easily aligned.
4. An overjet of 10-12 mm and a deep overbite.

1.3.1.3 Bionator

The bionator was developed in Germany by Wilhelm Balter in the early 1950s to increase patient's comfort and facilitate daytime wear to increase the functional use of the appliance. Balter accomplished this by drastically reducing acrylic bulk of the appliance as shown in fig3. The upper and lower components of the bionator were connected by a wire, facilitating incremental activation **(phulari, 2017).**

Figure 3 : The Bionator standard appliance (Singh, 2007).

Indications (Graber, 2009 and Ishaq *et al.*, 2016):

1. Useful in class II malocclusion with mandibular retrognathism, some open bite and class III cases.
2. The Bionator is useful in the treatment of Class II division I malocclusions in the mixed dentition, particularly those associated with habits and abnormal tongue function.
3. The Bionator has an important role as a retention appliance.

- **Contraindications (Franchi *et al*, 2000 and Singh, 2007):**

1. Class II relationship caused by maxillary prognathism.
2. Vertical growth pattern.
3. Labially tipped lower incisors.
4. Malocclusions with crowding.
5. Open-bite problems with skeletal etiology.

- **Advantages and disadvantages (Singh, 2007):**

1. Appliance is less bulky.
2. Can be worn full time, except during meals.
3. Appliance exerts a constant influence on the tongue and perioral.

The main disadvantage lies in the difficulty of correctly managing.

1.3.1.4 Frankel appliance

Frankel appliance or Frankel regulator is a functional orthodontic appliance which was developed by Rolf Frankel in 1950, it focused on the modulation of muscular activity to produce changes in jaw and teeth as shown in fig4 **(Thai, 2015).**

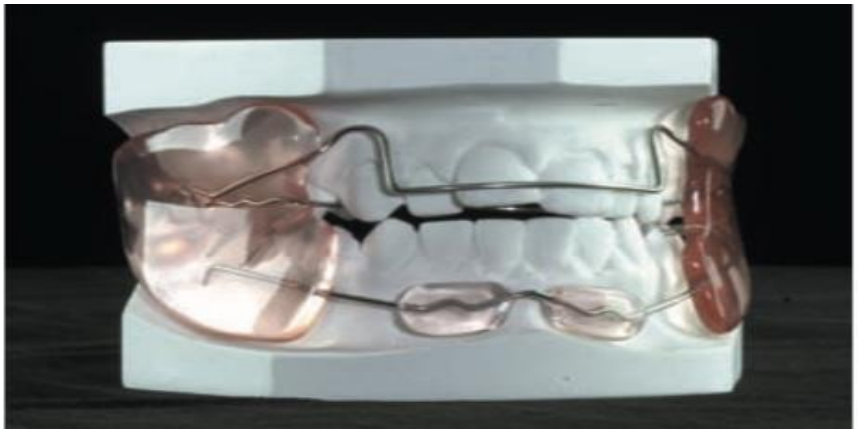

Figure 4: Frankel Appliance (Mitchell, 2013)

It embodies the principle of both the Anderson appliance and the oral screen.it made to a postured occlusion to utilize the forces of the masticatory muscles and it carries screens to relieve the forces of the circumoral musculature **(Woodside *et al*., 1987).**

The function of the regulator is designed to be an exercise device, its conceptual method of action is based on medical orthopedic principle that consider exercise and muscle training are important factors in the normal development of osseous tissue **(Bishara and Ziaga, 2001).**

1.3.1.4.a -Types of Frankel appliance (Woodside *et al*., 1987)

1. FRI-used for Class I and Class II, Division.
2. FR II used for Class II Division 2 and Division 1.
3. FR III used for Class II.

1. FRI Appliance: This appliance had Type A, B and C. The difference between A and B was the lower lingual loops in one and lower lingual shield in another. This was mainly used for Class 1 and Class 2 Division 1 malocclusion.it has Buccal Shield and Lip Pads and lingual shield as shown in (Fig. 5) **(Nanda, 2014)**.

