ADULT ORTHODONTICS

INTRODUCTION

- The past 30 years have seen a major change in orthodontic practices.

- Changed lifestyles and patient awareness have increased the demand for adult orthodontic treatment.

- Multidisciplinary dental therapy has allowed better management of the more complicated and unique requirements of the adult patient population, thereby, greatly improving quality of care and treatment prognosis.

DEFINITION

- According to Ackerman,

Adult orthodontics is concerned with striking a balance between achieving optimal proximal and occlusal contact of teeth, acceptable dentofacial esthetics, normal function and reasonable stability.

Adults who seek orthodontic treatment fall into two quite different groups

(1) younger adults (typically under 35, often in their 20s)

First group, the goal is to *improve their quality of life.* They usually seek comprehensive treatment and the *maximum improvement that is possible*. They may or may not need coordinated treatment with other dental specialists.

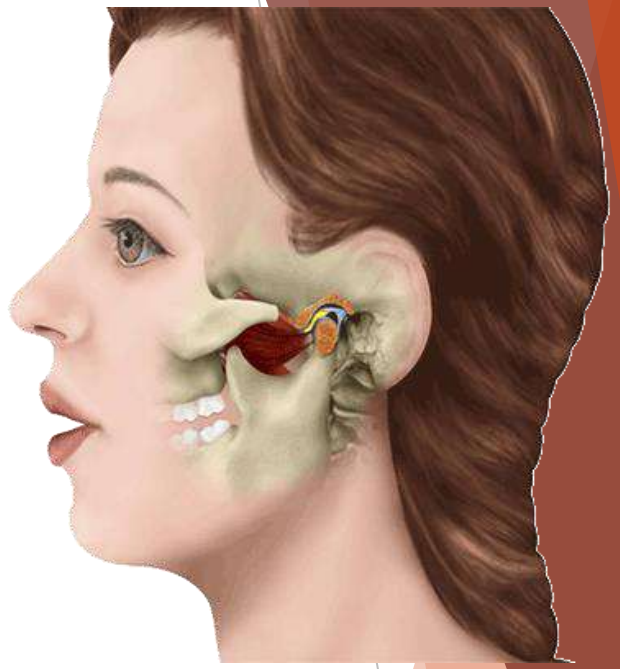
(2)an older group, typically in their 40s or 50s

Second group seeks to maintain what they have not necessarily to achieve as ideal a result as possible. For them, *orthodontic treatment is needed* to meet specific goals that would make control of dental disease and restoration of missing teeth easier and more effective, so the orthodontics is an adjunctive procedure to the larger periodontal and restorative goals

REASONS FOR RISE IN ADULT ORTHODONTIC PATIENTS

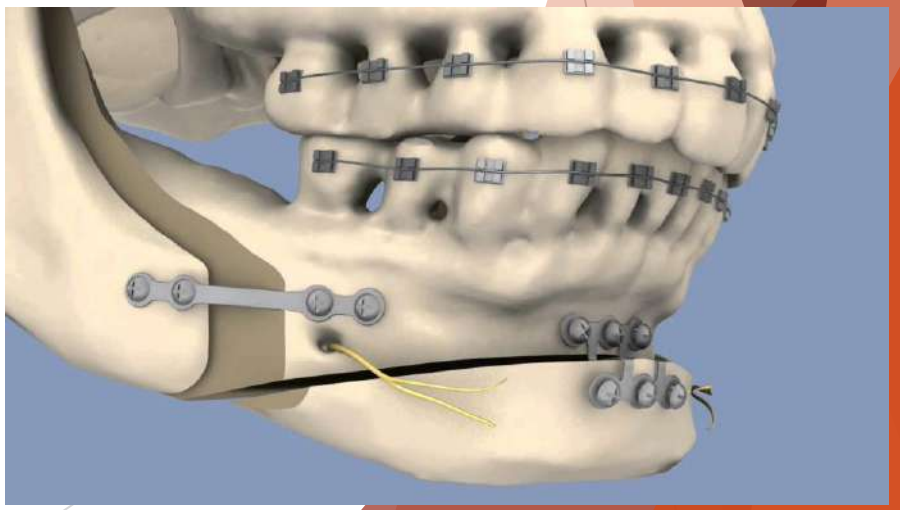
1. Availability of a variety of cosmetic appliances including *invisalign & lingual braces* which is more acceptable for adults.
2. Improved appliance placement techniques like *indirect bonding and tooth coloured wires* have caught the attention of adults who would not otherwise seek orthodontic treatment.
3. Increased experience with adult orthodontic treatment and achievement of good results.
4. Increased public awareness of the possibilities of adult treatment.

5. Increased desire of patients and dentists for treatment of dental mutilation problems, using tooth movement rather than removable prostheses.



6. More sophisticated and successful management of the symptoms associated with joint dysfunction.

7. More effective management of skeletal jaw dysplasias using advanced orthognathic surgical techniques.



DIFFERENCE BETWEEN ADULT AND CHILD PATIENTS

ADULT

1. No growth potential, only tooth movement.
2. Appearance of great concern
3. Takes time to adjust to the appliance.
4. Speech adjustment more difficult.
5. Periodontal disease may be a complicating factor & must be eliminated.
6. General health must be considered.
7. Well motivated and cooperating patients.

CHILD

1. Tooth movement possible in addition to growth modification.
2. Appearance is of less concern
3. Will tolerate most appliances readily.
4. Speech adjustment is quick.
5. Periodontal disease none or not severe.
6. General health is not usually a concern.
7. Poor to excellent patient cooperation.

INDICATIONS FOR ADULT ORTHODONTICS

1. To improve *tooth periodontal tissue* relationship.
2. To establish an improved plane of occlusion to ensure *equal distribution of forces*.
3. To balance the existing space between teeth for *better prosthetic replacement* & tooth to tooth contact.
4. To improve occlusion and coordination with masticatory muscles and TMJ.
5. To satisfy the *esthetic* needs of the patient.

CONTRAINDICATIONS FOR ADULT ORTHODONTICS

- Severe skeletal discrepancies.
- Advanced local or systemic disease.
- Excessive alveolar bone loss.
- Inability to bring about results that are perceived as satisfactory by patient.
- Poor stability prognosis.
- Lack of patient motivation.

BIOMECHANICAL CONSIDERATIONS

- Since adult patients who need orthodontic treatment often have periodontal problems, the *magnitude of force used to move teeth must be reduced* to prevent damage to the PDL, bone, cementum and bone.
- Loss of alveolar bone height or periodontal attachment leads to apical relocation of the centre of the resistance. This should be considered during treatment.

Mechanics and treatment

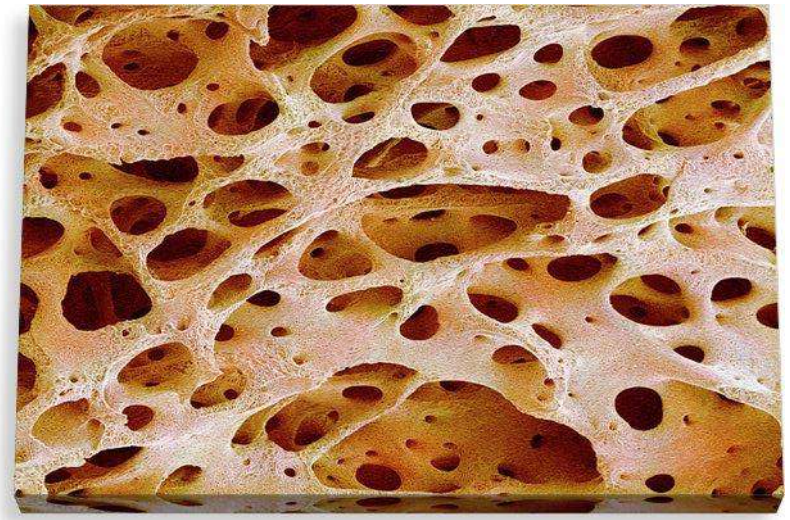
- Adult treatment mechanics is the same but modified to meet specific treatment requirements.
- Tooth intrusion is difficult considering the possibility of root resorption.
- Tipping is not difficult but bone loss may be a complication.
- Rotation is simple and rapid but has the highest relapse tendency.

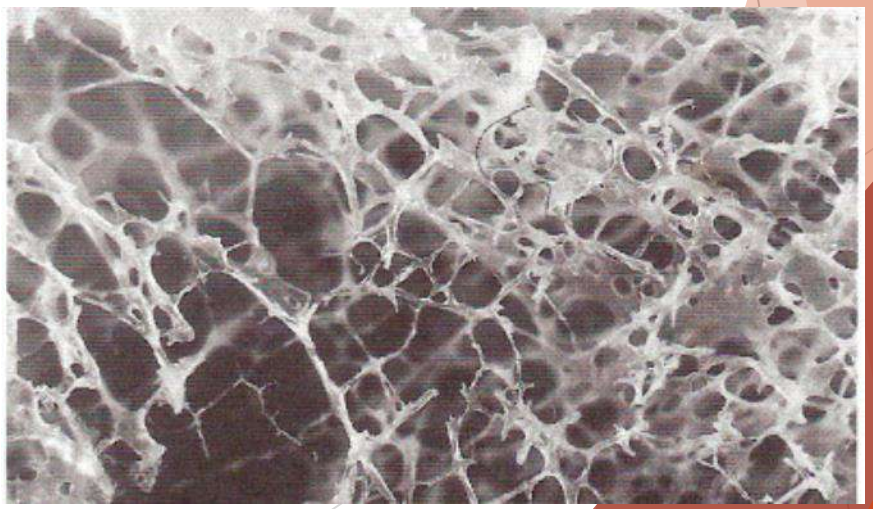
Age changes in PDL

- The primary tissue to be influenced by the mechanical forces added to the teeth is the periodontal ligament.
- It has been proposed that the insufficient source of pre-osteoblasts might account for the delayed response to mechanical stimulus.
- The age-related changes in decrease in vascularization may explain the delayed reaction to orthodontic forces described in adults.

Age related bone changes

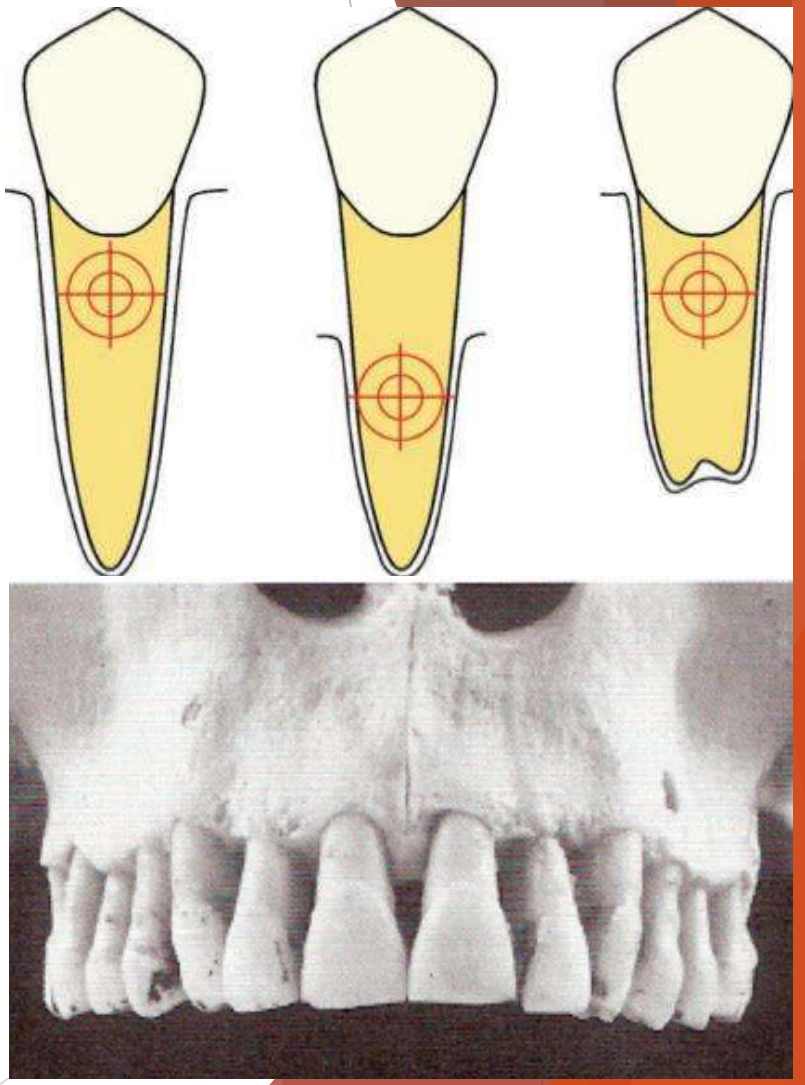
- Orthodontic tooth movement as a result of bone modelling and remodelling also depends greatly on age-related changes of the skeleton.
- Cortical bone becomes more dense while the spongeous bone reduces with age and the structure changes from that of a honeycomb to a network.





Local age changes

- The apical displacement of the marginal bone level is one local factor that influences the biological background for tooth movement in adults.
- With marginal bone loss the center of resistance of the tooth is displaced apically.
- Another factor of importance is occlusal function. This is highly related to both the quantity and quality of the lamina dura and surrounding bone.



Anchorage considerations in adults

- Anchorage in an adult patient may be affected by poor periodontal status.
- Use of headgears although beneficial may not be acceptable due to esthetic reasons.
- Therefore intraoral anchorage devices such as transpalatal arches and controlled forces are recommended.

- The biologic background for orthodontic tooth movement in adults indicates that :

1. The forces used in adults should be at a lower level than those used in children.

2. The initial forces should be kept low.

3. With increasing marginal bone loss, light continuous forces should be maintained during tooth displacement.

DIAGNOSIS AND ADULT ORTHODONTICS

- Diagnosis involves collection of data in a systematic manner to help in identifying the nature and cause of the problem.
- Because of a greater possibility for buried roots, impactions, periodontal breakdown and atrophic changes, periapical, occlusal and TMJ films should be obtained routinely in addition to panoramic radiograph and cephalogram.
- Adult patients need thorough examination for signs of TMD as they are at a higher risk.
- They should also be checked for wear facets, faulty restorations ,prosthesis and occlusal disharmonies.

