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CLASS II Division 1 MALOCCLUSION

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Done by

Mohammed Zaki Hassan

5th Grade

Supervisor

Dr. Sarah Mohammed Jasim

B.D.S, M.S.C

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

۞ وَعِندَهُۥ مَفَاتِحُ ٱلْغَيْبِ لَا يَعْلَمُهَآ إِلَّا هُوَ ۚ وَيَعْلَمُ مَا فِى ٱلْبَرِّ وَٱلْبَحْرِ ۚ وَمَا تَسْقُطُ مِن وَرَقَةٍ إِلَّا يَعْلَمُهَا وَلَا حَبَّةٍ فِى ظُلُمَٰتِ ٱلْأَرْضِ وَلَا رَطْبٍ وَلَا يَابِسٍ إِلَّا فِى كِتَٰبٍ مُّبِينٍ ﴿٥٩﴾

صَدَقَ اللهُ العَظِيمُ

الانعام 59

Dedication

To my beloved.....

Mother & Father

Brother & Sisters

and My Boss of co

Special Thank To Mr Nibal Al Gaban

Acknowledgment

First of all, I thank “Allah” almighty for granting me the will and strength to accomplish this project and pray that his blessings upon me may continue throughout my life.

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Introduction

Occlusion is the way in which the maxillary and mandibular teeth articulate, in reality dental occlusion is a much more complex relationship because it involve the study of the teeth, their morphology and angulations, the muscles of mastication, the skeletal structures, the temporomandibular joint and the functional jaw movements, also it involve the relationship of teeth in centric occlusion, centric relation, And during function, because all of this requires neuromuscular coordination, occlusion also involves an understanding of the neuromuscular system **(Wheeler, 1984; Bishara, 2001).**

Malocclusion is an irregularity in the occlusion beyond the accepted range of normal **(Jones and Oliver, 2000).**

The etiology of malocclusion is a fascinating subject about which there is still much to elucidate and understand at a basic level, malocclusion can occur as a result of genetically determined factors which are inherited, **(Cassidy *et al.*, 1998),** or commonly a combination of both inherited and environmental factors acting together **(Mitchell and Carter, 1996 and 2000; Gardiner *et al.*, 1998)**.

Class II malocclusions are of interest to the practicing orthodontists since they constitute about 25-33% of the cases they treat. In individuals with normal occlusion and skeletal relationship, the amount of maxillary and mandibular growth is synchronized and the result is a well-balanced and esthetically pleasing profile. In individuals with Class II malocclusions, there is an anteroposterior discrepancy between the maxillary and mandibular dentitions, which may or may not be accompanied with a skeletal discrepancy **(Bishara, 2006; Al-Mulla, 2009)**.

1. Ideal Occlusion

It is a hypothetical concept based on the anatomy of the teeth; it is rarely, if ever, found in nature; however, it provides a standard by which all other occlusions may be judged **(Jones and Oliver, 2000).**

1.2. Normal Occlusion

Normal occlusion is an occlusion which satisfies the requirements of function and esthetics but in which there are minor irregularities of individual teeth

(Houston, 1975).

1.3. Keys to normal occlusion

Andrews (1972) described an ideal occlusion rather than a normal occlusion; the ideal occlusion described by Angle and Andrews serves as a paragon of occlusal excellence that gives clinicians a treatment good to which they can aspire **(Bishara, 2001):**

1. Molar relationship: The mesiobuccal cusp of the upper first molar occludes with the groove between the mesiobuccal and middle buccal cusp of the lower first molars and the distobuccal cusp of the upper first molar contacts the mesiobuccal cusp of the lower second molar.

2. Crown angulations: (Mesiodistal tip) All teeth crowns are angulated mesially.

3. Crown Inclination: Inclination refers to the labiolingual or buccolingual inclination of the crown of the teeth.

4. Rotation: Rotations are not present.

5. Spaces: Spaces are not present.

6. Occlusal plane: is either flat or slightly curved.

1.4. Angle's classification

(Gardiner *et al.*, 1998; Mitchell and Carter, 2000) stated that Angle's classification was based upon the premise that the first permanent molars erupted into a constant position within the facial skeleton, which could be used to assess the anteroposterior relationship of the arches. **Angle** describes three groups:

- Class I or neutrocclusion: The mesiobuccal cusp of the upper first molar occludes with the mesiobuccal groove of the lower first molar; discrepancies of up to half a cusp width either way were also included in this category.

- Class II or distocclusion: The mesiobuccal cusp of the lower first molar occludes distal to the class I position, this is also known as a post normal relationship and subdivided into:

a- Class II division 1: Where the maxillary incisors are proclined b- Class II division 2: Where the maxillary incisors are retroclined

- Class III or Mesiocclusion: The Mesiobuccal cusp of the lower first molar occludes mesial to the class I position.

1.5. Incisor classification

The British Standards Institute Classification of Incisor Relationship is as the following **(BS4492, 1983):**

- Class I: The lower incisor edges occlude with or lie immediately below the cingulum plateau (middle part of the palatal surface) of the upper central incisors.

- Class II: The lower incisor edges lie posterior to the cingulum plateau of the upper incisors; there are two divisions to Class II malocclusion:

o Division 1: The upper central incisors are proclined or of average inclination with an increased overjet. o Division 2: The upper central incisors are retroclined

(less than 105° to the maxillary plane); the overjet is usually of an average size but may be increased.

• Class III: The lower incisor edges lie anterior to the cingulum plateau of the upper incisors; the overjet may be either reduced or reversed.

Williams and Stephens (1992) introduced a modification to this classification to increase its reliability by adding the Class II intermediate group, when there is an increased overjet with upright incisors.

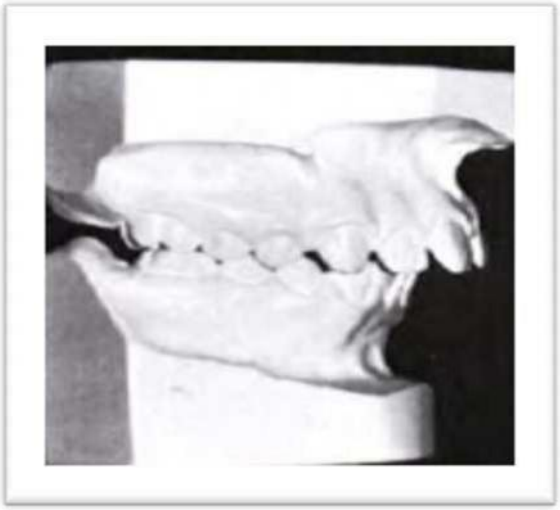
2. Class II malocclusion

Class II malocclusions are of interest to the practicing orthodontists since they constitute about 25-33% of the cases they treat. In individuals with normal occlusion and skeletal relationship, the amount of maxillary and mandibular growth is synchronized and the result is a well-balanced and esthetically pleasing profile. In individuals with Class II malocclusions, there is an anteroposterior discrepancy between the maxillary and mandibular dentitions, which may or may not be accompanied with a skeletal discrepancy **(Bishara, 2006; Al-Mulla, 2009)**.

2.1. Classification of Class II Malocclusions

A. Dental Class II Malocclusions: Depending on Angle's classification system for malocclusions which describes anteroposterior relationships of the permanent first molars and categorized the Class II malocclusions as having a distal relationship of the mandibular teeth relative to the maxillary teeth of more than one-half the width of the cusp. Angle divided the Class II malocclusions based on the inclination of the maxillary central incisors into **(Angle, 1907; Graber 1969; Sassouni, 1969 and 1970)**.