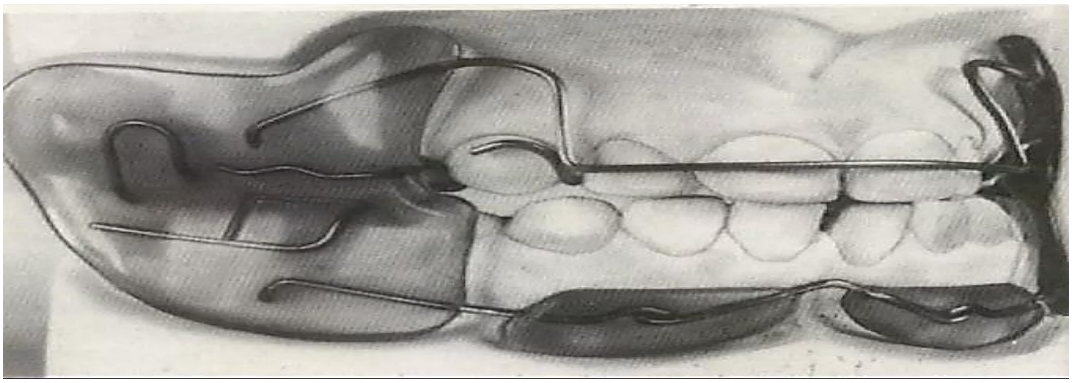

Figure 5: Frankel Appliance type I FR II

2. FRII Appliance

The FR-II has been used primarily for class II division 2 malocclusion, it has used active plates to align the maxillary anterior teeth before placing the FR-II as shown in figure 6. In any event, routine alignment of maxillary anterior teeth in Class II, Division 2, malocclusion is suggested prior to FR-II placement. Such pre functional appliance (fixed mechanotherapy) for the maxillary anterior segment is needed in one third to one half of all class II patients (Albert, 1983).

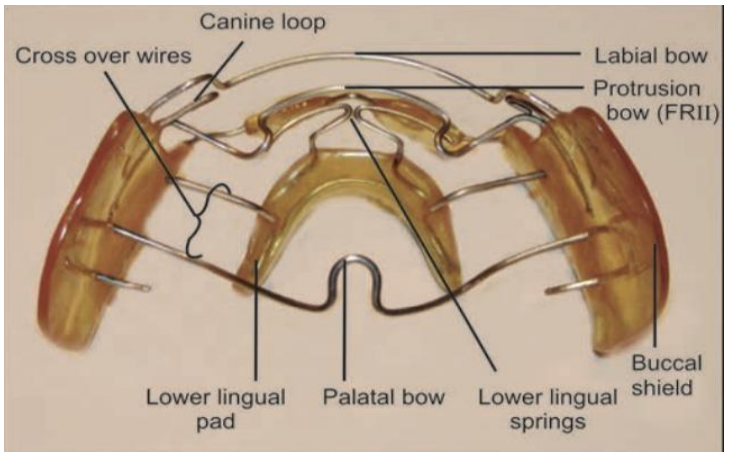

Figure 6:FR II Parts of appliance **(Singh, 2007)**

- **Mode of action (Singh, 2007):**

1. Increase in transverse sagittal direction by use of buccal shields and lip pads.

2. Increase in vertical direction by allowing the lower molar to erupt freely because appliance is fixed to the upper arch.

3. Muscle adaptation, the form and extension of the buccal shields and lip pads along with the prescribed exercises corrects the abnormal perioral muscle activity.