MULTIDISCIPLINARY APPROACH

- Most adult patients require a multidisciplinary team for their comprehensive rehabilitation.
- The team may include :

1. General dentist
2. Orthodontist
3. Restorative dentist
4. Prosthodontist
5. Oral & maxillofacial surgeon
6. Plastic surgeon

TREATMENT ASPECTS IN ADULT ORTHODONTICS

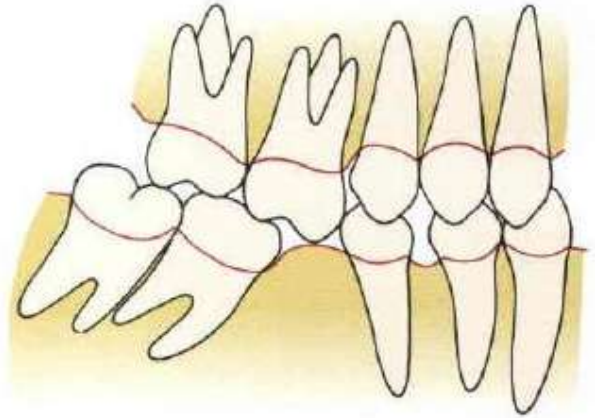
- Profitt has classified adult orthodontic procedures into the following three areas:
- ***Comprehensive orthodontic treatment***
- ***Adjunctive orthodontic treatment***
- ***Surgical orthodontic treatment***

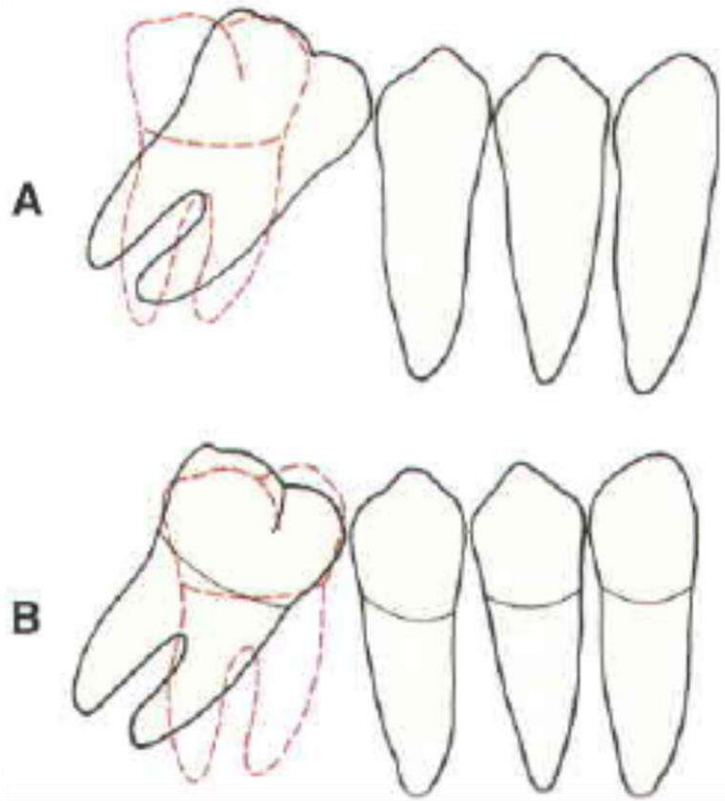
Adjunctive orthodontic treatment

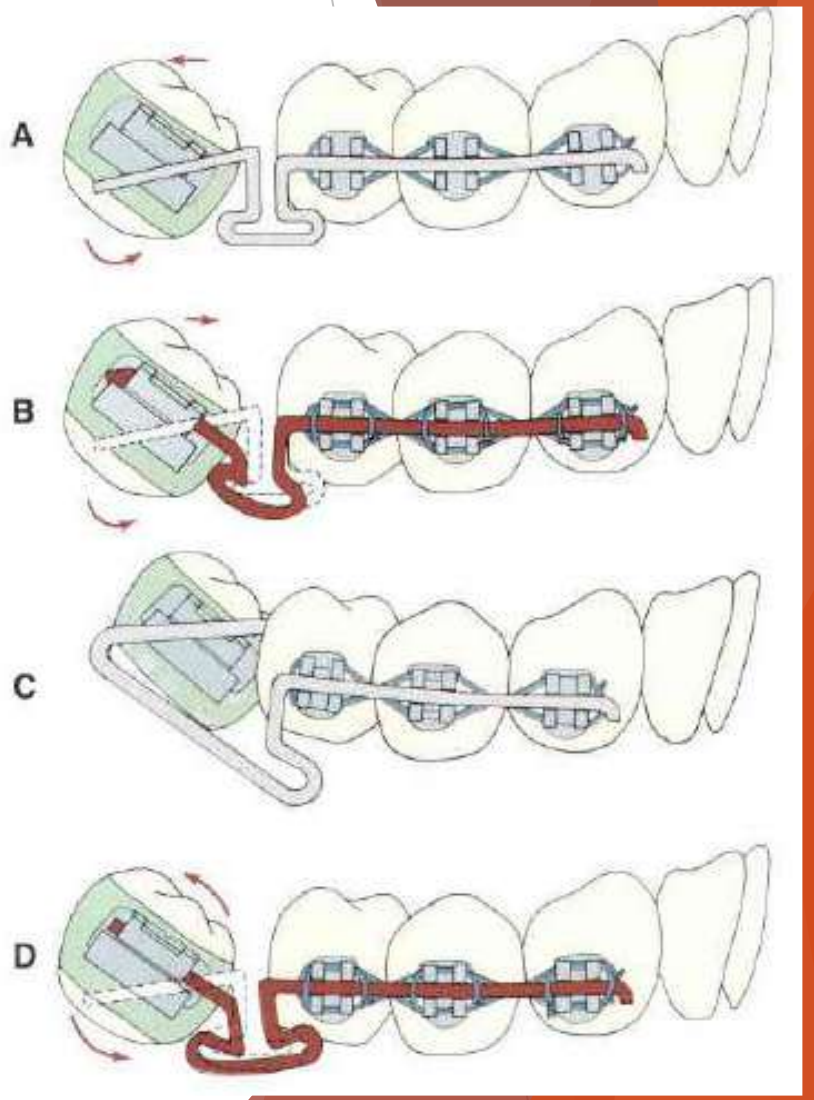
- It is the tooth movement *carried out to facilitate other dental procedures* necessary to control disease and restore function.
- The goals include:
- Facilitate restorations by positioning teeth so that more ideal & conservative techniques can be used.
- Improve periodontal health by eliminating plaque harbouring areas, improving alveolar ridge contour.
- Establish favourable crown-to-root ratios & position teeth in such a way that forces are transmitted along the long axes.

- Typically, appliances are required in only a portion of the dental arch and only for a short time in adjunctive treatment.
- The adjunctive treatment procedures include:

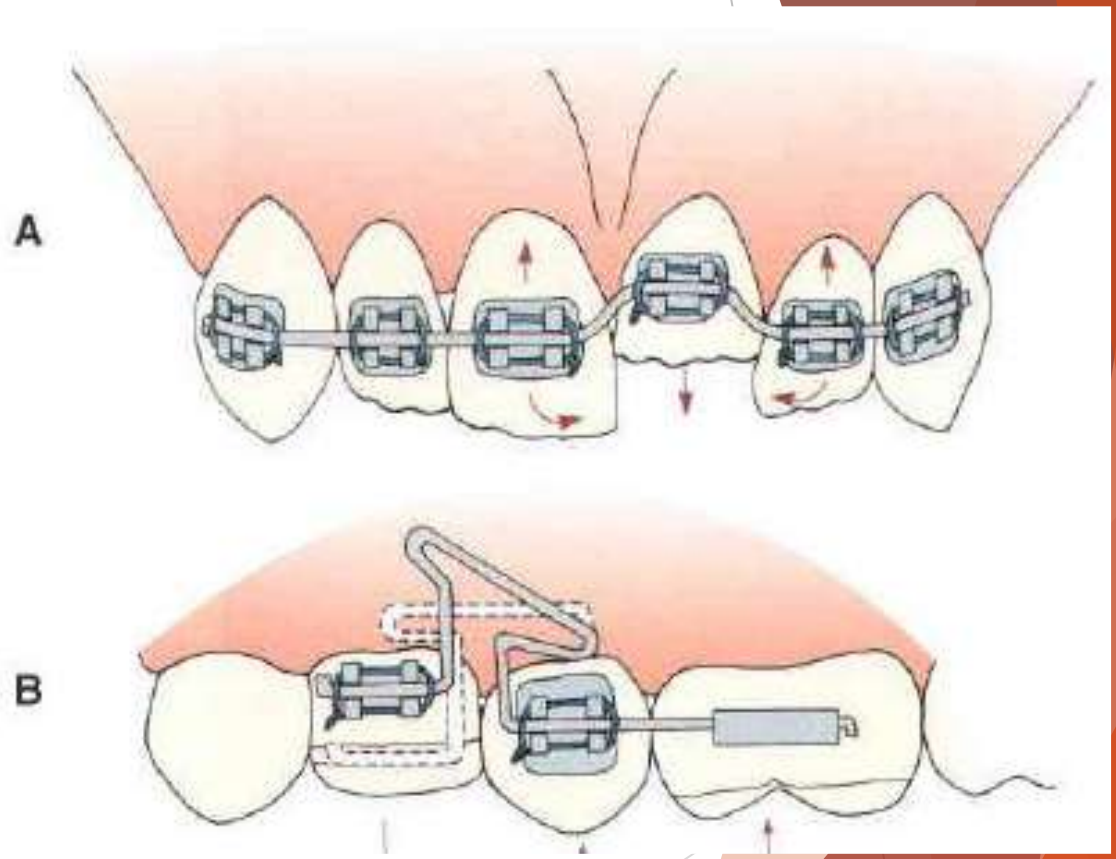
1. ***Uprighting of teeth***







Forced eruption



Comprehensive treatment

- It implies orthodontic treatment that would take more than 6 months duration.
- Its is similar to that in adolescents.
- However following considerations should be kept :

1) Biological limitations :

- adults exhibit decreased blood flow and vascularity & insufficient source of progenitor cells at the site of tooth movement.
- Cortical bone gets more dense and spongy bone reduces with age.
- These biologic limitations dictate a conservative approach to mechanics.

2) Lower force levels : the forces used in adults should be at a lower level than those used in children.

3) Periodontal considerations : periodontal care should be undertaken as frequently as needed during the orthodontic treatment to keep a check on periodontal inflammation.

4) Multidisciplinary approach : the team for comprehensive rehabilitation.

5) Esthetic requirements : esthetic appliances are preferred.

6) Comfort requirements

7) Biomechanical considerations : adult treatment mechanics are modified to meet specific treatment requirements.

- The appliances used in adult orthodontics should fulfill the following requirements:

1. Should be simple to ensure cooperation.
2. Should use light force for best physiologic response.
3. Should be fixed to maintain treatment control.
4. Should be long acting to decrease the number of appointments.
5. Shortest overall treatment period with a stable correction.

Surgical orthodontic treatment

- As adults do not grow longer, dentofacial orthognathic surgeries are major surgical procedures carried out along with orthodontic therapy to correct dentofacial deformities or severe orofacial disproportions involving maxilla, mandible or both.
- It involves planned fracturing of the facial skeletal parts and repositioning them as required.

RETENTION IN ADULT ORTHODONTICS

- Retention mechanics should be a part of the original treatment plan.
- It may include removable retainers, operative procedures, and/ fixed retention.
- The general principles of retention applies for adults patients too.

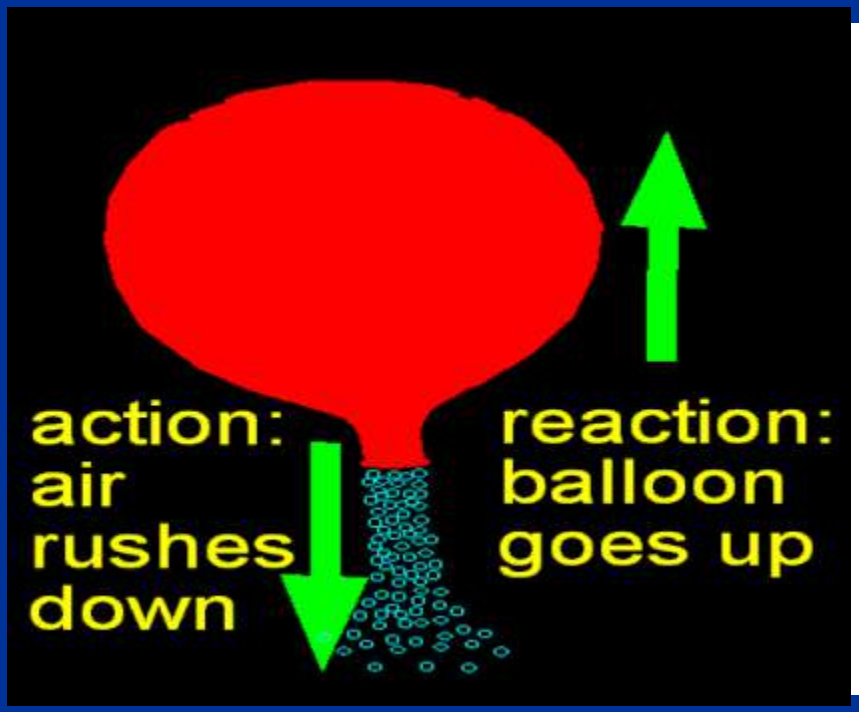
SUMMARY

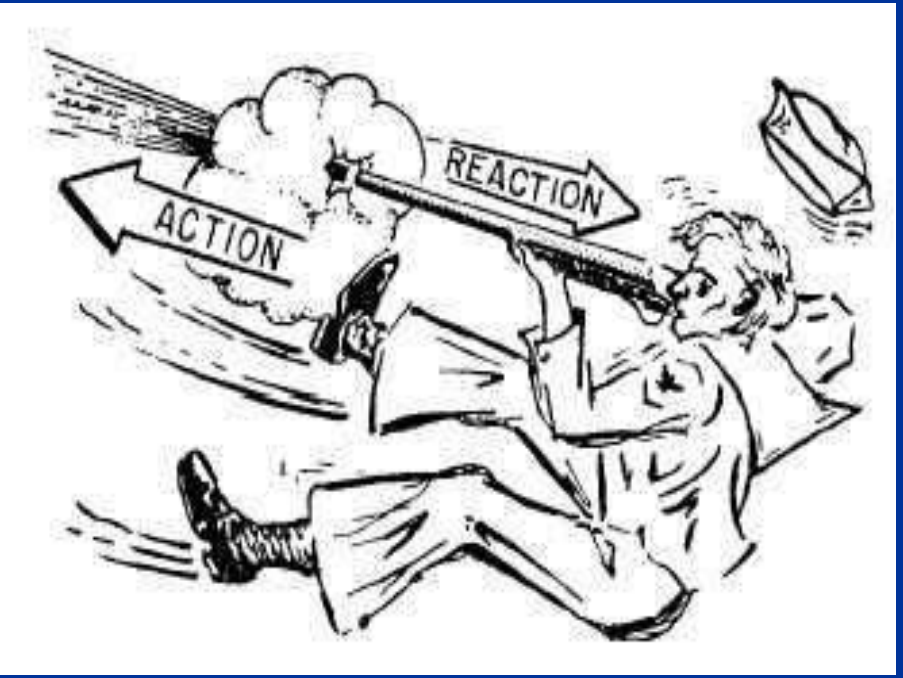
- INTRODUCTION & DEFINITION
- REASONS FOR RISE IN ADULT ORTHODONTIC PATIENTS
- INDICATION FOR ADULT ORTHODONTICS
- CONTRAINDICATION OF ADULT ORTHODONTICS
- AGE CHANGES IN PDL
- COMPREHENSIVE & ADJUNCTIVE TREATMENT IN ADULT ORTHODONTICS

ANCHORAGE

NEWTON'S third law of motion :

" Every action has an equal and opposite reaction."





Definition

According to ***White and Gardiner*** anchorage is the site of delivery from which a force is exerted.

According to ***Graber*** anchorage is defined as the nature and degree of resistance to displacement offered by an anatomic unit for the purpose of effecting tooth movement.

SOURCES OF ANCHORAGE

These are anatomical units and /or regions which are used for the purpose of providing the resistance to movement, i.e. anchorage. These are further classified into two groups depending upon their location-

- *Intra oral sources*
- *Extra oral sources*

INTRA ORAL SOURCES

The anchorage units lie within the oral cavity. They include-

1. *Teeth*
2. *Alveolar bone*
3. *Basal bone*
4. *Musculature*

TEETH

- Forces can be exerted from one set of teeth to move certain other teeth.

The anchorage potential of teeth depends upon a number of factors –

1. **Root form** – the root in cross section can be either round , flat(mesiodistally) or triangular.