• Class II Division 1 malocclusions: are described as having labially inclined maxillary incisors, an increased overjet with or without a relatively narrow maxillary arch and overbite range from a deep to an open bite (Figure 1).



(Figure 1) Class II Division 1 Malocclusion with proclined maxillary central incisors (Proffit, 2007).

The Class II Division 2 malocclusions: are described as having excessive lingual inclination of the maxillary central incisors overlapped on the labial by the maxillary lateral incisors (Fig 2). In some cases, both the central and the lateral incisors are lingually inclined and the canines overlap the lateral incisors labially. The Class II Division 2 malocclusion is often accompanied by a deep overbite and minimal overjet. In cases with extreme overbite, the incisal edges of the lower incisors may contact the soft tissues of the palate. In a few Class II Division 2 cases, the mandibular labial gingival tissues may be also traumatized by the lingually inclined maxillary incisors, particularly in the absence of an overjet. With Class II Division 1 or 2 malocclusions, the molar relationship may be unilateral or bilateral. Unilateral cases are classified as a "subdivision" of the affected side **(Bishara, 2006)**.

(Figure 2) Class II Division 2 Malocclusion with retroclined maxillary central incisor teeth

B. Skeletal Class II Malocclusions:

This term indicates that the Class II malocclusion is resulting from an anteroposterior disproportion in size or discrepancy in position of the jaws rather than malposition of the teeth relative to the jaws (retrusion of mandibular teeth or protrusion of maxillary teeth or both) which is commonly associated with Class II dental malocclusions. Typically, some natural dental compensation is observed in the presence of the skeletal discrepancy. This compensation tends to make the dental discrepancy less severe than the skeletal discrepancy and is exhibited most often as protrusive mandibular incisors and less frequently as retrusive maxillary incisors. Another typical compensation is a maxillary dental arch that is narrower or constricted than normal because it is in occlusion with a narrower part of the mandibular dental arch. This transverse dental compensation is characterized further by mesiolingual rotation of the maxillary first molars. Skeletal Class II malocclusions can be subdivided conveniently into those comprised of either mandibular deficiency or maxillary excess or combination of both skeletal discrepancies **(Spalding, 2001)**.

2.2 Morphological Features of Class II Division 1 Malocclusions

All cases of class II malocclusions developed from a very similar deciduous dental arch morphologic pattern so that it is very difficult to distinguish and predict the

ultimate shape of the dental arch before the eruption of the permanent incisors. In addition; the anteroposterior relationship of the dental arches in untreated Class II cases, whether in the deciduous, mixed, or permanent dentitions, did not improve with age **(Frolich, 1962; Bishara *et al.*, 1988)**.

- Typical class II division 1 malocclusion has a mandibular arch normal in form with a greater compensating curve than normal [either elevation of incisors or occasionally the mandibular molars being depressed or infra-erupted] **(Gilmore, 1950)**.
- Anterior arch length was found to be increased markedly during the transition period and overbite and overjet increased in the untreated cases, which may allow the lower lip to rest between the maxillary and mandibular incisors maintaining or accentuating the overjet. **(Brodie, 1953; Frolich, 1962)**.
- During swallowing, an abnormal mentalis muscle activity and aberrant buccinator activity, together with compensatory tongue function and position, could cause changes in the dentofacial structures such as constriction of the maxillary posterior segments, protrusion and spacing of the maxillary incisors, and abnormal inclination of the mandibular incisors **(Graber, 1963)**.
- The presence of this relative constriction of the maxillary arch, when related to the mandibular arch in Class II malocclusions, is expressed from the earlier stages of dental arch development. These trends continue in the mixed and early permanent dentitions and do not self-correct without treatment. Therefore, if there is a discrepancy in the transverse relationship, it should be corrected together with the anteroposterior discrepancy **(Bishara *et al.*, 1996)**.

3.Diagnosis

Classification of skeletal pattern for diagnosis is universally.

Recognized:

- Class I-the mandible is 2-3 mm posterior to maxilla
- Class II- the mandible is retruded relative to the maxilla
- Class Ill -the mandible is protruded relative to the maxilla **(laura michell, 2007).**

This can be done with the patient

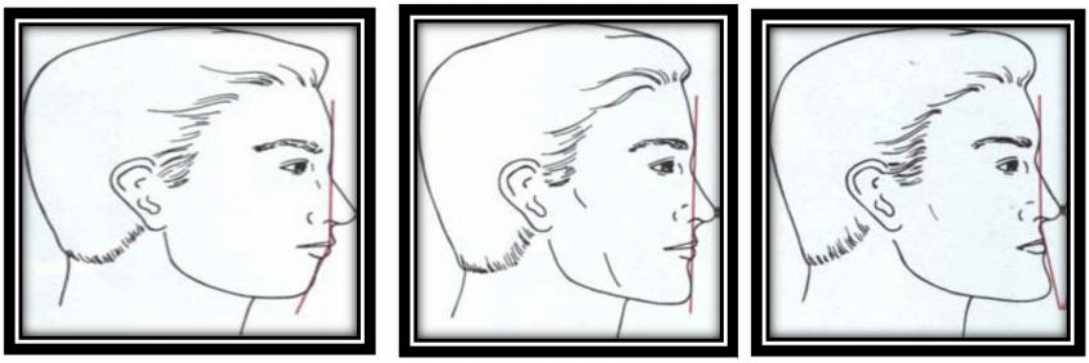
Either sitting upright or standing, but not reclining in a dental chair, and looking at the horizon or a distant object.

With the head in this position, note the relationship between two lines, one dropped from the bridge of the nose to the base of the upper lip, and a second one extending from that point downward to the chin **(profit,2007)**.

Requires placing the patient in the physiologic natural head position, the head position.

An angle between them indicates either profile convexity (upper jaw prominent relative to chin) or profile concavity (upper jaw behind chin).

A convex profile therefore indicates a skeletal Class II jaw relationship, whereas a concave profile indicates a skeletal Class I I I jaw (proffit,2007)



(Figure 3) types of profiles

3.1. Three types of profiles are seen:

a. Straight or the Orthognathic profile The two lines form an straight line

b. Convex profile The two lines form an acute angle with the concavity facing the tissues.

- This type of profile is seen in Class IT div 1 patients due to either a protruded maxilla or a retruded mandible.

c. Concave profile The two lines form an obtuse angle with the convexity facing the tissues.

- This type of profile is seen in Class ill patients **. (singh,2007)**.

3.2. Diagnostic Records

Orthodontic diagnostic records are taken for two purposes:

It is important to remember that the records are supplements to, not replacements for, the most important source of information for clinical diagnoses, the clinical examination. **(Profit, 2007).**

3.2.1. Study model

There are two reasons for doing this: (1) if the casts are viewed with a symmetric base that is oriented to the midline of the palate, it is much easier to analyze arch form and detect asymmetry within the dental arches; and (2) neatly trimmed and polished casts are more acceptable for presentation to the patient, as will be necessary during any consultation about orthodontic treatment **(profit, 2007).**

.

(Figure 4. study model)

3.2.2. Radiographic examination

The commonly used views include the following.

A panoramic view: an orthopantomographic (OPT) radiograph, or left and right lateral oblique's.

A lateral cephalometric radiograph: indicated for skeletal discrepancies and/or where anteroposterior movement of the incisors is required

A view of the upper incisors: either a periapical or an upper anterior occlusal**(laura Mitchell,2007).**

(Figure 5 Cephalometric radiographs)

Inter-incisal Angle

The inter-incisal angle relates the relative position of the upper incisor to that of the lower ihcisor.