1.3.2 Fixed functional appliances:

1.3.2.1 Herbst Appliance

is generally fixed to the molars (back teeth) on top. From there, a small tube and rod, somewhat like a tiny shock absorber, extends down to a fixed point on the bottom teeth as shown in figure 7 .This mechanism puts a constant slight pressure on the lower jaw, causing it to develop in a more forward position. Wearing a Herbst appliance often produces a noticeable effect in a relatively short time; typically, the appliance is worn for about 12 months **(Yildirim *et al*., 2014).**

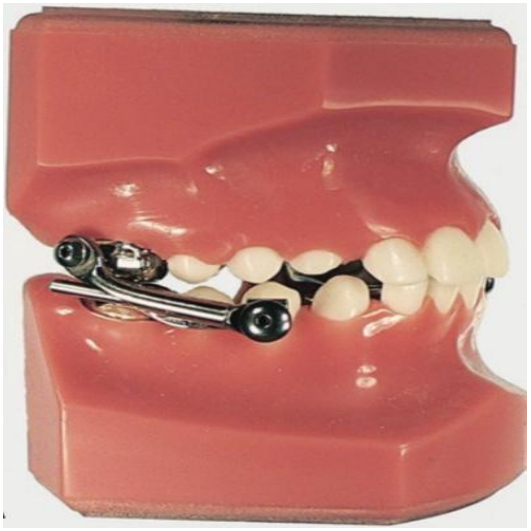

Figure 7: **Herbst appliance (Proffit, 2019).**

a-Indications (Mitchell, 2013)

- Dental class II malocclusion.
- Deep bite with retroclined mandibular incisors.
- Skeletal class II mandibular deficiency.

b-Contraindications (Miethke et al., 2003)

- Dental and skeletal open bites.
- Cases prone to root resorption.
- in autistic children and in patients with severe bruxism.

C-Advantages and disadvantages (Singh, 2007; Mitchell, 2013)

The advantage of Herbst appliance includes abundant documentation availability and variety of modifications to suit the need of individual clinician. The major disadvantages of Herbst appliance are as follows:

- High cost.
- Herbst appliance associated with more chances of breakage.
- Less patient acceptance.

1.3.2.2 Jasper Jumper

An American orthodontist James Jasper replaced the rigid telescopic mechanism used in Herbst appliance with a flexible plastic cover open coil spring that can be attached directly to auxiliary wires with a complete partial or fixed appliance in place as shown in figure 8. The Jasper jumper is essentially a heavy coil spring encased in plastic that uses pivoting attachments at both ends to permit a greater range of opening, an auxiliary is frequently used **(Singh, 2007; Proffit, 2019).**

Figure 8: JASPER JUMPER in mouth (Singh, 2007).

a. Indication (Nielsen, 2020)

Used in correction of class II malocclusion.

b. Contraindications (Nielsen, 2020)

- Dental and skeletal open bites.
- Minimum buccal vestibular space.
- Vertical growth pattern with increased lower facial heigh.

c. Advantages (Henriques *et al*., 2009)

1- low cost.

2-shorter treatment period than is associate with fixed appliances .

3-Its flexible structure permits lateral jaw movements.

d. Disadvantages (Stucki and Ingervall, 1998)

1-It is more prone for breakage.

2-Lack of force when the mouth is held open slightly, such as in a sleeping mouth breather.

1.4 Extra oral appliances

1.4.1 Headgear

Headgears are the most widely used extraoral orthopedic appliances. They are mainly used in the management of skeletal class II malocclusion by growth modification. They are also used for the distalization of maxillary molars, as well as for reinforcing intraoral anchorage **(Proffit, 2019).**

1.4.1.1-Mode of action

A headgear can be used to treat a variety of skeletal class II problems. When used for growth modification it is designed to deliver heavy extraoral orthopedic forces to the sutures of maxilla. Such heavier forces compress the maxillary sutures and thus modify the pattern of bone apposition at these sites. This, in turn-changes the magnitude and direction of growth of the maxilla.
while the mandible continues to grow forward an adequate amount to “catch up” with the maxilla, thus correcting the anteroposterior jaw relationship, also used for distalization of maxillary molars and to reinforce intraoral anchorage **(Perinetti et al., 2015; phulari, 2017).**

1.4.1.2-Types of headgear (Tulloch et al., 2004; phulari, 2017)

- Cervical pull headgear.
- Occipital pull headgear.
- High pull headgear.
- Combination pull headgear.