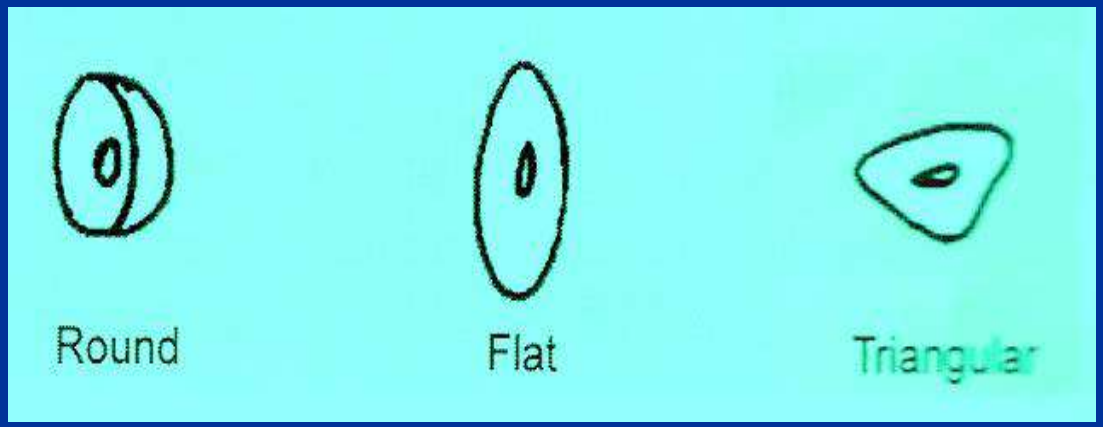
   The distribution and direction of periodontal fibers also affects anchorage.

   Round roots offer least anchorage because they have only half of their periodontal fibers stressed in any given direction.

Mesiodistally flat roots resist mesodistal movement better as compared to labiolingual movement as more number of fibers are activated on flatter surfaces.

Triangular roots like those of canines offer greater anchorage.

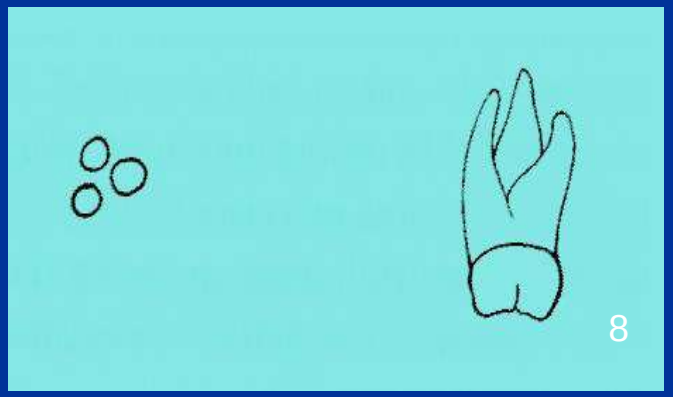
The tripod arrangement of roots like that seen on maxillary molars also aids in increasing anchorage. The round palatal root resists extrusion and the two flat buccal roots resist intrusion and mesiodistal stresses



2. **Root size** – the larger or longer the roots the more their anchorage potential. E.g.; maxillary canines offer great anchorage

3. **Number of roots** – Multirooted teeth provide greater anchorage as compared to single rooted teeth with similar root length

4. **Axial inclination of the tooth** - when the tooth is inclined in the opposite direction to that of the force applied it provides greater anchorage.



5. **Root formation** - teeth with incomplete root formation are easier to move and are able to provide lesser anchorage.

6. **Contact points** - teeth with intact contacts and /or broad contact provide greater anchorage.

7. **Intercuspation** – good intercuspaion leads to greater anchorage potential. This is because teeth in one jaw are prevented from moving because of the contact with those of opposing jaw.
8. **Ankylosed Teeth** – attached directly to bone hence lack periodontal ligaments. Orthodontic tooth movement of such tooth is not possible so they can serve as excellent anchor wherever possible

Multirooted > single rooted

Longer rooted > shorter rooted

Triangular shaped root > conical or ovoid root

Larger surface area > smaller surface area

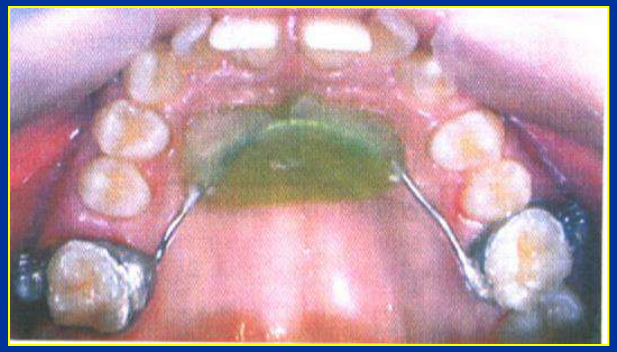
ALVEOLAR BONE

- Alveolar bone: surrounds the Tooth
- Within limits the alveolar bone resists deformation. This can be seen from the rearrangement of trabecular pattern with the alveolar bone.
- Once the forces generated exceed those that can be resisted by the bone, it permits tooth movement by bone remodeling.
- Less dense bone offers less anchorage than mature bone.

BASAL BONE

Certain areas of the basal bone like the hard palate and the lingual surfaces of the mandible in the anterior region can be used to augment the anchorage.

The Nance palatal button makes use of the hard palate to provide resistance to the mesial movement of the maxillary molars.

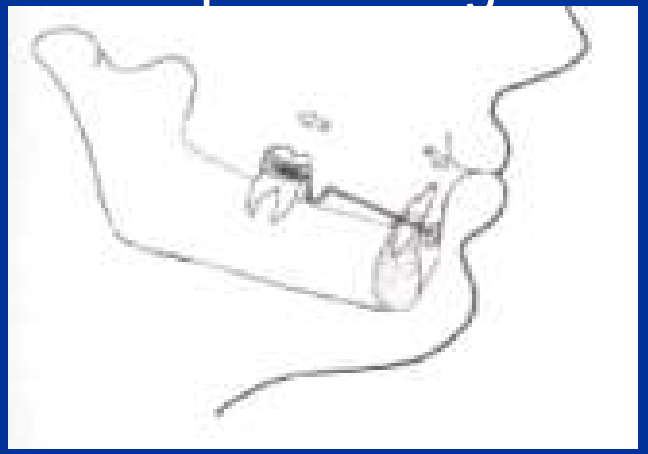


MUSCULATURE

Under normal circumstances the perioral musculature plays and important part in the growth and development of the dental arches.

Hypo tonicity of the perioral musculature might lead to spacing and flaring of anterior teeth. The hyper tonicity of the same muscles has the reverse effect.

Lip bumper is an appliance that makes use of the tonicity of the lip musculature and enhances the anchorage potential of the mandibiular molars preventing their mesial movement

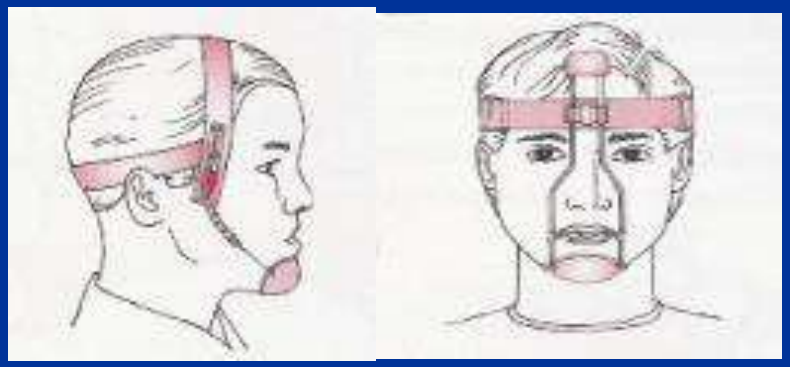


EXTRAORAL ANCHORAGE

- Anchorage units are situated outside the oral cavity.

- The extraoral structures most frequently used are at the cervical region (as with the use of the cervical pull head gear) , the occiput (as with the occiput pull head gear), the forehead and the chin(e.g. the face mask).

- With the use of extraoral anchorage the anchorage units are situated far away from the actual site where the movement is taking place hence there is hardly any chance of any changes taking place in the anchorage units.



- **<u>Disadvantage of extra oral anchorage</u>** – lack of patient cooperation.
- The anchorage assembly is bulky and externally visible making patients conscious of their appearance and effecting the time for which they wear the appliance.
- Any decrease in the number of hours for which the anchorage assembly is worn affects the quality of results achieved.

CLASSIFICATION OF ANCHORAGE

1) According to the manner of force application -

- simple anchorage
- stationary anchorage
- reciprocal anchorage

2) According to jaws involved -

- Intramaxillary
- Intermaxillary

3) According to the site of anchorage –

- Intraoral
- Extraoral a. cervical
  b. occipital
  c. cranial
  d. facial
- Muscular

4) According to the number of anchorage units-

- Single or primary anchorage
- Compound anchorage
- Multiple or reinforced anchorage

5) White and Gardner classified anchorage into six categories as-

1. Simple
2. Stationary
3. Reciprocal
4. Reinforced
5. Intermaxillary
6. Extra oral

INTAORAL ANCHORAGE

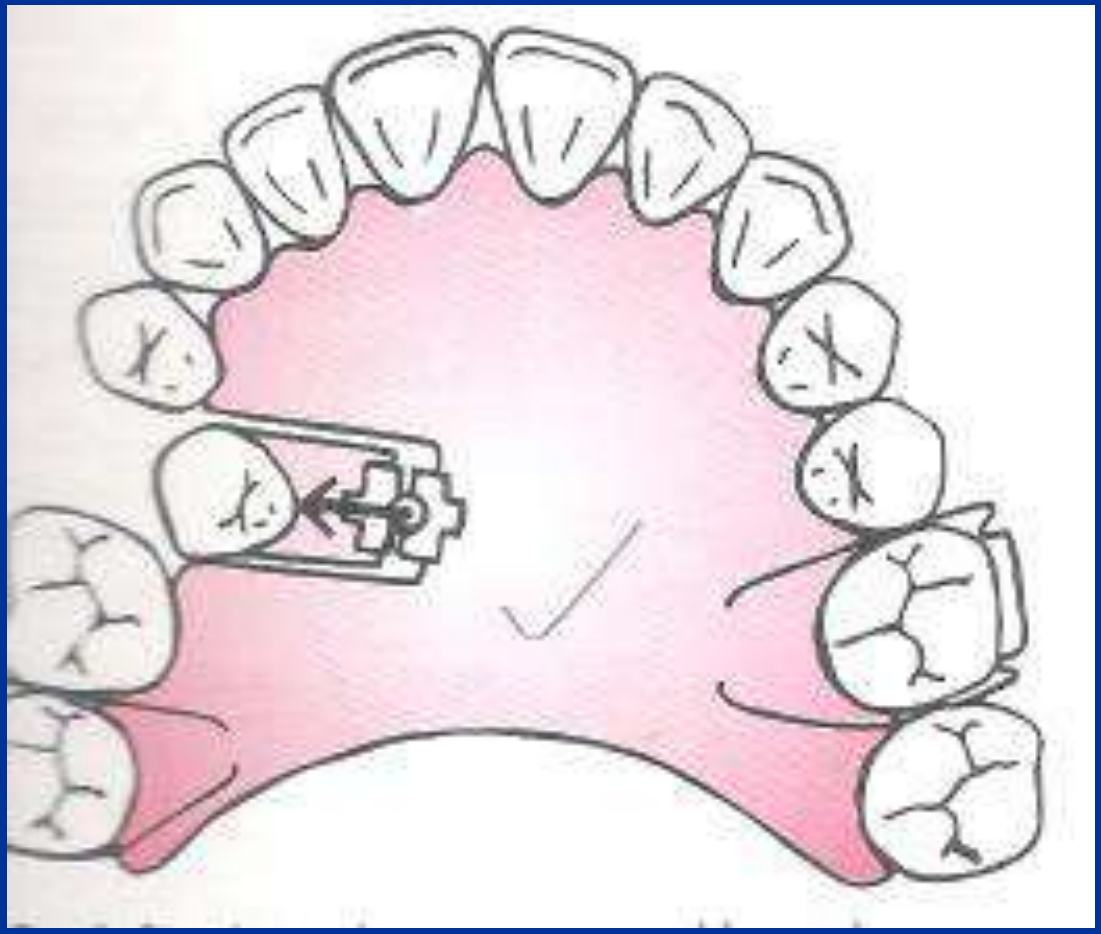
- Anchorage in which all the resistance units are situated within the oral cavity is termed as intra oral anchorage.
- E.g. teeth, palate and lingual alveolar bone of mandible
- It can be further divided into intermaxillary and intramaxillary anchorage depending upon the location of the anchorage providing elements between the two jaws.

SIMPLE ANCHORAGE

- Dental anchorage in which the manner and application of force tends to displace or change axial inclination of the tooth or teeth that form the anchorage unit in the plane of space in which the force is being applied.

- In other words resistance of anchorage unit to tipping is utilized to move another tooth or teeth.

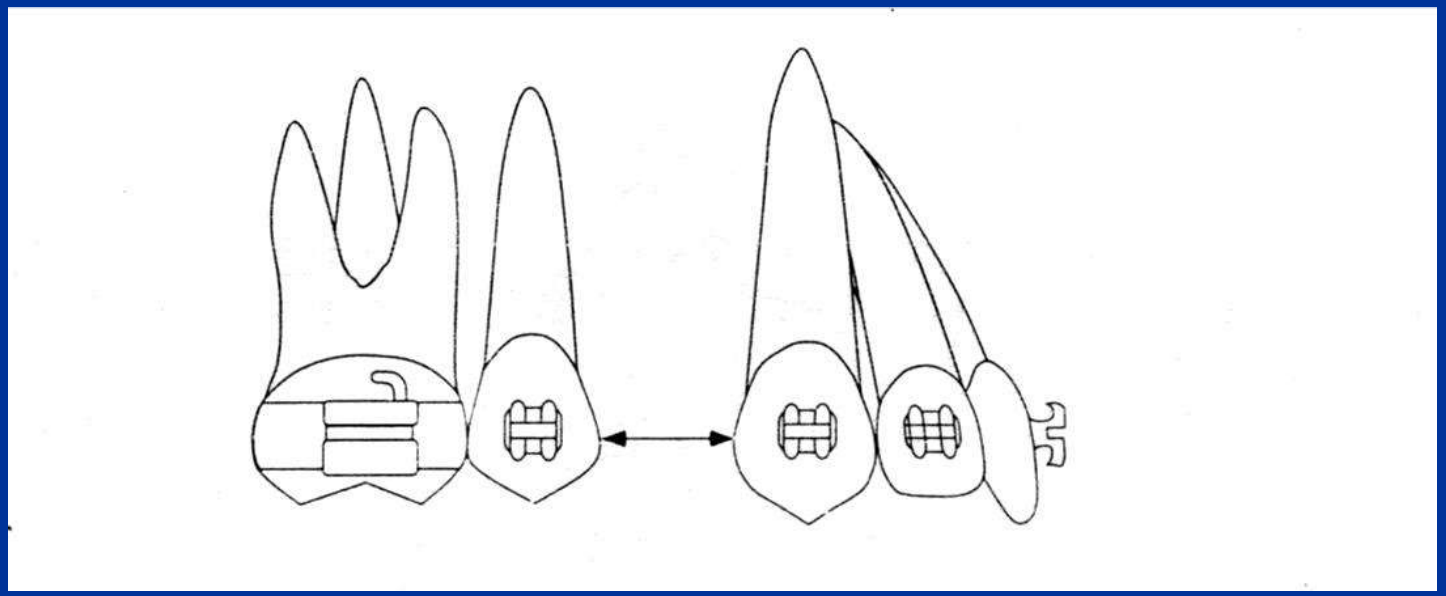
- Anterior retraction with the help of a Hawley's appliance or the movement of a single tooth using a screw appliance are examples of simple anchorage.