If the angulation is more acute or less than the mean of 130°, then the anteriors are considered to be proclined. Hence, the upper and or lower teeth may require up-righting or need to be retracted. **(Singh 2007).**

3.2.3. Supplemental diagnostic aids include:

1. Specialized radiographs; like

a. Occlusal views of maxilla and/or mandible.

b. Selected lateral jaw views, etc.

2. Electromyography examination of muscle activity

3. Hand-wrist radiographs

4. Computed axial tomography (CT scan)

5. Magnetic Resonance Imaging (MRI)

6. Endocrine tests and/or other blood tests

7. Estimation of the basa 1 metabolic rate

8. Sensitivity (vitality) tests

9. Biopsy (SINGH,2007)

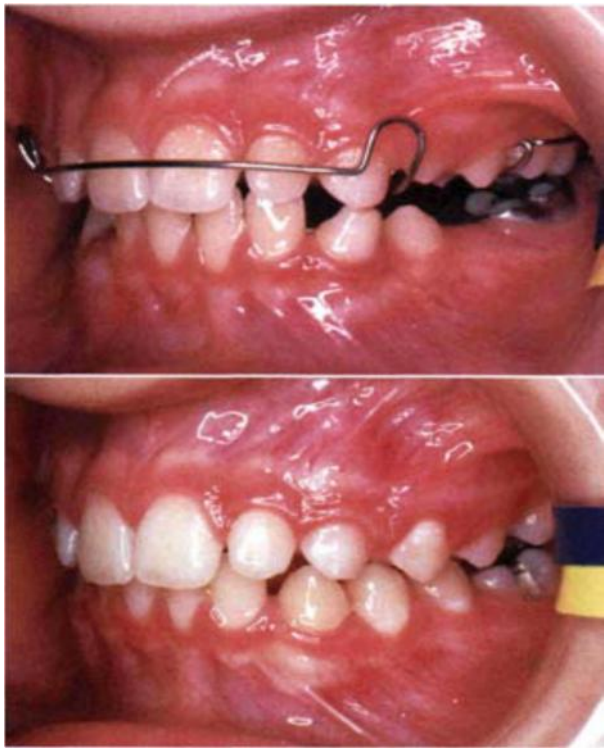
4. Treatment of class II

4.1. Treatment of class II in preadolescent children

4.1A.Treatment of Nonskeletal Problems in Preadolescent Children

Treatment for maxillary dental protrusion during the early mixed dentition is indicated only when the maxillary incisors protrude with spaces between them and are esthetically objectionable or in danger of traumatic injury.

When this condition occurs in a child who has no skeletal discrepancies, it is often a sequel to prolonged thumb sucking. Eliminating the thumb habit prior to tooth movement is advisable The more common for maxillary incisor protrusion is a Class II malocclusion If there is adequate vertical clearance and space w i t h in the arch, maxillary incisors that have been displaced by a sucking habit can be tipped lingually with a removable or a fixed appliance **(proffit,2007).**



(Figure 6, hawley-type removable appliance).

A Hawley-type removable appliance

utilizing multiple clasps and a labial bow can be effective for this purpose When the teeth require bodily movement or correction of rotations, a fixed appliance **(proffit,2007).**

IF the Class II dental relationship is the result of mesial drift of maxillary permanent molars caused by premature loss or small maxillary primary molars, it may be possible to move the maxillary permanent molars distally to achieve a normal

Class I relationship and regain space for the other permanent maxillary teeth.

Successful distal movement of the molars depends on the severity of the mesial drift intraoral spring force applied with a removable or fixed appliance **(Bishara, 2001).**

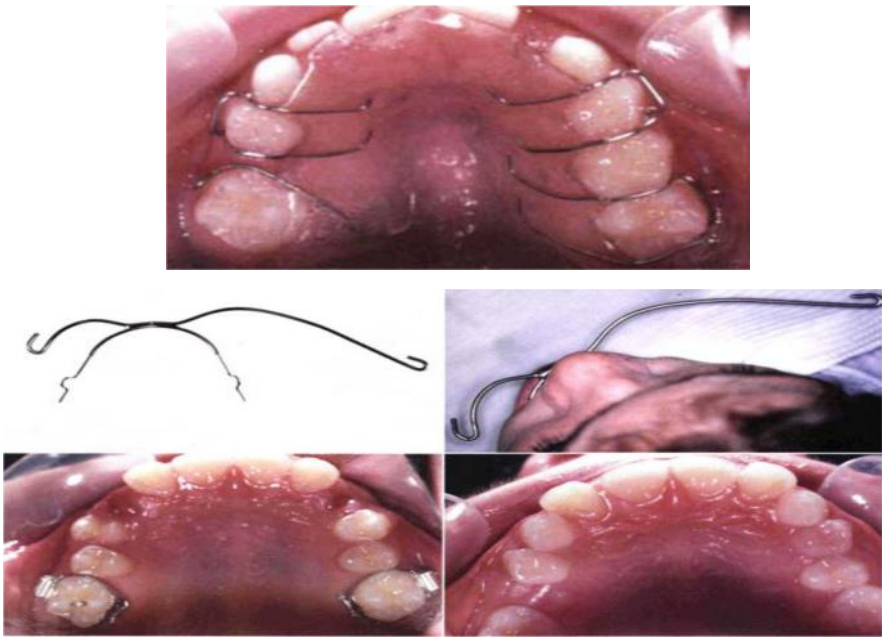
A removable appliance retained with Adams' clasps and incorporating a helical finger spring adjacent to the tooth to be moved is very effective.

This appliance is the ideal design for tipping one molar One posterior tooth can be moved up to 3 mm distally during 3 to 4 months of full-time appliance wear.

The spring is activated approximately 2 mm to produce 1 mm of movement per month

Sometimes both molars need to be moved distally, but one requires substantially more movement than the other.

To accomplish this, an asymmetric face bow withneckstrap **(proffit,2007).**



(Figure 7, removable appliances).

In many children with severe crowding, a decision can be made during the early mixed dentition that expansion is fruitless and that some permanent teeth will have to be extracted to make room for the others.

A planned sequence of tooth removal can reduce crowding and It will also allow the teeth to erupt over the alveolus and through keratinized tissue, rather than being displaced buccally or lingually.

It was advocated originally as a method to treat severe crowding without or with minimal use of appliance Serial extraction treatment begins in the early mixed dent.

on with extraction of primary incisors if necessary, followed by extraction of the primary canines to allow eruption and alignment of the permanent incisors

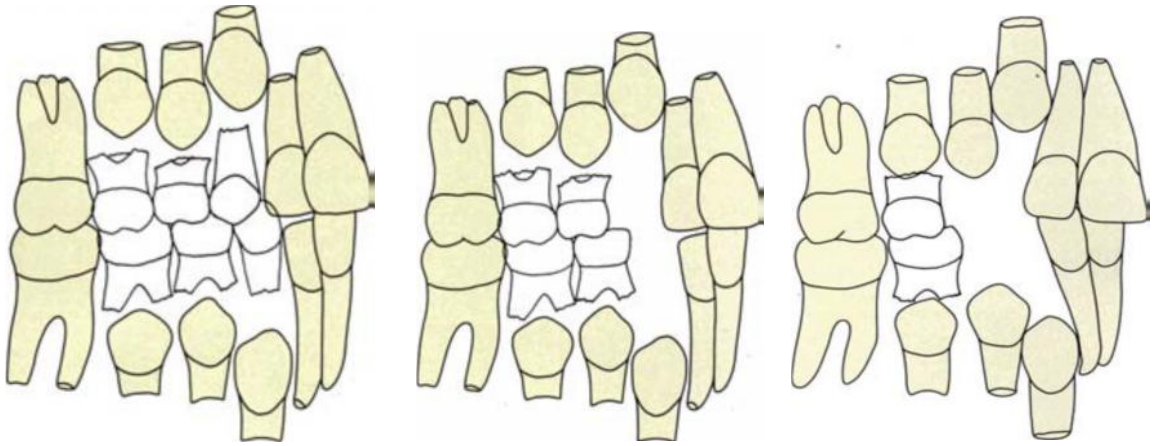
As the permanent teeth align without any appliances in place, there is usually some lingual tipping of the lower incisors, and overbite often increases during this stage.