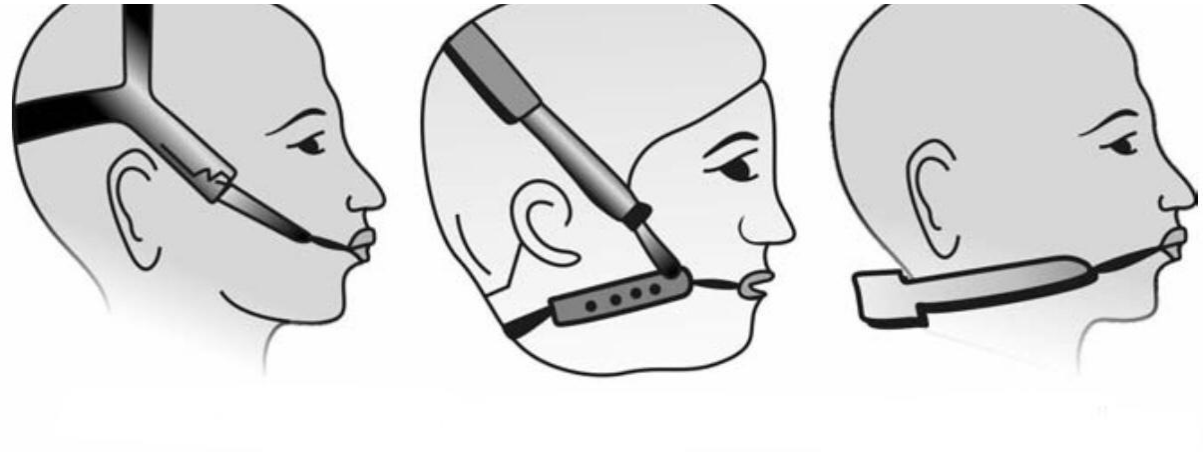

Figure 9: Different type of headgear : high pull, medium pull and low pull (kumar *et al.*, 2007)

a. Cervical headgear

Is the most commonly used headgear appliance, used mainly for the correction of Class II malocclusion by restraining the forward and downward

growth of the maxilla as shown in figure 10. Cervical traction is believed to have an interaction with the growth of the mandible as well as extrusion of maxillary molars (Patil et al., 2017).