Simple anchorage – removable appliance incorporation a screw for buccal movement of a palatally placed premolar

STATIONARY ANCHORAGE

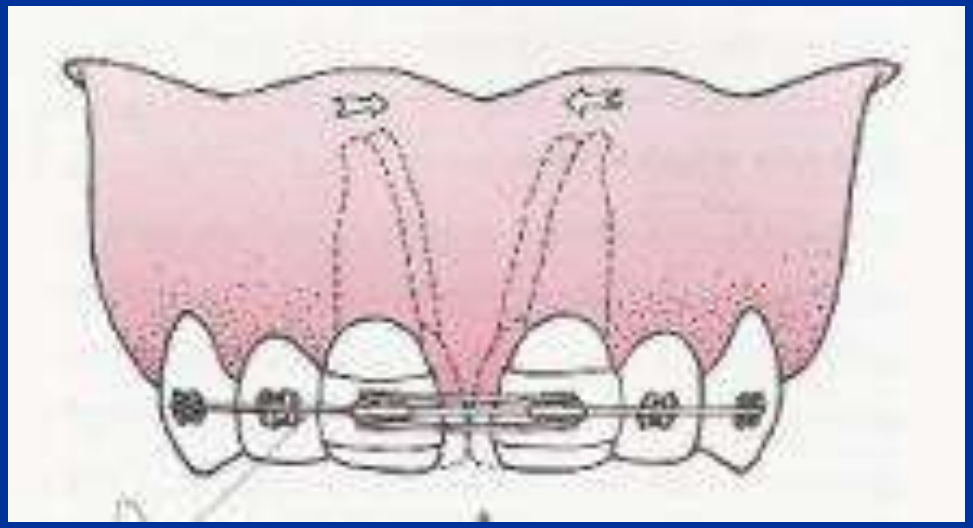
- Stationary anchorage is said to exist when the application of force tends to displace the anchorage units bodily in the plane of space in which the force is being applied. The anchorage potential of teeth being moved bodily is considerably greater as compared to teeth being moved using a tipping force.



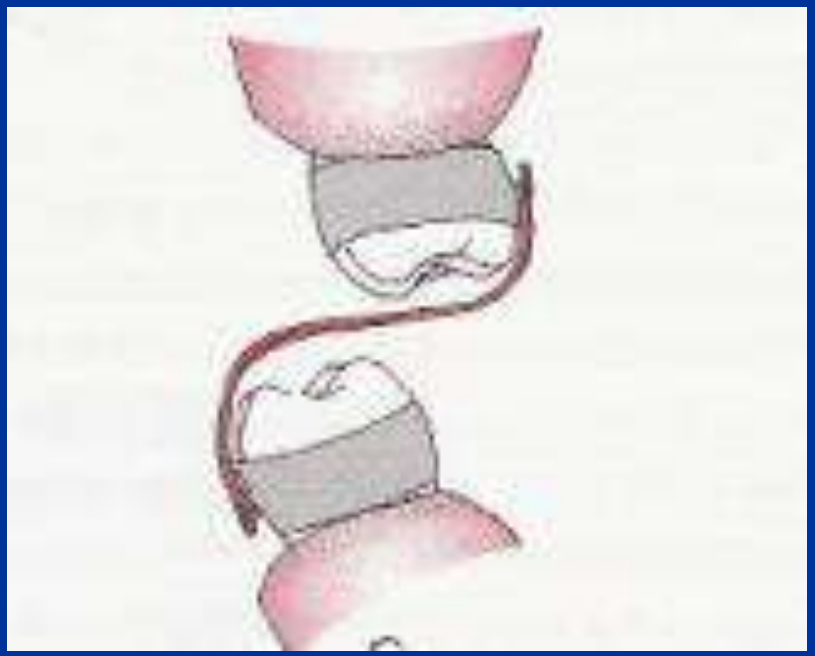
RECIPROCAL ANCHORAGE

- Reciprocal anchorage is said to exist when two teeth or two sets of teeth move to an equal extent in an opposite direction. Here the root surface area of the so called anchorage units is equal to that of the teeth to be moved. The effect of the forces exerted is equal, i.e. the two sets of teeth are displaced in the opposing direction but by the same amount.

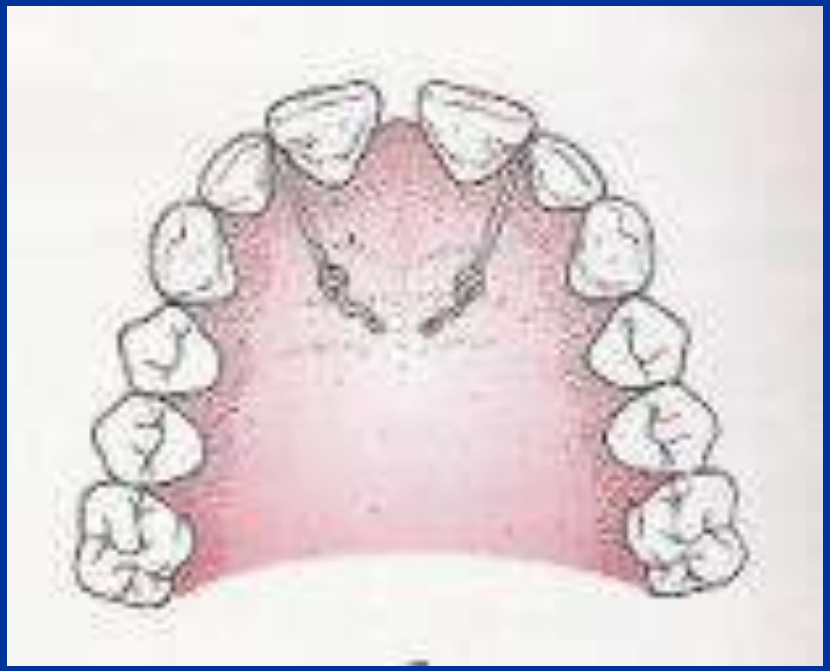
- Examples are - cross elastics to correct molar cross bite, arch expansion using a midline screw and the molar rotator



Reciprocal anchorage – correction of midline diastema using elastics



Reciprocal anchorage – cross bite elastics for correction of single tooth posterior cross bite

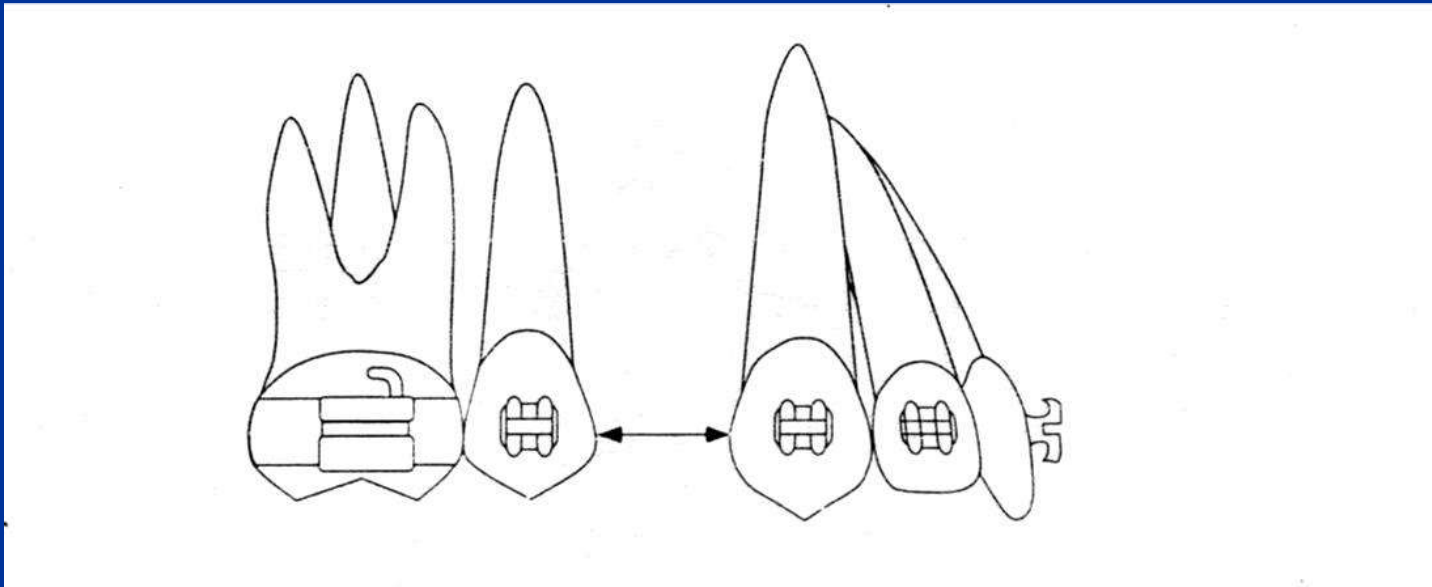


Reciprocal anchorage – finger springs used to close a midline diastema

Reciprocal anchorage – Arch expansion using a removable appliance incorporating a Coffin spring

INTRAMAXILLARY ANCHORAGE

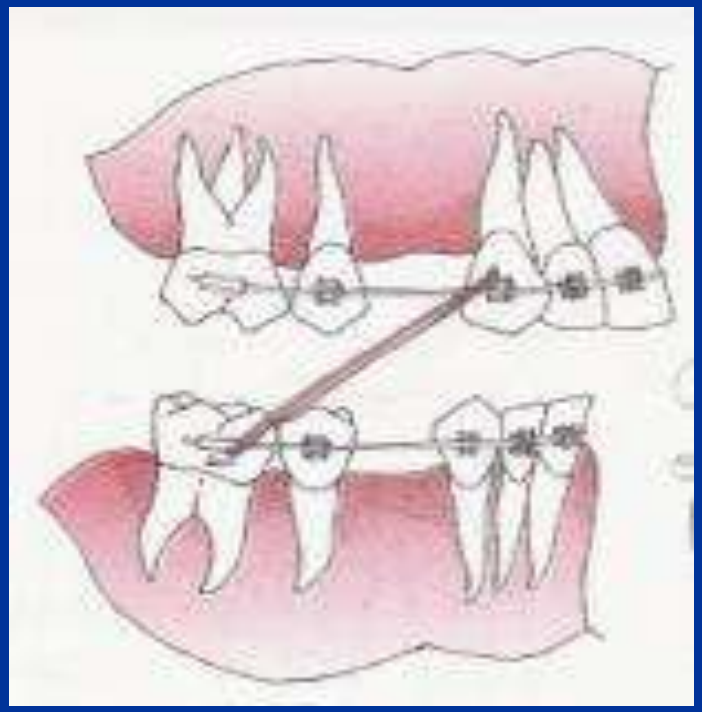
- When all the units offering resistance are situated within the same jaw then anchorage is described as intramaxillary.
- In this type of anchorage the teeth to be moved and the anchorage units are all situated either entirely in the maxillary or mandibular arches.
- For example when elastic chains are used to retract the anterior segment using the posterior teeth as anchorage units.
- Intramaxillary anchorage can be further subdivided into three subtypes depending upon the manner of force application as- simple, stationary and reciprocal

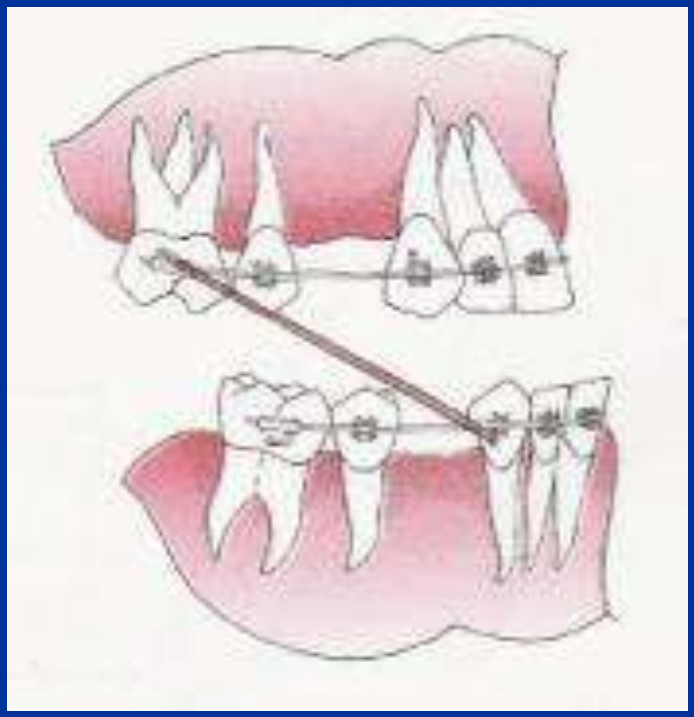


INTERMAXILLARY ANCHORAGE

- Anchorage in which all the resistance units situated in one jaw are used to effect tooth movement in the opposing jaw is called intermaxillary anchorage. Also termed as baker's anchorage.
- E.g. when class 2 elastics are used to retract maxillary anteriors then anchorage units are situated in the mandibular arch.
- It can also be subdivided into three subtypes depending upon the manner of force application –

1. Simple
2. Stationary
3. Reciprocal





Baker's anchorage – Class 2 and class 3 intermaxillary anchorage

PRIMARY ANCHORAGE

- Cases where the tooth to be moved is pitted against a tooth with a greater alveolar support area is said to display primary or single anchorage.
- For example, a molar being used to retract a premolar.

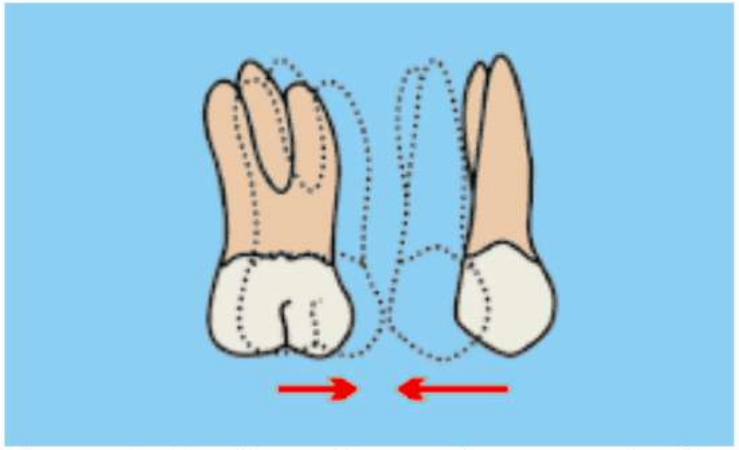


Figure 3: simple anchorage, such as movement of one tooth against another, closing the space by movement of both teeth. The larger tooth will move less than the tooth with the smaller root surface (From (Naish et al., 2015).

COMPOUND ANCHORAGE

- This type of anchorage provide for use of more teeth with greater anchorage potential to move a tooth or group of teeth with lesser support.

- For example, retracting incisors using loop mechanics in the fixed orthodontic appliances.