The maxillary premolars usually erupt before the canines, so the eruption sequence is rarely a problem in the upper arch.

In the lower arch, however, the canines often erupt before the first premolars, which causes the canines to be displaced facially.

To avoid this result, the lower primary first molar should be extracted when there is 1/2 to 2/3 root formation of the first premolar.

This usually will speed up the premolar eruption and cause it to enter the arch before the canine **(proffit,2007).**



(Figure 8, Early Serial Extraction).

The result is easy access for extraction of the first premolar before the canine erupts.

A complication can occur if the primary first molar is extracted early and the first premolar still does not erupt before the canine.

This can lead to impaction of the premolar that requires later surgical removal after the first premolar has been extracted; the second primary molars should exfoliate normally.

The premolar extraction spaces close partially by mesial drift of the second premolars and permanent first molars but largely by distal eruption of the canines **(proffit,2007).**

4.1B.Treatment of skeletal Problems in Preadolescent Children

Treatment of Skeletal Problems in Children The functional appliance as well as the headgear can be used during the mixed dentition. However, the position and relationship of the incisors must be acceptable to place most functional appliances. **(Bishara,2007).**

Mode of Action and Goals of Treatment with Headgears A headgear intended for use in growth modification is designed to deliver an adequate extra oral orthopedic force to compress the maxillary sutures, modifying the pattern of bone apposition at these sites.

Although posterior and superior extra oral orthopedic forces primarily are intended to inhibit anterior and inferior development of the maxilla, they also inhibit mesial and occlusal eruption of the maxillary posterior teeth.

The goal of treatment is for this restriction of maxillary growth to occur while the mandible continues to grow forward an adequate amount to "catch up" with the maxilla **(bishara,2001).**

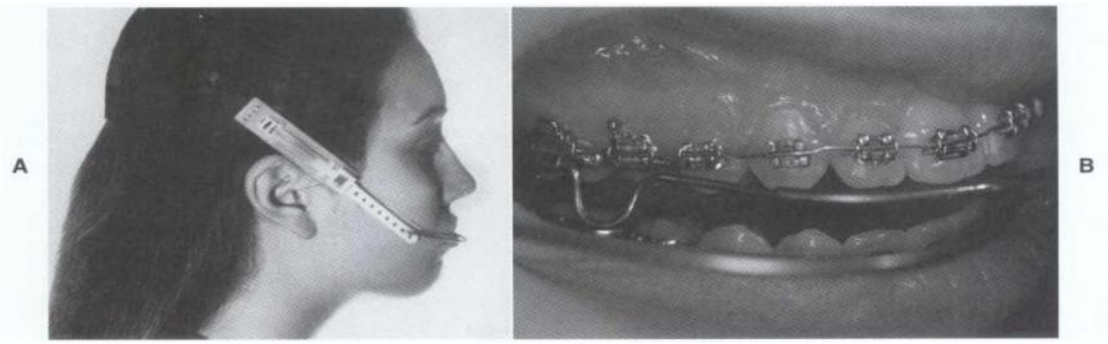
I. Headgears

is a common term for an appliance that is used for delivering a posteriorly directed extra oral force to the maxilla.

Each head Treatment gear consists of a metal device attached extra orally to an occipital or cervical attachment and intraorally to
an appliance fixed to the teeth.

There are essentially two types of headgear available for delivering extra oral force to the maxilla: the facebow and the J-hook headgear.

The first and most common type of headgear is the facebow, which is a large-gauge wire framework consisting of an outer bow for the extra oral attachment soldered to an inner bow that attaches intraorally in tubes attached to the maxillary first permanent molar bands . it can be used with either a maxillary fixed or removable appliance**(Bishara,2001)**.



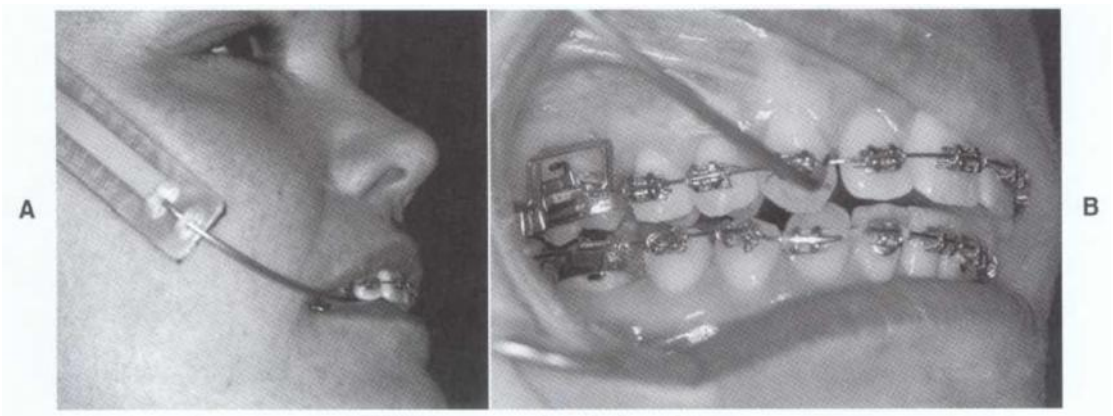
(Figure 10, facebow).

The second type of headgear, commonly referred to as a J-hook headgear, is two separate, curved, large gauge wires that are formed on their ends into small hooks, both of which attach directly to the anterior part of the maxillary arch wire

This type of headgear is more commonly used for retraction of canines or incisors rather than orthopedic purposes.

The J-hook headgear is limited to use only with a maxillary fixed appliance with a continuous arch wire. It is preferable if all the maxillary teeth are incorporated in

The fixed appliance. Delivery of the J-hook headgear requires much more preparation of the teeth than the facebow **(Bishara,2001).**



(Figure 11, J-hook headgear).

There are two basic types of extra oral attachments that provide anchorage for the headgear The first Is the cervical attachment or neck strap The second type of extra oral anchorage for a headgear is the occipital attachment or head cap Selection of Magnitude Duration.

Direction, and Timing of Extra oral Force The orthodontic force magnitude used to move a tooth usually varies between 15 and 400 g depending on the size of the tooth or, more specifically, the periodontal ligament surface area and the type of tooth movement. Delivery of the J-hook headgear requires much more preparation of the teeth than the facebow **(Bishara,2001).**

force should be as nearly constant as possible to provide effective tooth movement and should be light because it is concentrated against only two teeth.

The more the child wears the headgear, the better; 14 to 16 hours per day is minimal.