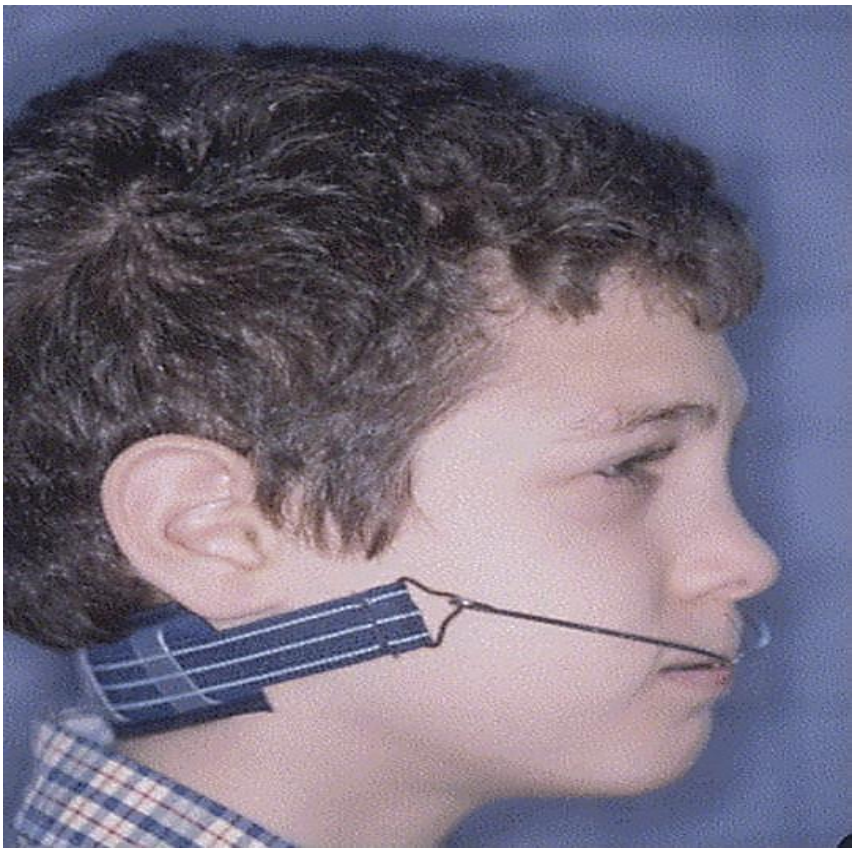

Figure 10 : Cervical headgears (kumar *et al*., 2007)

- **Cervical headgears are contraindicated (Ghosh, 2018)**

1. Patient with open bite.
2. vertical skeletal discrepancies.

b. Occipital pull headgear

Occipital headgear derives anchorage from occipital region of the head, it is usually constructed with the outer bow cut short at a position adjacent to the first molar. This results in a line of force that acts vertically and posteriorly through the center of resistance as shown in fig11. This high angle of the force vector created results in a distal and intrusive force on the maxillary molars **(Phulari, 2017).**

Figure 11: Occipital Pull Headgear (Singh, 2007)

1. High vertical-pull headgear

High-pull headgear derives anchorage from the parietal region as shown in figure 12. It produces intrusion and distalization of maxillary molars. It is used when vertical maxillary excess is also to be addressed (kumar et al., 2007).

Figure 12: High Vertical-Pull Headgear (Singh, 2007)

2. Combination pull headgear

This is a hybrid of high pull and low pull, theoretically producing a pure distal movement without any extrusion or intrusion of the molars. The forces are transmitted to the teeth through a combination of a head cap and a neck strap, as shown in fig 13 .also provides patient comfort due to the increased force distribution **(Levrini and Favero, 2003).**

Figure 13: Combination Pull Headgear (kumar *et al.*, 2007)

1.5 Growth modification of class III

1.5.1 Class III Malocclusion

Class III malocclusion is described by prominent lower incisors that results from discriminately jaws position or/and teeth, and has genetic or environmental etiology **(Dehesa-Santos *et al.*, 2021).**

The characteristic features of Class III malocclusion are present at an early age, usually between 3 and 5 years of age. If left untreated, the Class III malocclusion or severe anterior crossbite may worsen, with the majority of these patients ultimately requiring orthognathic surgery as adults.

The treatment in all developing Class III cases should be undertaken as soon as the abnormality is diagnosed to prevent it from becoming permanent and

resulting in a full-blown Class III malocclusion. It provides more pleasing facial aesthetics (the lip posture and facial appearance concave soft tissue profile) thus improving the psychosocial development of a child. Various treatment options available for the management of developing Class III malocclusion are as follow (Azamian and Shirban, 2016):

(1) functional appliances such as reverse twin block, Frankel appliance, and the removable mandibular retractor.

(2) orthopedic appliances such as chin cap and face mask

1.5.2 Skeletal factors of class III

Class III malocclusion might be due to mandibular prognathism, maxillary retrognathism, protrusive mandibular dentition or retrusive maxillary dentition, or a combination of these components.

The most common cause of Class III malocclusions is excessive growth of the mandible **(Rédua, 2020).**

Dental features of Class III maxillary incisors protrusion and mandibular incisors retrusion with edge-to-edge bite as shown in figure 14 or anterior crossbite and the mesiobuccal cusp tip of the maxillary first permanent molar is posterior to the buccal groove of the mandibular first permanent molar **(Soni *et al*., 2017).**

Figure 14: Dentoalveolar compensation (Mitchell, 2013).