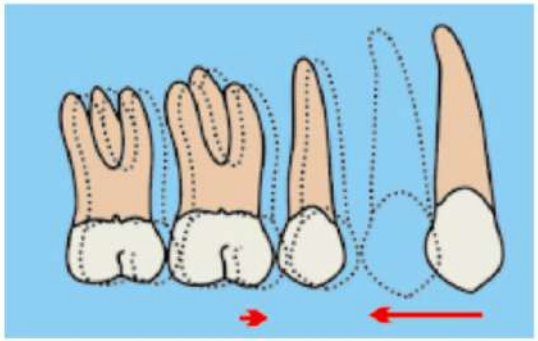
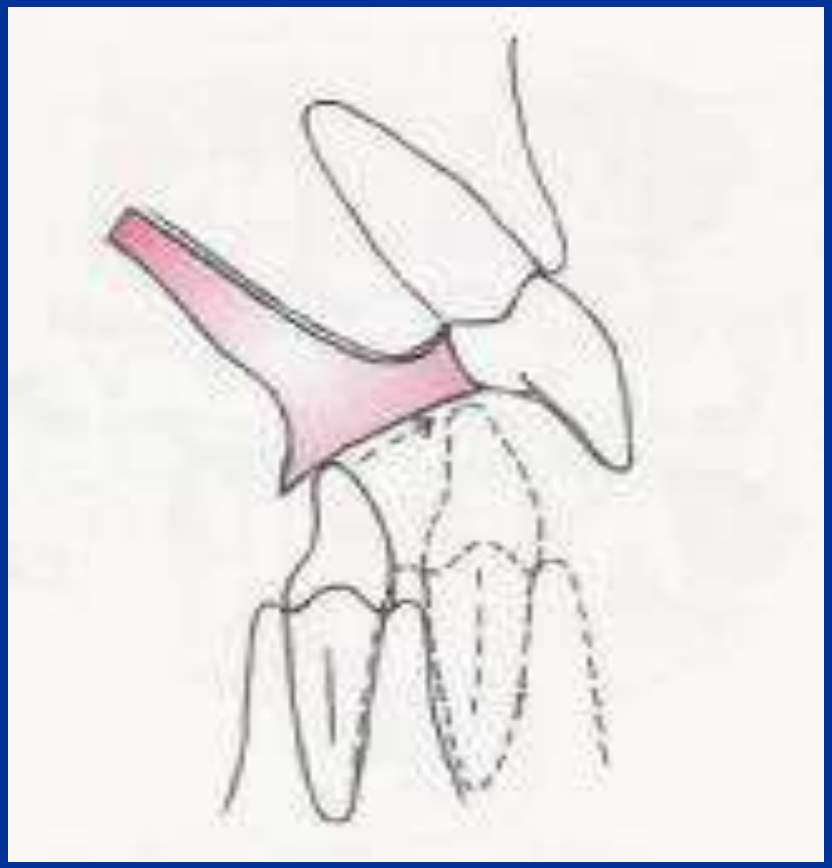


Figure 4: compound anchorage. This is often used when retracting the canine, using the second premolar, first and second molars as an anchorage block to prevent mesial movement in favour of distal movement of the canine. Anterior teeth can be retracted one by one using compound anchorage. From (Naish et al., 2015).

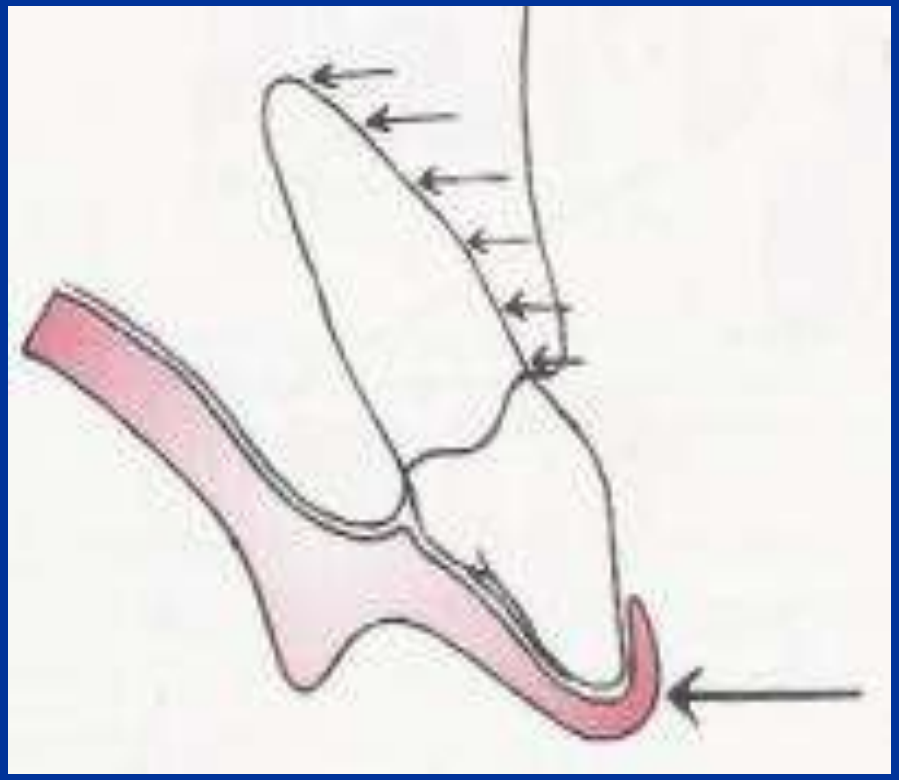
REINFORCED ANCHORAGE

- Anchorage in which more than one type of resistance unit is utilized is termed as reinforced anchorage.

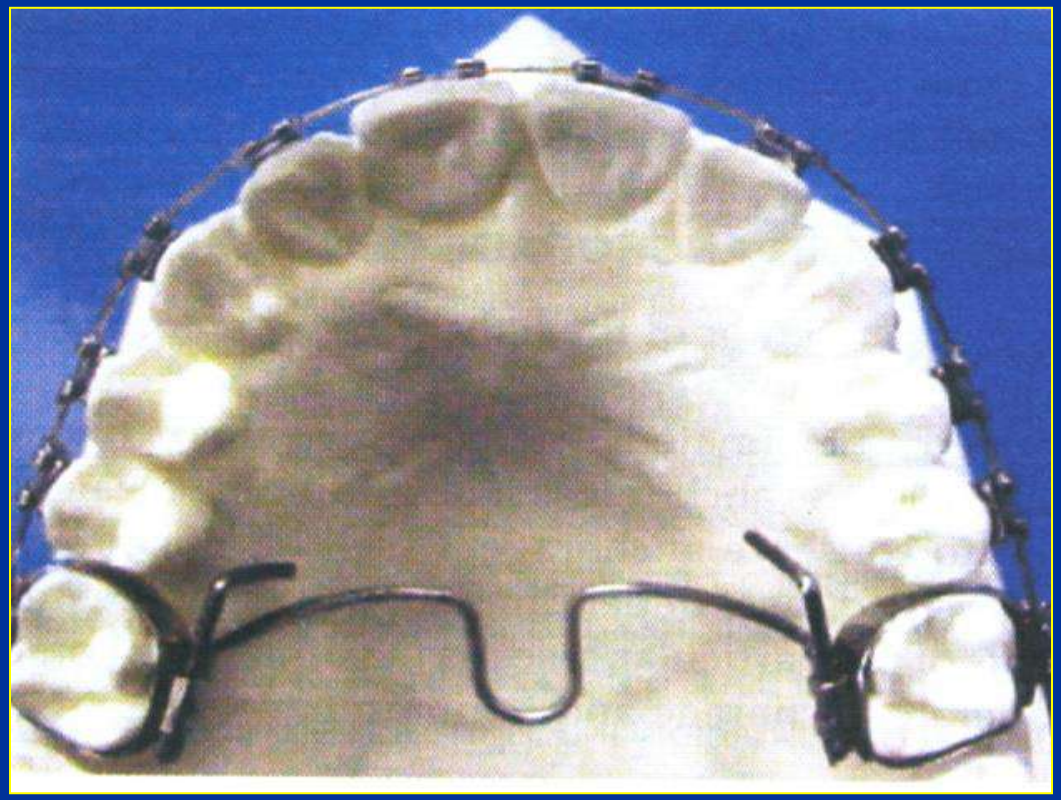
A. Extraoral forces to augment anchorage- forces generated from extraoral areas such as cranium, back of the neck and face can be used to reinforce anchorage.



Upper anterior inclined plane- by which a distal force is applied on the maxillary teeth thus reinforcing maxillary anchorage.



Reinforced anchorage – Sved appliance



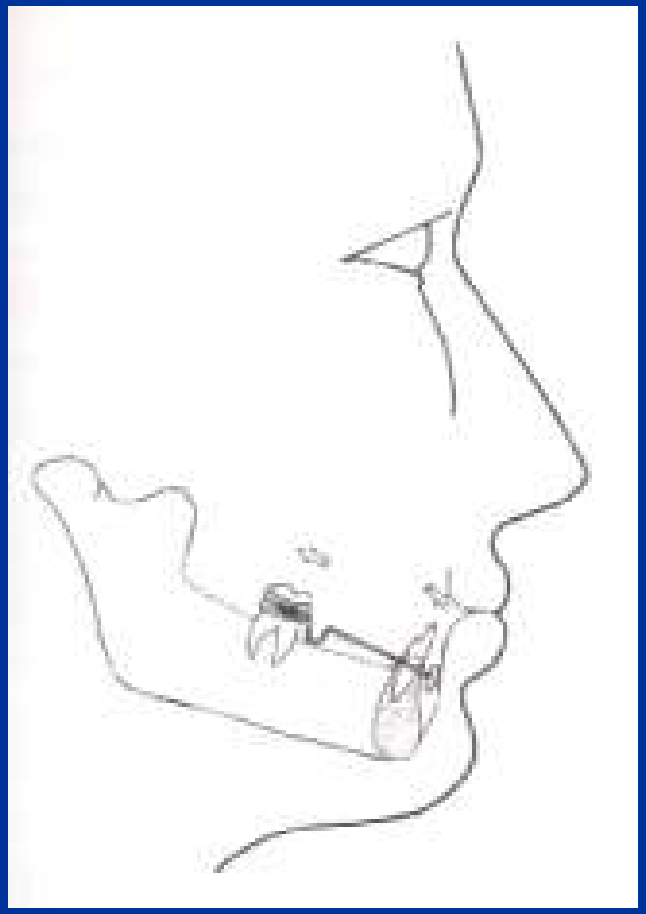
Reinforced anchorage- Transpalatal arch

Transpalatal arch – this is a wire that spans the palate in a transverse direction connecting first permanent molars of either side.

MUSCULAR ANCHORAGE

- The perioral musculature is not only very strong but also resilient. The forces generated by the musculature can sometimes be used to bring about tooth movement.

- The lip bumper appliance may be used to distalize the mandibular first molars or the transpalatal arch when kept away from the palate may cause intrusion of the maxillary first molars to which it is attached.



Muscular anchorage – lip bumper utilizing muscular anchorage.

ANCHORAGE PLANNING

- At the time of determining the space requirement to resolve the malocclusion in a given case it is essential to plan for space that is likely to be lost due to the invariable movement of the anchor teeth.

The anchorage requirements depends on the following –

a.) **Number of teeth to be moved :** the greater the number of teeth being moved the greater is the anchorage demand. Moving teeth in segments as in retracting the canine separately rather than retracting the complete anterior segment together will decrease the load on the anchor teeth.

b.) **Type of teeth to be moved:** teeth with large flat roots and/or more than one root exert more load on the anchor teeth.

Thus it is more difficult to move a canine as compared to an incisor or a molar compared to a premolar

c.) **Type of tooth movement :** moving teeth bodily requires more force as compared to tipping the same teeth.

d.) **Periodontal condition :** teeth with decreased bone support or periodontally compromised teeth are easier to move as compared to healthy teeth attached to a strong periodontium

e.) **Duration of tooth movement :** prolonged treatment time places more strain on the anchor teeth. Short term treatment might bring about negligible amount of change in the anchor teeth whereas the same teeth might not be able to withstand the same forces adequately if the treatment becomes prolonged.

CLASSIFYING ANCHORAGE REQUIREMENTS

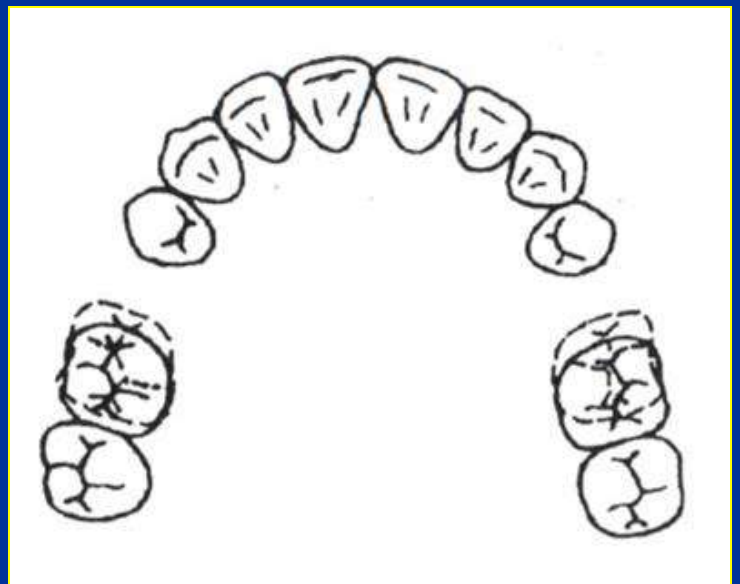
- Beggs estimated that one third of the extraction space is lost as anchor loss if no additional means are used to conserve anchorage.

- In spite of precaution taken certain amount of unwanted movement of the anchor teeth invariably occurs during orthodontic treatment. Such unwanted movements of anchor teeth is called ‘ **anchorage loss**’

- Based on the anchorage loss that is permissible the anchorage demand of an extraction case can be of three types -

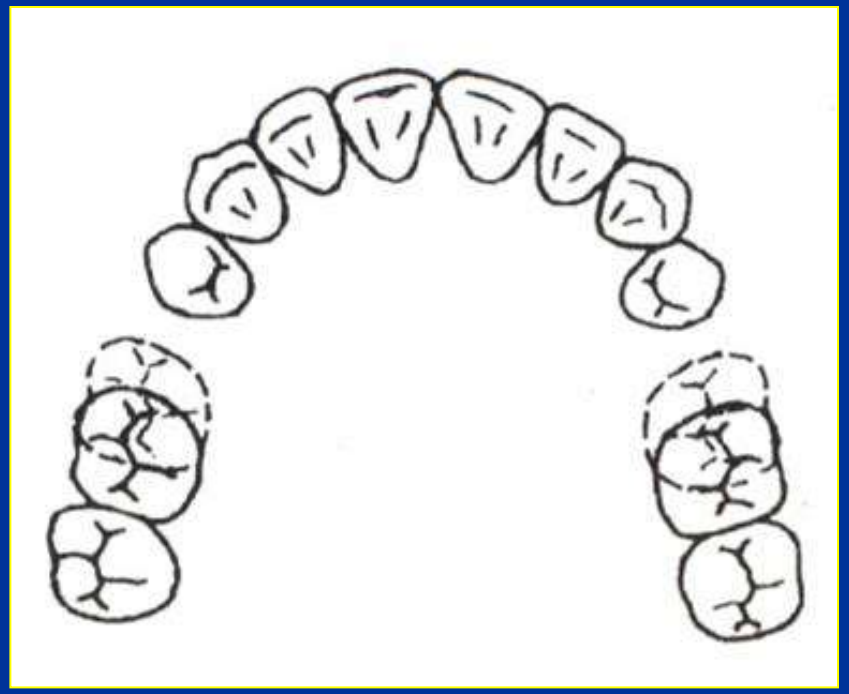
1. Maximum anchorage
2. Moderate anchorage
3. Minimum anchorage

- **MAXIMUM ANCHORAGE :** These include cases where the anchorage demand is critical or in other words maximum space should be required to correct the malocclusion proper and anchor loss should be minimum.
- In such cases ***no more than one fourth*** the extraction space can be lost to the forward movement of the anchor teeth,i.e. anchor loss.
- All care should be taken to preserve anchorage and the use of additional methods to augment anchorage should be planned in the treatment plan.