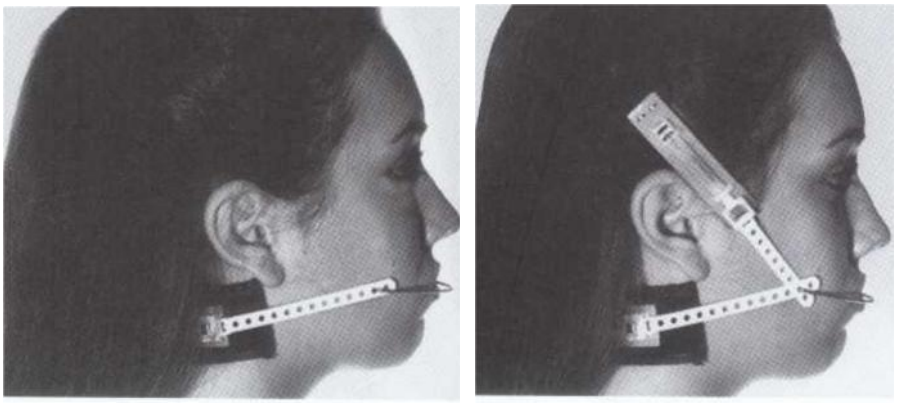
Approximately l00gm of force per side is appropriate **(proffit, 2007)**

In a preadolescent child, extra oral force is almost always applied to the first molars via a facebow w i th a head cap or a neck strap for anchorage.

To be effective in controlling growth, headgear should be worn regularly for at least 10 to 12 hours per day.

The growth hormone release that occurs in the early evening strongly suggests that, as with functional appliances, putting the headgear on right after dinner and.

Wearing it until the next morning—not waiting until bed time to put it on—is an ideal schedule **(Proffit, 2007)**



(Figure 12, neck strap and head cap).

II. Functional Appliances

ClassII functional appliances are designed to position the mandible downward and forward to stimulate or accelerate mandibular growth.

Theoretically, the distraction of the mandibular condyles out of the glenoid fossae reduces the pressure on the actively growing condylar cartilage and alters the muscle tension on the condyles, increasing the amount of endochondral growth more than would normally occur. Although a functional appliance is primarily intended to enhance the downward and forward growth of the mandible **(Bishara, 2007)**.

Functional appliances also can influence eruption of posterior and anterior teeth.

It is possible to level an excessive curve of Spee in the lower arch by blocking eruption of the lower incisors while leaving the lower posterior teeth free to erupt.

If upper posterior teeth are prohibited from erupting and moving forward while lower posterior teeth are erupting up and forward, the resulting rotation of the occlusal.

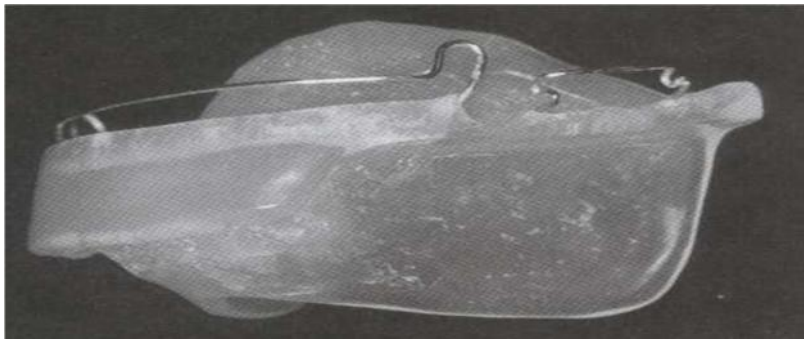
Plane and forward movement of the dentition will contribute to correction of the Class II dental relationship.

This is another effect of most functional appliance treatment for Class II problems **(Proffit, 2007).**

Types of Functional Appliances

All functional appliances are intraoral devices, and nearly all of them are tooth-borne or supported by the teeth The most common functional appliances are 1-removable tooth-borne appliances, including the activator, bionator, and twin block appliances.

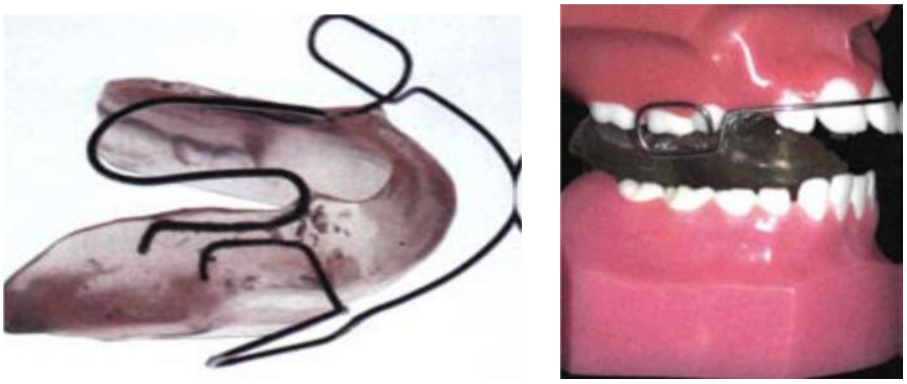
To achieve the desired skeletal and dental effects, these appliances depend on the stretch of the soft tissues caused by the mandible being positioned downward and forward as well as by the muscle activity generated by the mandible attempting to return to its original position. The activator consists of a large acrylic splint with a large lingual flange to maintain the mandible downward and forward.



(Figure 13, the activator, Bishara,2001).

B.The bionator increase patient comfort and facilitate daytime wear to increase the functional use of the appliance.

this by drastically reducing the acrylic bulk of the activator There is a much smaller mandibular lingual flange, minimal inter occlusal acrylic, a trans palatal wire in place of palatal acrylic, and a modified labial bow with buccal extensions that minimize cheek pressure on the teeth H.



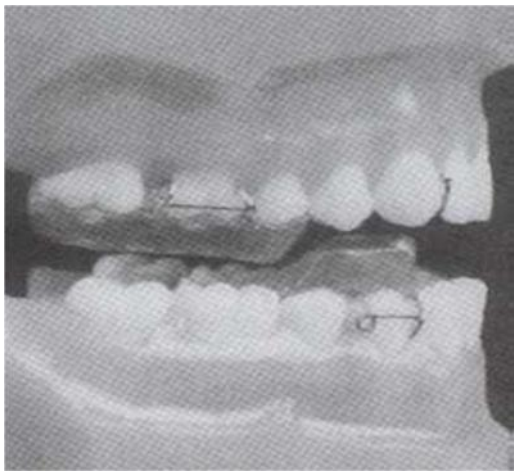
(Figure 14,The bionator).

For most Mandibular deficient patients, a bionator or activator-type appliance is the simplest, most durable, and most readily accepted appliance.

The flanges against the alveolar mucosa below the mandibular molars or lingual pads. contacting the tissue behind the lower incisors provide the stimulus to posture the mandible to a new position **(Proffit,2007).**

C-The twin block applianctwo-piece or split activator using separate maxillary and mandibular appliances with occlusal acrylic portions that serve as inclined guide planes and bite blocks to determine the extent that the mandible is postured downward and forward.

Although this appliance provides for more range of mandibular movement and is adjusted and modified more easily than other functional appliances, it has a greater tendency to protract mandibular incisor (Bishara,2001).