1.5.3 Myofunctional appliances used in treatment of class III

1.5.3.1 Frankel III appliances

The Frankel III appliance can be very effective if the case is diagnosed early. The biggest problem is patient cooperation. The Frankel III appliance stretches the soft tissue envelope around the maxilla in an attempt to stimulate the forward growth of the maxilla. as shown in figure 15. At the same time, it does not allow the mandible to advance forward. The vertical opening of the appliance is used to enhance the downward and forward eruption of the maxillary posterior teeth (singh, 2007).

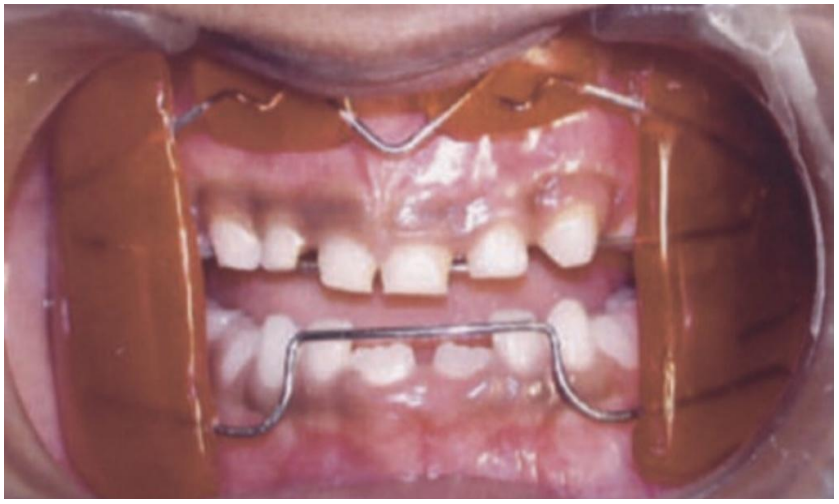

Figure 15: FRANKEL III (Singh, 2007)

1.5.3.2 Chin cup

Chin cup is an extraoral orthopedic orthodontic appliance used to treat skeletal class III malocclusions caused by mandibular prognathism. It covers the chin and is connected to a headgear. Chin cup appliance is aimed at restraining the forward growth of the mandible **(Phulari, 2017)**.

Chin cup assembly consists of **(Shahid *et al.*, 2017)**:

- Chin cup—covers chin.
- Head cap—covers the head.
- Elastic strap—connects the chin cup with the head cap.

Figure 16: Chin cup assembly (Singh, 2007).

1.5.3.3 Types of chin cup:

a- Occipital pull chin cup

Occipital pull chin cup is called so because in this type of chin cup the anchorage is derived from the occipital region of the head. Occipital pull chin cup is one of the most common, it is used in class III malocclusion or mild-to-moderate mandibular prognathism and Moderately proclined mandibular incisors **(Johnston, 2005).**

b- Vertical pull chin cup

Anchorage is derived from the parietal region of the head in this type of chin cup as shown in figure 17.It is used in patients with open bite (phulari, 2017).

Figure 17: Vertical pull chin cup (Singh, 2007).

- Effects of chin cup appliance (Proffit, 2019).

1. Redirection of mandibular growth in a downward or backward direction.
2. Remodeling of the mandible and a decrease in mandibular plane angle or gonial angle.
3. Lingual tipping of lower incisors.
4. Improvement in skeletal and soft tissue profile.

- Indications (Singh, 2007)

Chin cup appliances are indicated in:

1. Patients with a mild skeletal prognathism of the mandible.
2. In the case of decreased facial height.
3. Patients who have well aligned or protrusive, but not retroclined mandibular incisors.