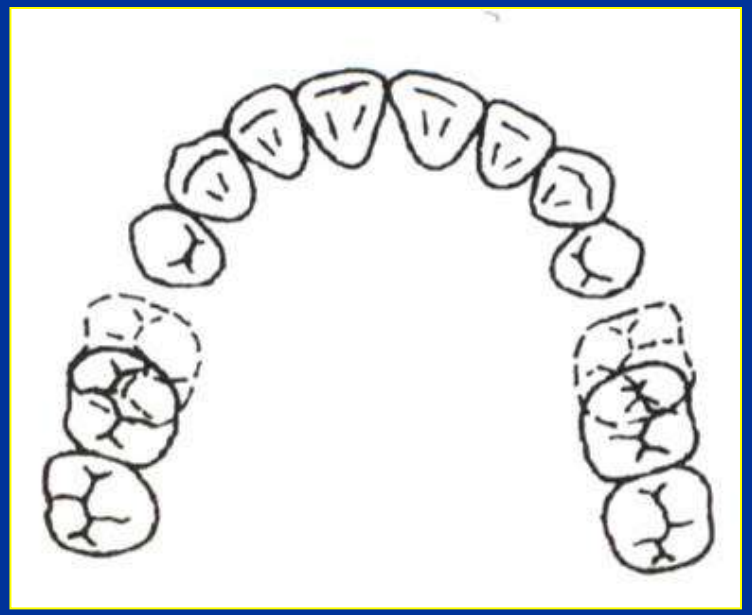


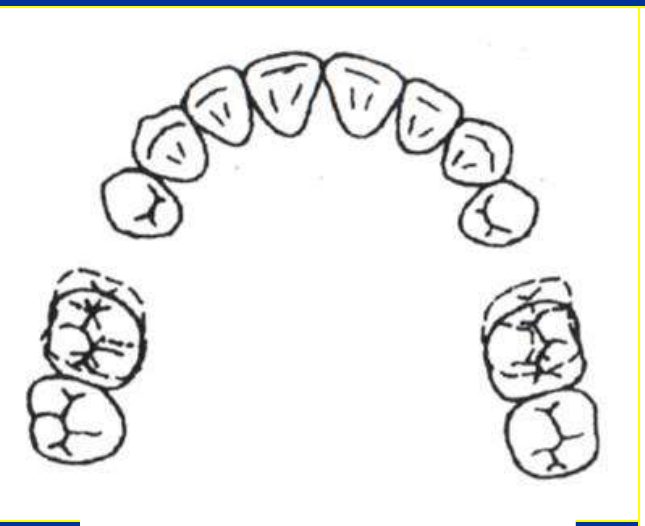
- **MODERATE ANCHORAGE :**

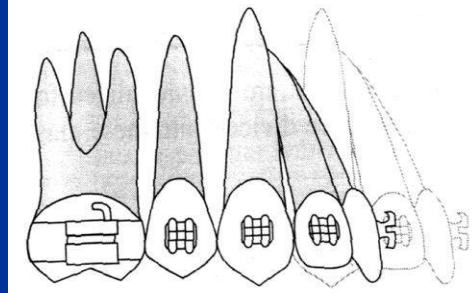
  These are cases where the anchor teeth can be allowed to move forward into the extraction space for ***one fourth to half*** the total extraction space. Reinforcing the anchorage might not be required.



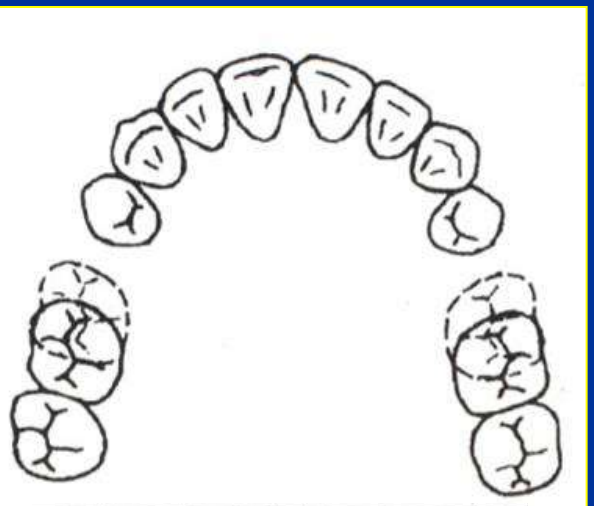
- **MINIMUM ANCHORAGE :** These include cases where a very less amount (less than half) of the extraction space is required for the actual resolution of the malocclusion. The rest of the space,i.e. ***more than half*** the extraction space needs to be closed by bringing the anchor teeth forward or to anchor loss

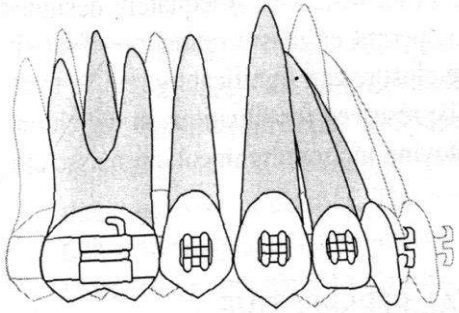




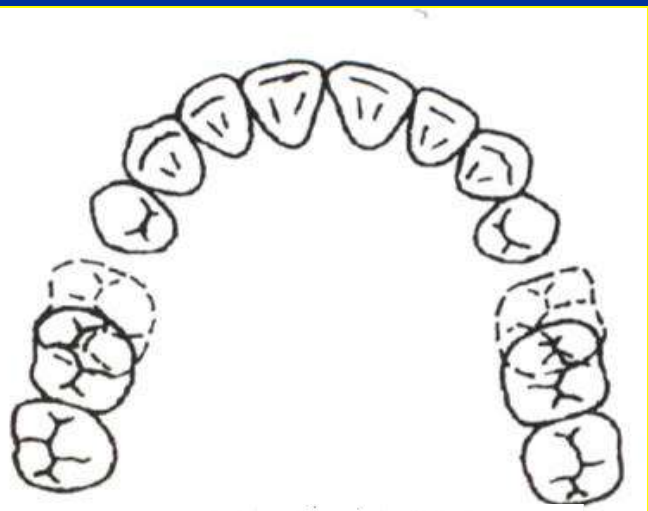


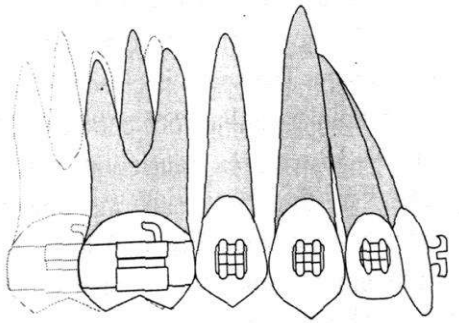
Group A Anchorage



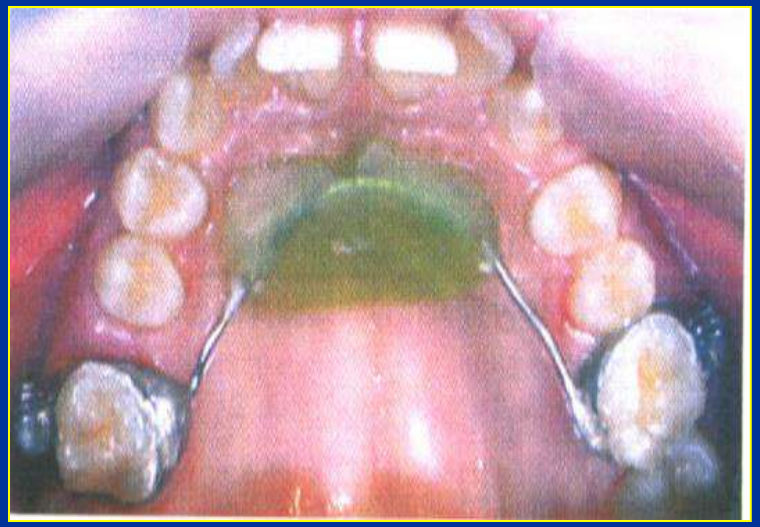


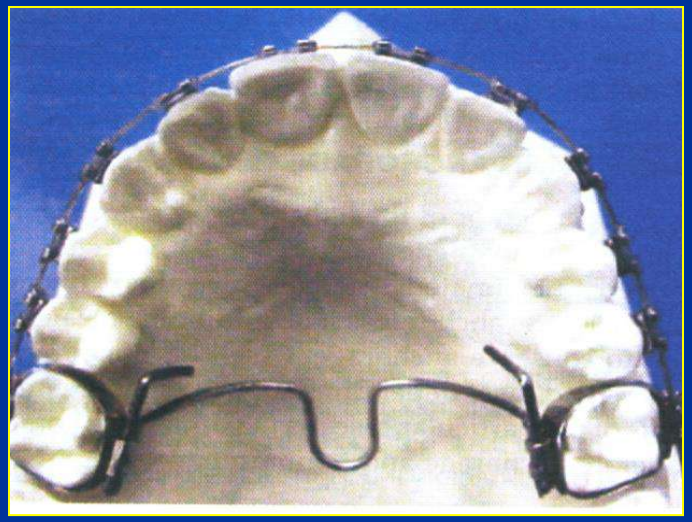
Group B Anchorage





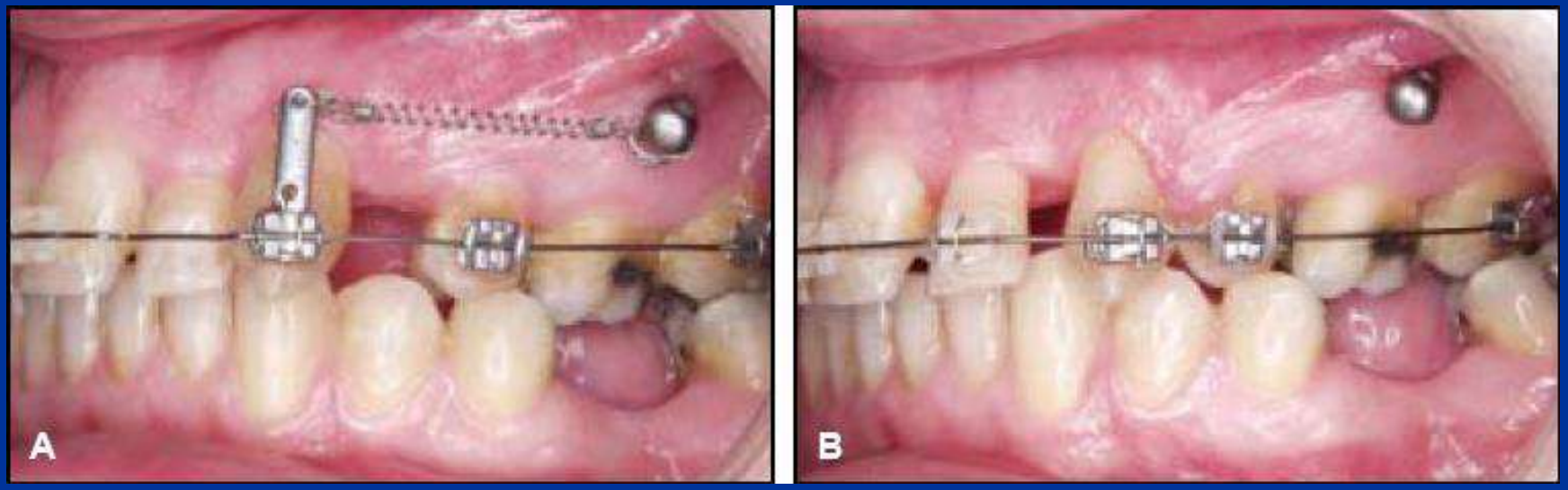
Group C Anchorage

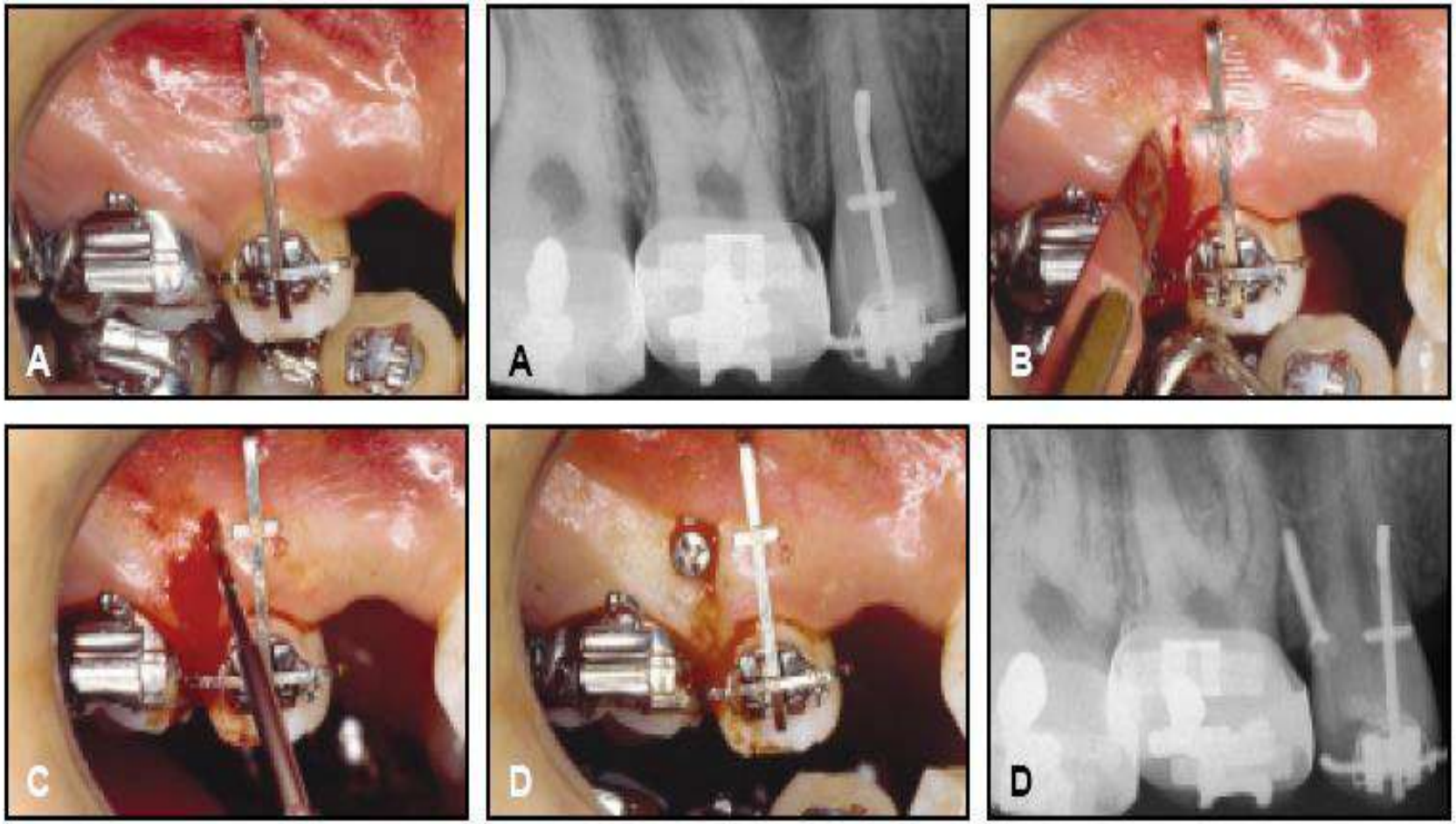




Absolute Anchorage

- Mini implants





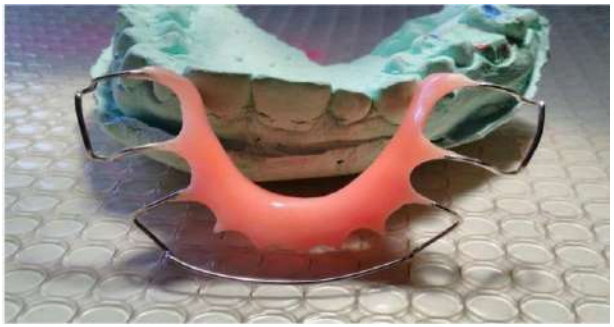
Surgical procedure. A. Insertion site measured from guide bar on bite-wing x-ray. B. Stab incision for flap reflection. C. Drilling through cortical bone only. D. Micro-implant insertion.