(Figure 15, Bishara,2001)

(Figure 16, the twin block appliance ,proffit,2007)

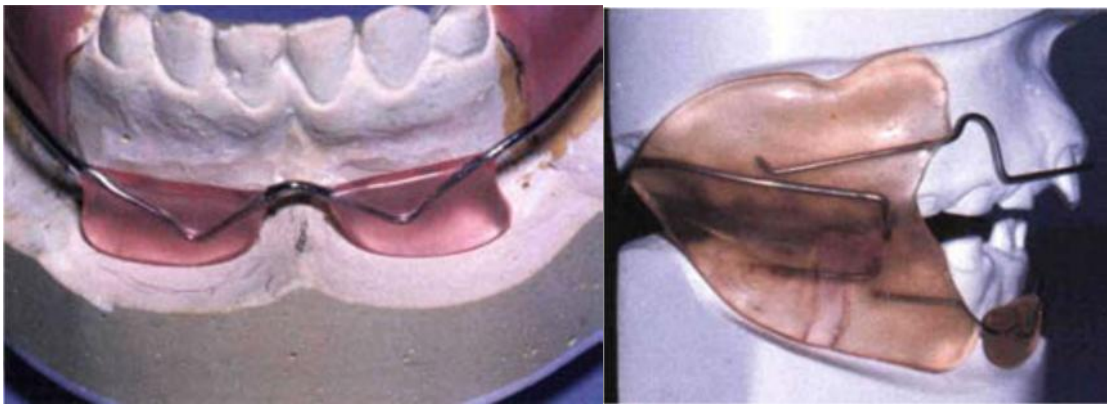
2-The second main type of functional appliance is the removable tissue-borne one that is represented by only one appliance Franke1,128 this appliance was created in an attempt to minimize unwanted tooth movement and to recontour the facial soft tissue adjacent to the teeth as well as posture the mandible downward and forward. **(B ishara,2001).**

Plastic buccal shields and lip pads, both of which are incorporate into the Frankel appliance, hold the soft tissues away f r om the teeth.

The effect is to disrupt the tongue-cheek equilibrium, and this in turn leads to facial movement of the teeth and arch expansion.

A buccal shield is more effective in producing buccal expansion than wires to hold the cheeks away f r om the teeth Lip pads positioned low in the vestibule force the lip musculature to stretch during function.

A combination of lip pads and buccal shields w i l l result in an increase in arch circumference as well. Buccal shields and lip pads are an integral part of the Frankel appliance, but can be added to any appliance **(Proffit,2007).**



(Figure 17, frankel II, Proffit,2007)

3-The fixed tooth-borne appliance is the third type of functional appliance, which also is represented by only one appliance.

Herbs introduced a fixed appliance that maintained the mandible in a forward position while permitting the teeth to occlude **(Bishara, 2001).**

The advancement component of the Herbst appliance is the sliding p in and tube on each side that force the mandible forward If the appliance is bonded or cemented, this approach has the advantage of full-time wear and permanent postural change (at least until the dentist removes the appliance).

The disadvantage is that pressure against the teeth, which produces compensatory incisor movements, cannot be avoided.

The Herbst appliance also is prone to breakage by aggressive patients. **(Proffit, 2007)**

combined appliancepplianceapproach to orthopedic treatment using extra oral

force in combination with a functional appliance may provide greater cumulative skeletal growth effects than use of either appliance alone **(Bishara,2007)**.

(Figure 18, Combined Growth Modification Treatment,proffit,2007)

4.2. Treatment of class II in in the early permanent dentition comprehensive orthodontic treatment

Orthodontic correction of the molar relationship nearly always involves moving from a Class II or partially Class II Excluding surgery to reposition the jaws, there are two possibilities:

(1) Differential growth of the jaws, guided by extra oral force or afunctional appliance, or.

(2) Differential anteroposterior movement of the upper and lower teeth—with or without differential closure of extraction space **(Proffit, 2007).**

4.2.1.Correction by Distal Movement of Upper Molars

Class II correction by distal movement of upper molars has definite limits that it is important to understand and respect.

W i th headgear, it is now clear that significant distal positioning of the upper posterior teeth relative to the maxilla occurs primarily in patients who have vertical growth and elongation of the maxillary teeth Without this, it is difficult to produce more than 2 to 3 mm of distal movement of the upper molars, unless the upper second molars are extracted **(PROFFIT,2007)**.

4.2.2.Molar Rotation as a Factor in Distalization

In patients with mild to moderate skeletal Class II malocclusion, the upper molars are likely to have rotated mesially around the lingual root, and merely correcting the rotation changes the occlusal relationship in a Class I direction This can be done wi THtranspalatal lingual arch, an auxiliary labial arch or the inner bow **(Proffit,2007)**.

(Figure 19, Molar rotation as a factor distalization)

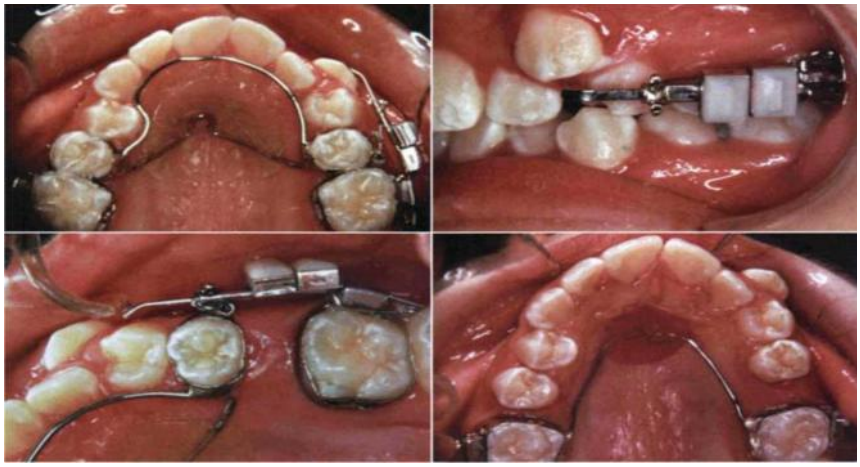
4.2.3.Palatal Anchorage Systems for Distal Movement of Molars

Although removable appliances contact the palate, they are not effective in moving molars back, probably because they do not fit well enough.

A fixed appliance that stabilizes the premolars and includes a plastic pad contacting the rugae is needed.

There are several possibilities for generating the molar distalizing force.

A-NiTi coil springs compressed against the molars (from an anterior anchorage unit) produce an effective and nearly constant force system for the distal Magnets in repulsion also can be used quite effectively but the A-NiTi springs have the additional advantage being less bulk and usually are a better choice **(Proffit,2007).**



(Figure 20 ,The use of magnets in repulsion to distalize maxillary first molars

The pendulum appliance uses beta-Ti springs that extend from the palatal acrylic and fit into lingual sheaths on the molar tube .The effects of this appliance illustrate the potential of palatal anchorage for molar distalization.

In a small but well-characterized sample of patients who were treated to a super-Class I molar relationship with thependulum appliance activated to produce 200 to 250 grams, Byloff et al found that molar movement averaged just over 1 mm/month (1.02 ± 0.68), with a considerable degree of distal tipping of the crown and an elevation of the molar As one would expect, despite the contact of the appliance with the palate, the premolars and incisors were tipped anteriorly, but the molar moved distally 2 to 3 times as far as the anchor teeth.

Figure 21, Pendulum appliance,profit 2007

4.2.6. Dental camouflage of class ii Skeletal problems

The goal of dental camouflage is to disguise the unacceptable skeletal relationship by orthodontic ally repositioning the teeth in the jaws so there is an acceptable dental occlusion and esthetic facial appearance.