1.5.3.3 Face mask (PROTRACTION FACEMASK)

Face masks are also called “reverse pull headgear” or “protraction headgear.” As shown in figure 18 Face mask has been used in the treatment of

patients with class III malocclusion and a maxillary deficiency. It exerts a mesial force on the maxilla with an equal and opposite force on the chin and forehead, thereby causing a forward movement of maxilla (phulari;2017). It can even be used for the selective rearrangement of the palatal shelves in cleft patients (kumar, 2007).

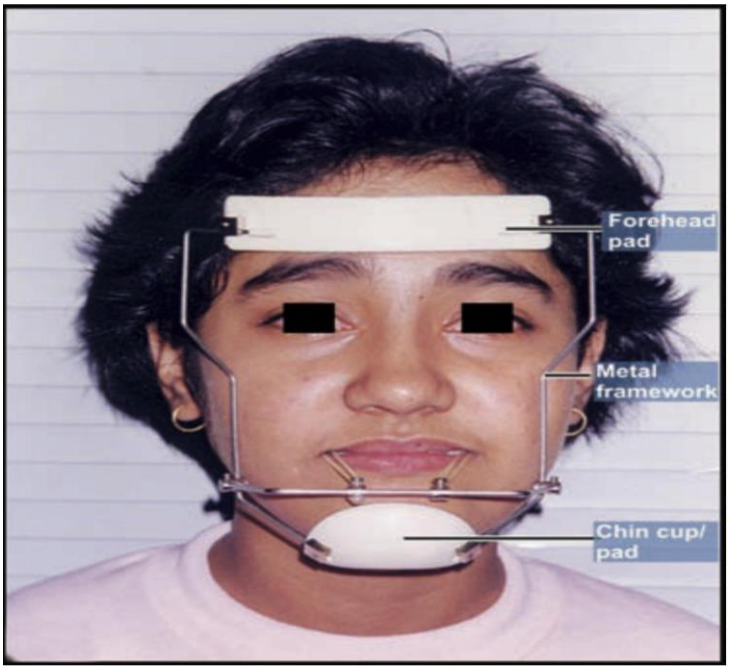

Figure 18: Face mask (Singh, 2007).

1.5.3.3.a Mode of action

Face mask produces forward displacement of the maxillary complex by effecting significant changes in the circum maxillary sutures and in the maxillary tuberosity (Phulari, 2017).

1.5.3.3.b Principles of face mask therapy (Proffit, 2019)

The amount of forward maxillary movement is influenced by a number of factors such as:

a. Age of the patient: Some studies suggested that face mask may be most effective in the primary or early mixed dentition.

b. Design of anchorage systems: The design of anchorage systems for maxillary protraction varies from palatal arches to rapid maxillary expansion appliances.

c. Force level: Successful maxillary protraction has been reported using a force of 300–500 gm/side in the primary and mixed dentitions.

d. Direction of force: Hata et al. suggested that an effective forward displacement of the maxilla can be obtained clinically from a force applied 5 mm above the palatal plane.

e. Treatment duration: Treatment time varies from 3 to 16 months.

f. Treatment timing: The optimal time to intervene in a patient with early class III malocclusions is at the time of the initial eruption of upper central incisors.

1.5.3.3.c Types of face masks

a- Delaire type of face mask: This type of face mask was developed by Delaire in the 1960s and is squarish with rigid metal framework. Metal framework of Delaire face mask consists of two vertical metal wires running parallely in the front of the ears on the either sides of the face incorporating forehead cap and chin cup. A horizontal metal wire in front of the mouth provides a means for attaching elastics (Phulari, 2017).

b- Tübinger type of face mask: Tübinger type of face mask is a modification of Delaire face mask. It consists of a chin cup from which originates two vertical rods that run in the midline, lateral to the nose on either side.