- Define and classify Anchorage
- Anchor loss
- Bakers Anchorage
- Anchorage planning
- Sources of Anchorage
- Types of Anchorage

FIXED APPLIANCES

INTRODUCTION

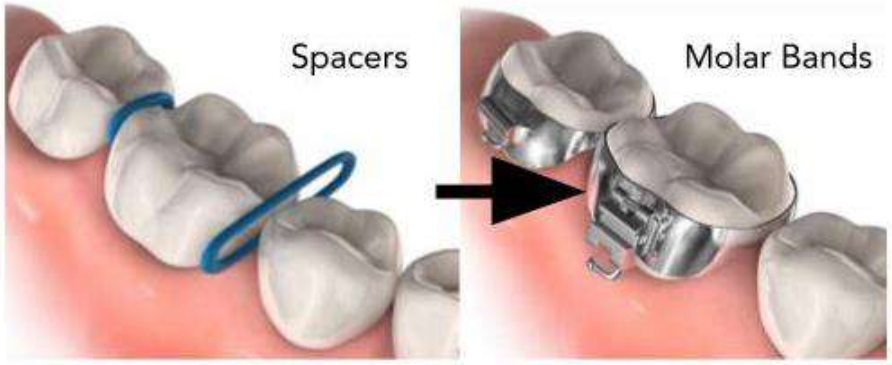
- **FIXED APPLIANCES** – The appliances that are fixed or fitted onto the tooth by the operator & cannot be removed by the patient at will are called fixed appliances.



- Unlike removable appliances that are capable of only tipping type of tooth movements, fixed appliances can bring about various other types of tooth movements including bodily movement, rotation, tipping, intrusion, extrusion & even root movements.

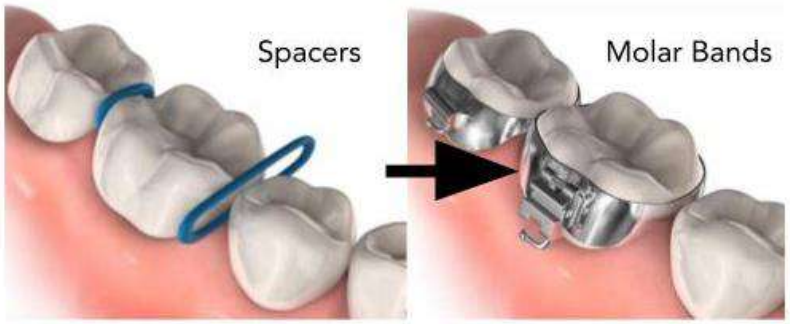
METHODS OF FIXING ATTACHMENTS ONTO THE TEETH-

- Various attachments are used in fixed appliance therapy such as brackets and molar tubes can be fixed directly onto the teeth with composite adhesives or can be attached to metallic bands that are cemented onto the teeth.



- The method of fixing attachments directly to the teeth is called **BONDING**
- Whenever the attachments are fixed to bands, which are cemented around the teeth, the technique is referred to as **BANDING**

BANDING-



- Banding involves the use of thin stainless steel strips called bands that are pinched tightly around the teeth and then cemented to the teeth.
- The stainless steel tape is available in different widths and thickness to suit different teeth.
- While the molar band material is wider and stiffer, the anterior band material is relatively thinner and narrower in width.
- The outer surface of band material is smooth and glossy while the inner surface is comparatively rough and dull, so as to aid in retention of the cement.

Indications Of Banding-

1)Banding is preferred over bonding in case of posterior teeth. The banded attachments are better capable of resisting occlusal forces than bonded attachments.

2)It is preferable to band a tooth that requires buccal as well as lingual attachments.

3)Bands are better likely to resist heavy forces, as in case of extraoral devices such as head gears.

4)Although it is possible to bond attachments on teeth that have porcelain or gold restorations or crowns, banding is preferred in these cases.

5)It is preferable to band teeth that show recurrent breakage of the bonded attachments due to bond failure.

STEPS IN BANDING

a)Separation of teeth

b)Selection of band material

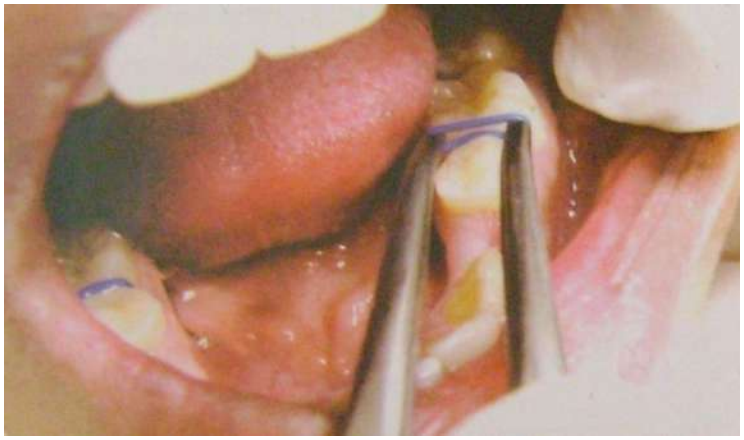
c)Pinching of band

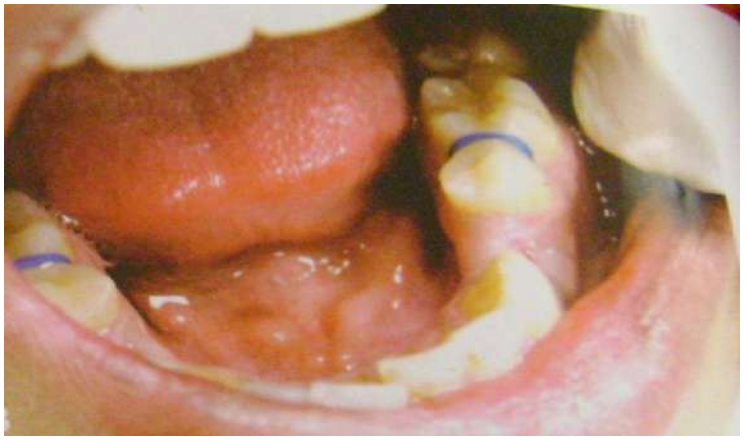
d)Fixing the attachments

e)Cementation of the band

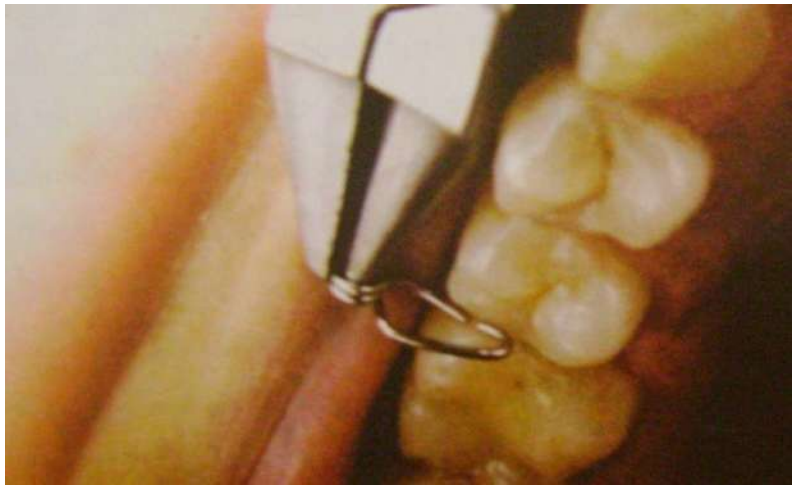
a)Separation of teeth

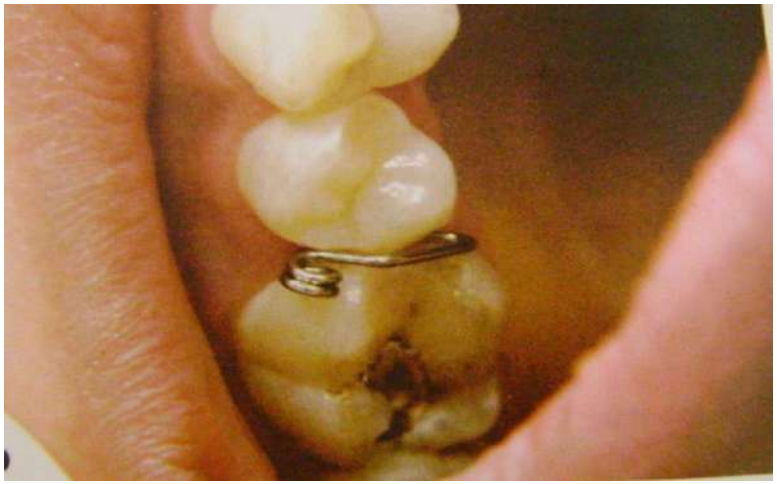
- Due to the presence of tight inter-dental contact between the teeth, it may not be possible to force the band past the contact area.
- It is not advisable to force the band through a tight inter-dental contact, as it is uncomfortable for the patient and also difficult for the operator.
- Tight contact should be hence broken using tooth separators prior to band pinching.
- Most separators have to be left in the mouth for 24 hours or more to bring about sufficient separation of the inter-dental contact.





SEPARATORS - PLACEMENT OF RING SEPARATORS





SEPARATORS- PLACEMENT OF KESLING SEPARATORS

b)Selection of band material- based on which tooth is being banded, the band material of appropriate thickness and width is selected.

c)Pinching of the band- band material of adequate length is taken and the two ends are welded together. The band is now passed through the separated inter-dental contact around the tooth to be banded.

- Using band pinching pliers, the band is tightly drawn around the tooth to form a ring. The neck of the band is spot welded to retain the tight fit.

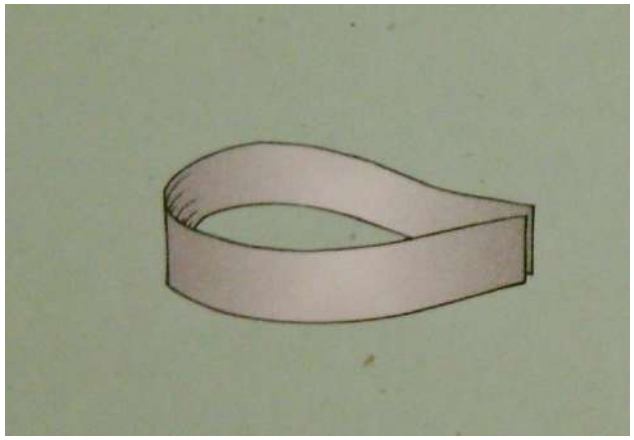
- The excess band material is cut off and the ends are adapted close to the band.
- The bent portion is spot welded and the gingival margins of the band are trimmed to conform to the contour of the gingival margin. The weld spot and rough margins are then smoothened and polished.

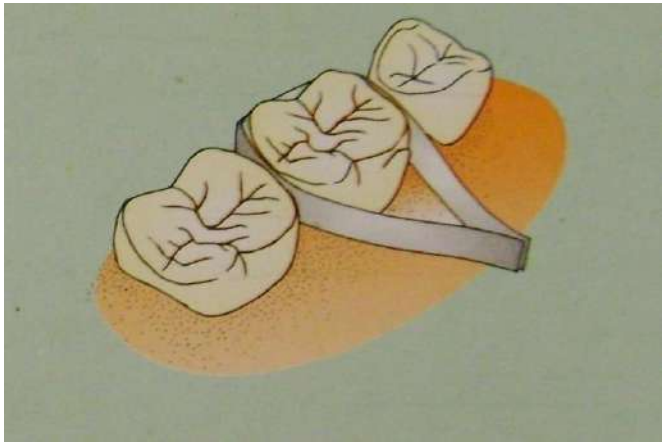
d)Fixing the attachments- once the band pinching is completed, the appropriate attachments are fixed onto the band.

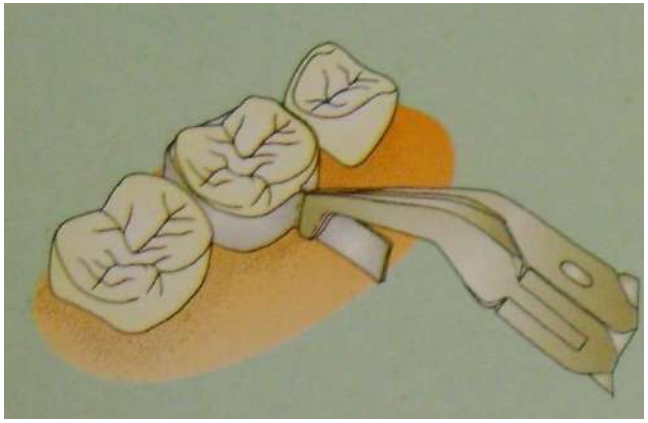
- The attachments include brackets for the anterior teeth and buccal or molar tubes for the posterior teeth.
- The attachments are fixed to the band by spot welding or soldering.

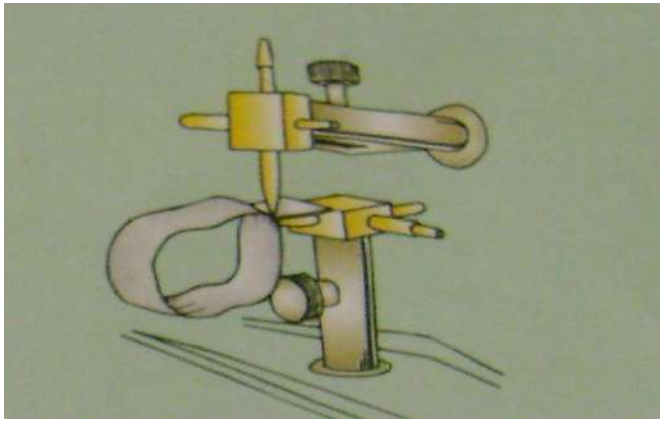
e)Cementation of the band- the final step involves cementation of band around the tooth.

- The inner surface of the band is rough in order to aid in retention.
- During cementation, adequate moisture control is necessary by means of saliva ejectors, and cotton rolls. Cements that can be used include zinc poly-carboxylate, zinc phospate, glass ionomer cement etc.,
- Preformed seamless bands are now available in various sizes.
- They have eleminated the need to pinch custom made bands.