Appropriate patients for dental camouflage treatment should be limited to older adolescents or adults who no longer have adequate facial growth potential to make it worthwhile to attempt or continue growth modification. only when the skeletal Class II problems are mild to moderate in severity **(Bishara,2001).**

The types of dental camouflage for Class II skeletal problems can be divided conveniently according to whether or not the treatment requires extraction of teeth **(Bishara,2001).**

4.2.6.1. Dental camouflage without extractions

it is a rare case where a skeletal Class 11 relationship can be treated successfully using dental camouflage without extractions.

It is necessary that the skeletal problem be mild enough with a Class II posterior occlusion of less than a half unit and a mild, excessive overjet.

It also is necessary for adequate space to be present in the dental arches.

Space is required in the maxillary arch to retract the incisors and eliminate overjet, and it is required in the mandibular arch to be able to protract the mandibular teeth into a normal posterior occlusion.

Treatment by means of dental camouflage must be undertaken with a complete fixed orthodontic appliance in place **(Bishara,2007)**

If the intraoral distal force to the maxillary molars is generated by a spring the reactive force is an equal mesial force to the maxillary anterior teeth, moving them in the opposite direction desired **(Bishara,2007).**

Absolute intraoral orthodontic anchorage with the use of an Osseo integrated titanium implant to prevent reciprocal forces from acting upon teeth.

When using an Osseo integrated titanium implant or miniscrew the implant or the miniscrew must be placed anteriorly in the palate.

The Osseo integrated titanium implant can be located more posteriorly **(Bishara, 2001).**

4.2.6.2. Class II camouflage by extraction of upper first premolars

Like upper second molar extraction, extraction of upper first premolars is a deceptively attractive solution to Class II problems and should be adopted only when its specific indications exist With this approach, the objective during orthodontic treatment is to maintain the existing Class II molar relationship, closing the first premolar extraction space entirely by retracting the.

Anchorage must be reinforced, but one method, Class II elastics from the lower arch, is specifically contraindicated.

The remaining possibilities are extra oral force to the first molars, a stabilizing lingual arch, retraction of the maxillary anterior segment with extra oral force directly against these teeth, or skeletal anchorage.

Excellent reinforcement of posterior anchorage can be obtained w i th extraoral force if it is applied consistently and for long durations.

The more constant the headgear wears, the less a stabilizing lingual arch will be needed.

Conversely, a stabilizing lingual arch augments the posterior anchorage full-time, while headgear is likely to be worn a good bit less.
Using fixed appliances to achieve bodily retraction of the upper incisors

The severity of the case that can be approached in this way is by the availability of Cortical bone palatal to the upper incisors and by the patient's facial profile.

If headgear is used in conjunction with this approach, a degree of growth modification may also be produced in favorably growing children **(laura Michell,2007)**.

(Figure 22, camouflage by extraction of upper4, Michell,2007)

The effect of the lingual arch is to prevent the molars from rotating mesiolingual around their palatal root, and secondarily to prevent them from tipping mesially

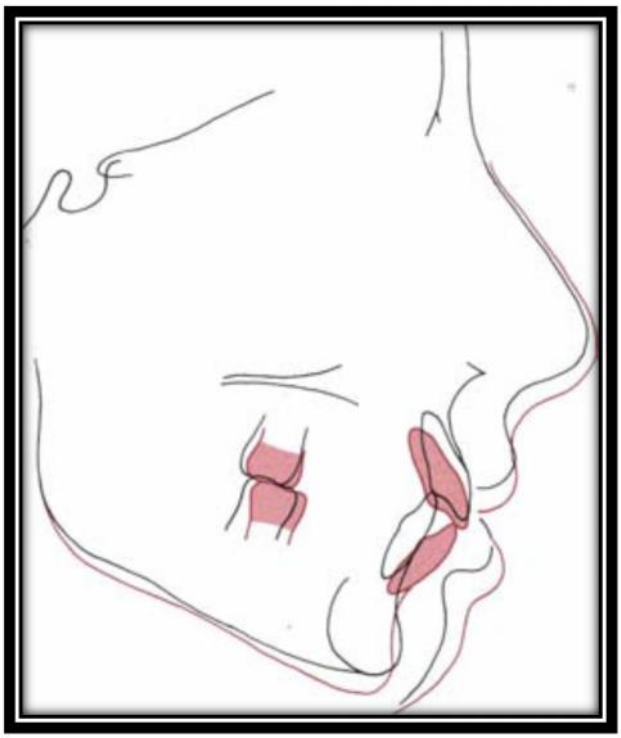
4.2.7. Molar Correction with Inter-arch Elastics

Without extraction spaces, Class II elastics produce molar correction largely by mesial movement of the mandibular arch, with only a small amount of distal positioning of the maxillary arch When this pattern of tooth movement is desired, the amount of force varies with the amount of tipping allowed in the mandibular arch. With a well-fitting rectangular wire in the lower arch that is somewhat constricted posteriorly (to prevent rolling the lower molars facially and control the inclination of the lower incisors), approximately 250 gm per side is needed to displace one arch relative to the other.

With a lighter round wire in the lower arch, not more than half that amount of force Class II elastics, therefore, are contraindicated in no growing patients who cannot tolerate some downward and backward rotation of the mandible elastics, Using Class II elastics for 3 or 4 months at the completion of treatment of a Class II patient to obtain good posterior interdigitating is often acceptable **(Proffit,2007).**

The use of Class II elastics should be limited to the permanent dentition with a complete fixed orthodontic appliance and continuous arch wires in place important reason for not using inter arch traction with only partial eruption of the permanent teeth.

The vertical forces associated with Class II elastics tend to extrude the maxillary incisors and the mandibular molars. **(Bishara, 2001).**



(Figure 23, molar Correction with inter-arch elastics Bishara,2001)

4.3. Treatment of class II in adults

4.3.1. Distalization of maxillary molars or the maxillary dental arch.

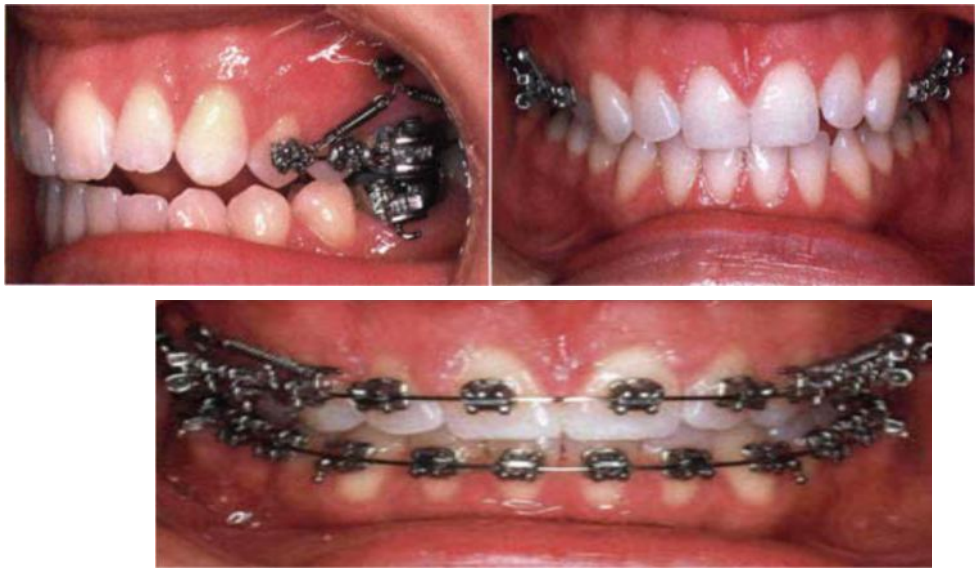
Distal movement of the maxillary molars is one way to provide space in a crowded maxillary arch; distal movement of the entire maxillary dental arch would provide.

a way to correct a Class II malocclusion due to a forward position of the upper teeth on their skeletal base.