Two vertical rods end superiorly by incorporating the forehead cap from which elastic encircles the head Tübinger type of face mask can be adjusted at forehead cap and horizontal bar to suit individual patients (Phulari, 2017).

c- Petit type of face mask: Even this type of face mask is also a modification of Delaire face mask. It consists of a chin cup and forehead cap with a single vertical rod running in the midline from chin to the forehead cap. It can be

adjusted at the forehead cap, chin cup and horizontal bar to suit individual patients (Rédua, 2020).

1.5.3.3 RME with anterior face mask

A rapid maxillary expansion (RME) by splitting of the mid-palatal suture causes a downward and forward movement of the maxilla. If at this time, when the sutures are split and the teeth are disoccluded , a face mask is used to pull the maxilla further forward,a synergistic action is seen as shown in figure 19 **(Proffit, 2019).**

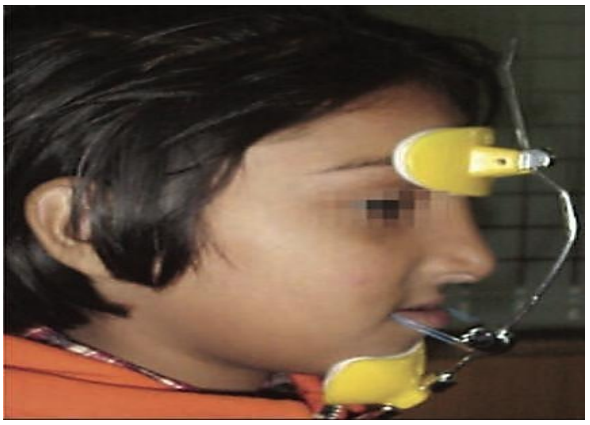

Figure 19: Patient treated with an RMA and anterior face mask (Singh, 2007).

Chapter Two:
Discussion

Class II malocclusion is considered the most frequent problem in orthodontic practice, it may involve cranialofacial discrepancy. Growing patients can be treated with functional appliances, adults with moderate class II malocclusion can be treated by fixed appliance while patients with server class II malocclusion are often treated with fixed appliances and orthognathic surgery (Phulari, 2017).

Class III malocclusion is a less frequently observed clinical problem than Class II or Class I malocclusion, occurring in less than 5% of population might be due to mandibular prognathism, maxillary retrognathism and also can be treatment in growing patients with functional appliances. Early treatment is commonly indicated to obtain a more normal jaw relationship. A facemask is thought to be an effective treatment approach for skeletal Class III in growing patients, severe cases can be treated with orthognathic surgery **(Loster *et al*., 2015**).

Myofunctional appliance is defined as an appliance that alters growth to generate a more acceptable relationship of the jaws, this is done by the stretching of muscles which generates forces that have effect on the mandible**.** Myofunctional appliances have been used for over 100 years in orthodontics to correct Class II and III malocclusion. During this time numerous different systems have been developed often accompanied by claims of modification and enhancement of growth. Extraoral appliances are used in orthodontics to apply forces to the jaws, dentition or both, Although the use of retraction headgear for the management of Class II malocclusion has declined over the last 20 years, headgear still has a useful role in orthodontics **(Rédua, 2020).**

The selection of appliances depends on the clinical assessment of conditions including the age, growth, cause of the malocclusion and severity of skeletal problems. The success of treatment is dependent on patient cooperative and timing the treatment during periods of growth **(Zhao *et al*., 2018).**

In noncooperative patients, the use of fixed appliances will be favorable.

Chapter Three:
Conclusions

1- Myofunctional appliance harnesses natural forces which it transmits to the teeth and alveolar bone in a predetermined direction, and can be used to modify the growth pattern in class II and III growing patients,

2- It has different type of myofunctional appliances that we can be used in child patients for early correction of skeletal and dental components of class II and III malocclusion They are generally removable and fixed.

3- Myofunctional appliances are a variety of intraoral and extraoral appliances

4- Choosing a specific appliance over another dependent on origin of malocclusion and the proper evaluation of each case by orthodontist.

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