For both types of movement, miniplates rather than bone screws provide a more predictable outcome and allow roots to move without interference from screws in the alveolar process.

After intrusion of the posterior segments, the same anchors used for that purpose easily can serve as anchorage for retraction.

The entire arch usually can be moved back 2-4 mm. Extraction of second molars to provide space for posterior movement of the dental arch, or extraction of premolars so that only the anterior segment has Tobe moved, is needed if a greater amount of retraction is necessary.



(Figure 24, Fixed appliancee)

Bone screws in the maxillary alveolus, or miniplates at the base of the zygomatic arch, offer anchorage that makes simultaneous retraction and intrusion much easier and more predictable **(Proffit, 2007).**

4.3.2.Extraction vs.Nonextraction Treatment

If the Class II dental relationship is the result of mesial drift of maxillary permanent molars caused by premature Loss or small maxillary primary molars, it may be Possible to move the maxillary permanent molars distallytoachieve a normal Class I relationship and regain space for the other permanent maxillary teeth. Successful distal movement of the molars depends on the severity of the mesial drift. If the molars are tipped forward, their crowns can be moved distallyusingeitherextraoral force applied to the molars with headgear or anintraora spring force applied with removable or fixed appliance Appliances that generate an intraoral distal force to the molars must be dependent on anterior anchorage to prevent anterior movement of the maxillary anterior teeth as a side effect. Usually the magnitude and duration of force necessary to bodily

move the molars distally overwhelm the anterior anchorage and result in unacceptable protraction of maxillary incisors Class II relationship, is to accept the molar relationship and obtain space for the remaining maxillary teeth by extracting maxillary first or second premolars.

4.3.3. Unilateral vs. Bilateral Class II

It is possible that the factors causing a Class 11 dental Relationship may occur only on one side of the arch, resulting in a unilateral Class 11 problem. If this is associated with dental midlines that are coincident with the facial midline, extraction of a maxillary premolar on the affected side, unless one is already missing,

May be indicated to provide adequate space for the Remaining teeth.

The unilateral Class II problem may be associated with a maxillary midline deviation toward the affected side caused by the loss or displacement of a premolar or canine on that side. Treatment may require extraction of a maxillary premolar on the unaffected side to center the maxillary midline with the face.

4.3.4 Surgical correction of class II skeletal discrepancy in adult

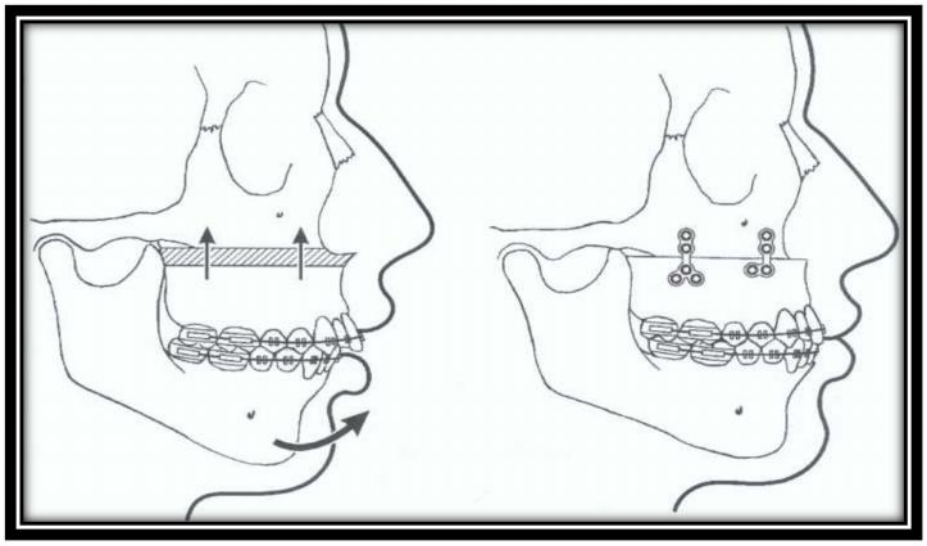
This can be the case if at least one of two features is present with the malocclusion.

The first is that the skeletal disharmony is so severe that the extent of dental movement (maxillary retraction or mandibular protraction) necessary to eliminate the overjet is either too great to permit a stable treatment outcome or too great to permit an esthetic facial result.

The second feature that precludes acceptable dental camouflage treatment is the presence of crowding or protrusion of incisors that is severe enough to require all of the lower extraction space to correct these problems **(Bishara, 2001).**

4.3.4.1.Maxillary Impaction: Indications and Treatment

The type of orthognathic surgery indicated for vertical maxillary excess is maxillary impaction Maxillary surgical impaction may include either a total maxillary osteotomy if the excess is anterior as well as posterior.



(Figure 25, maxillary impaction Bishara,2001).

OR bilateral posterior segmental maxillary osteotomies if the excess is more in the posterior.

One or more teeth and their supporting bone can be moved as a segmental procedure.

The Wassmund technique involves movement of the upper premaxilla segment of incisors and canines as a block, either distally to reduce an increased overjet or upwards to reduce excessive upper incisor show.

Nowadays a Le Fort I procedure is more frequently carried out and the maxilla divided from above into segments **(Proffit, 2007).**

4.3.4.1.1Le Fort I

This is the most widely used technique. The standard approach is a horseshoe incision of the buccal mucosa and underlying bone, which results in the maxilla being pedicle on the palatal soft tissues and blood supply. The maxilla can then be moved upwards (after removal of the intervening bone), downwards (with

interposition bone graft), or forwards. Movement of the maxilla backwards is not feasible in practice.

Where there is concern regarding the blood supply provided by the palatal vessels, the buccal approach can be made via small vertical incisions and tunneling of the mucosa, but this makes plating difficult and may increase the likelihood of relapse **(Iaura Mitchell, 2007)**.

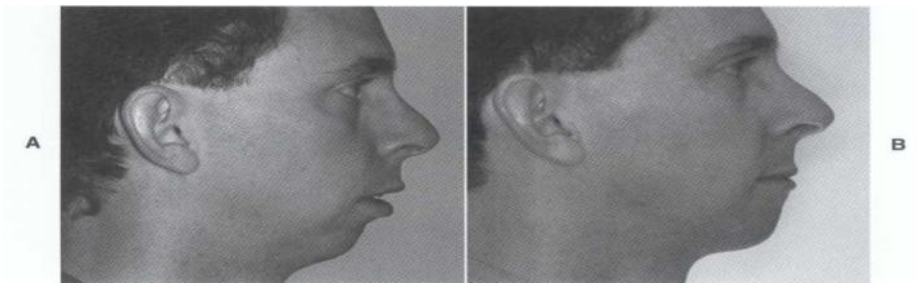
4.3.4.2Mandibular Advancement:

Indications and Treatment

In patients with skeletal Class II malocclusions in which neither growth modification nor dental camouflage offer an acceptable treatment, surgical advancement of the mandible is often necessary in combination with orthodontic treatment.

If the lower face height is short with an excessive anterior overbite, these vertical problems and the anteroposterior discrepancy can be effectively treated with rotation of the mandible downward anteriorly **(Bisara, 2001).**

The intraoral sagittal split ramus osteotomy is the most popular techniquefor surgical mandibular advancement**.(Bishara,2001).**



(Figure 26, Mandibular Advancement, Bishara,2001)

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