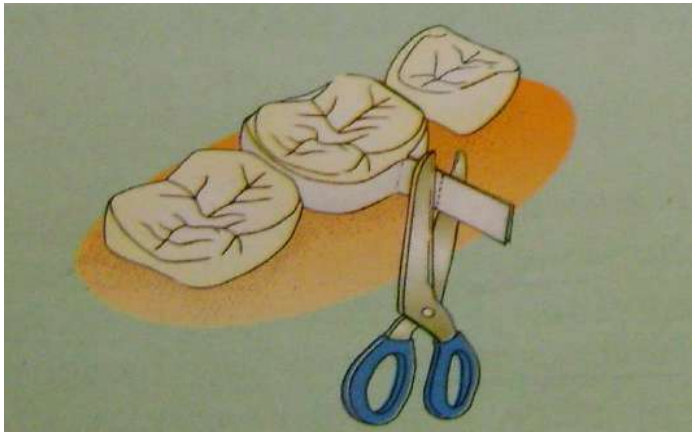


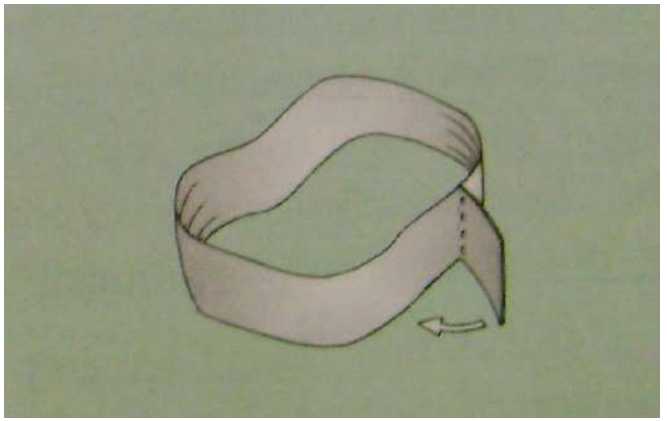
STEPS IN BANDING-

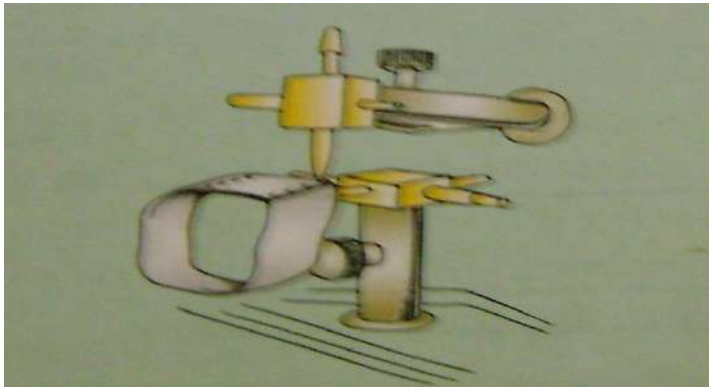
A) STRIP OF BAND MATERIAL FORMED INTO A RING.

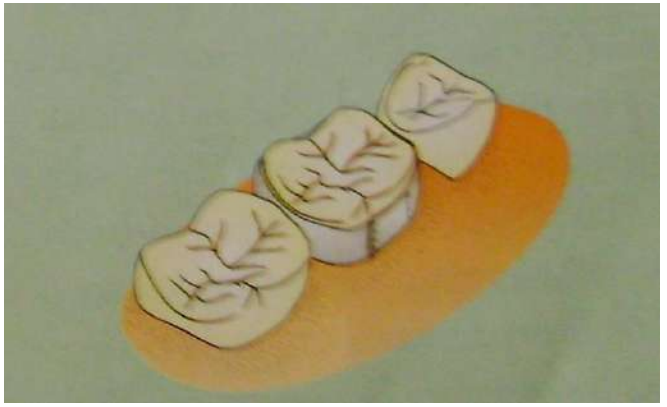
B) & C) BAND IS PLACED AROUND THE TOOTH AND PINCHED.

D) SPOT WELDER USED TO FORM WELD SPOTS









E) EXCESS BAND MATERIAL IS CUT OFF.

F)&G) THE REMAINING BAND MATERIAL IS ADAPTED ALONG THE CONTOURS OF THE BAND AND IS AGAIN SPOT WELDED.

H) BAND CEMENTED IN PLACE

BONDING

- The method of fixing attachments directly over the enamel using adhesive resins is called bonding. The elimination of bands greatly enhances esthetics and oral hygiene maintenance and has led to its popularity over banding.

- This procedure of direct attachment on the tooth surface requires pretreatment of enamel. The most accepted pretreatment method is acid-etching technique. This technique was in introduced in 1955 by Buonocore.

- Pretreatment of enamel by acid-etch technique helps in the following ways-

1)Enhances the surface energy-

The etching of the enamel helps in removing surface deposits and organic materials that are found on the surface of the teeth. It also increases the surface energy therby enhancing the wettability of the enamel.

2)Enhances the surface area and porosity-

- The etching of the enamel increases the surface area and porosity of the enamel thus increasing the bond strength. The enamel is etched to a depth of 20-25 microns.
- Advantages of bonding-

1)It is esthetically superior

2)It is faster to bond than to pinch bands around the teeth

)It enables maintenance of better oral hygiene

3)It is possible to bond on teeth that have aberrant shapes or forms. It might be impossible to band such teeth.

4)It is easier to bond than band in case of partially erupted or fractured teeth.

5)The risk of caries under loose bands is eliminated.

6) Interproximal areas are accessible for restoration and proximal stripping.

- Disadvantages of bonding-

1)Bonded attachments are weaker than banded attachments and hence are more prone to bond failure.

2)Bonding involves etching of the enamel with an acid which may lead to enamel loss and an increased risk of demineralization.

3) Enamel fracture can occur during debonding.

- Steps in bonding-

1)The crowns of the teeth to be bonded are cleaned using pumice and bristle brush so as to remove plaque and other organic debris present on the enamel surface.

2)After thorough cleaning, the teeth are washed and dried.

- During the bonding procedure , adequate moisture control should be maintained by the use of saliva ejectors and cotton rolls.
- It is advisable to use cheek retractor to keep the lips and cheeks away from the teeth to be bonded.

3)30-50% phosphoric acid in gel or liquid form is used to etch enamel.

- This etching is usually done for 45-60 seconds, after which the etchant is washed off with water.
- The teeth are then dried and once again isolated using fresh cotton rolls.
- The appearance of etched enamel is described as matte, dull whitish and lightly frosted.

4)Sealant is applied onto the etched enamel surface.

5)Adequate quantity of bonding adhesive is placed on the base of the brackets. The bracket is placed on the tooth and is firmly pressed into position. Excessive adhesive that appear as flash is removed using a scaler.

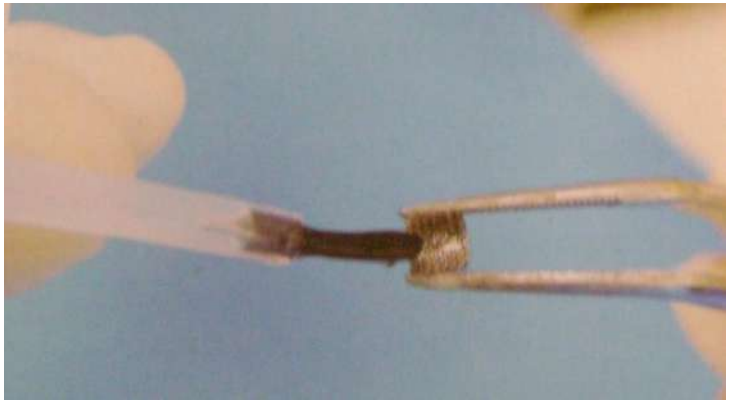
6)The bond is allowed to strengthen for some time before placing the arch wires.

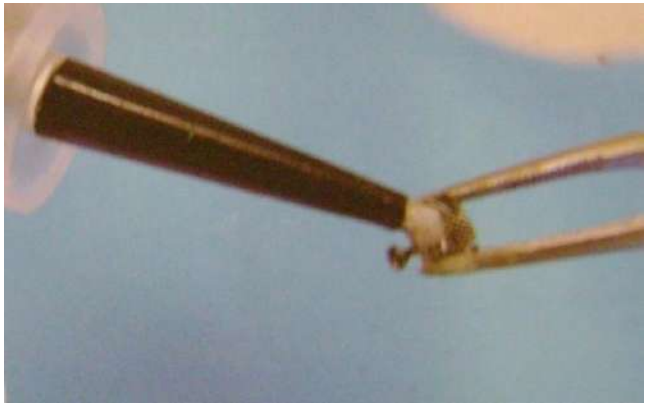
BONDING PROCEDURE-

A)TEETH CLEANED USING PUMICE.

B) & C) 30-35% PHOSPHORIC ACID USED TO ETCH ENAMEL.

D)ETCHANT IS WASHED OFF WITH WATER

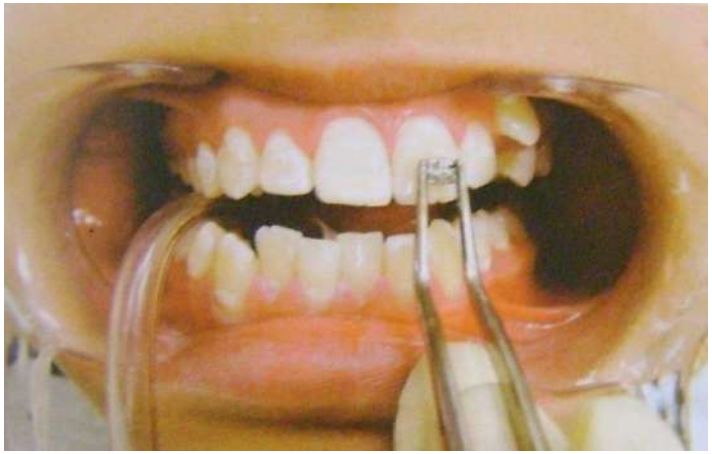


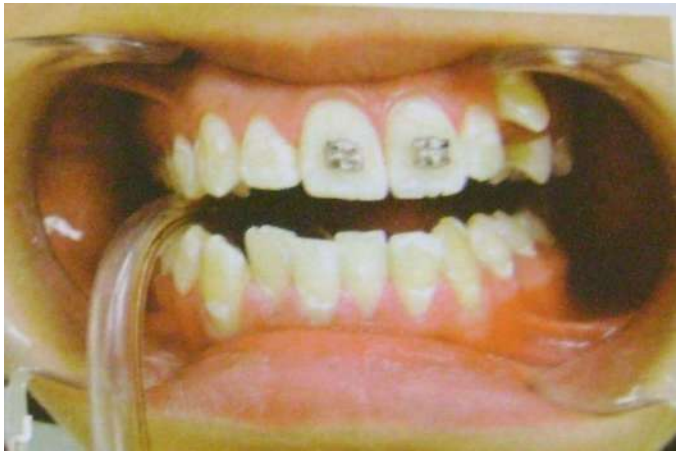


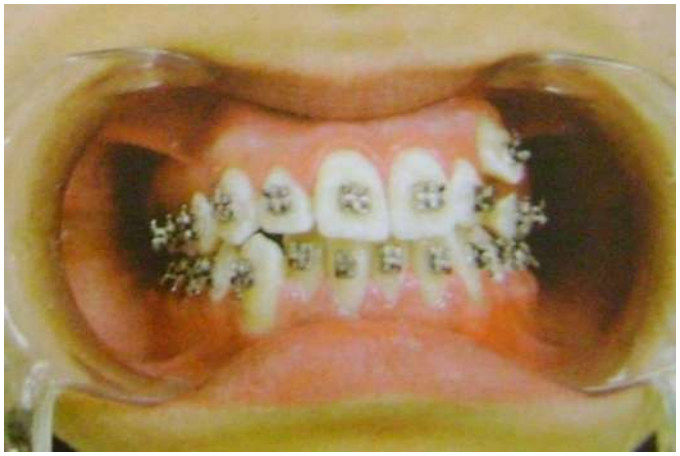
E)TEETH DRIED USING AIR. NOTE FROSTY WHITE ETCHED SURFACE.

F)SEALANT APPLIED.

G)&F)SEALANT AND ADHESIVE APPLIED ON UNDER SURFACE OF BRACKET MESH







I)&J)BRACKET PLACED ON TEETH.

K)EXCESS FLARE OF ADHESIVE REMOVED.

L) BANDING COMPLETED ON ALL TEETH

COMPONENTS OF FIXED APPLIANCE

ACTIVE COMPONENTS

1)Arch wires

2)Springs

3)Elastics

4)Seperators

PASSIVE COMPONENTS-

1)Bands

2)Brackets

3)Buccal tubes

4)Lingual attachments

5)Lock pins

6)Ligature wire

PASSIVE COMPONENTS

BANDS

- Bands are passive components that help in fixing the various attachments onto the teeth. They are available in various sizes to suit different teeth. They are made of soft stainless steel.
- The attachments like molar tubes and brackets are soldered or welded over these bands, which are cemented in position around the teeth.
- The use of preformed bands or seamless bands is becoming popular. The use of these bands reducing chair-side time by eliminating the tedious task of pinching these bands

BAND SIZES

	BAND THICKNESS (INCHES)	BAND WIDTH (INCHES)
Incisor	0.003	0.125
Canine	0.003	0.150
Premolar	0.004	0.150
Molar	0.005	0.180
	0.006	0.180

BRACKETS-

- Brackets act as handles to transmit the forces from the active components to the teeth. Brackets have one or more slots that accept the arch wire.
- Brackets can be classified in number of ways-

1)Edgewise type of bracket-

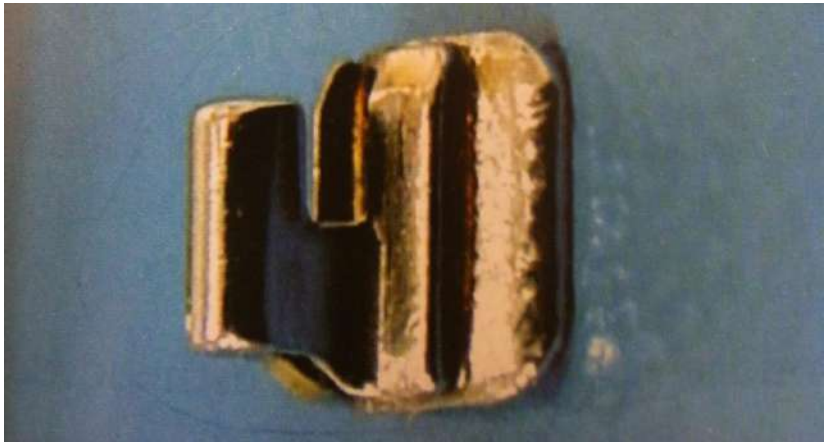
- Brackets used in the Edgewise and straight wire technique have a horizontal slot facing labially.

EDGEWISE TYPE OF BRACKET

- These brackets provide greater control over tooth movement and do not permit tipping of teeth.

2)Ribbon arch brackets-

- They are brackets that possess a vertical slot facing the occlusal or gingival direction. The slot us also narrow mesio-distally.
- This kind of bracket is used with round wires to bring about tipping of teeth in labio-lingual as well as mesio-distal direction.
- Ribbon arch brackets are used in the Begg fixed appliance.



RIBBON ARCH TYPE OF BRACKET

Metallic brackets & Ceramic Brackets-

- Most brackets in current are of the metallic variety. Of these steel brackets are most commonly used. The advantages of metal brackets include-

a)They can be recycled

b)They can be sterilized

c)They resist deformation and fracture

d)They exhibit the least friction at the wire bracket interface.

e)They are not very expensive.

- The disadvantages of metal brackets are-

1)They are esthetically not pleasing, the patient tends to have a metallic smile.

2)They can cause staining of teeth.

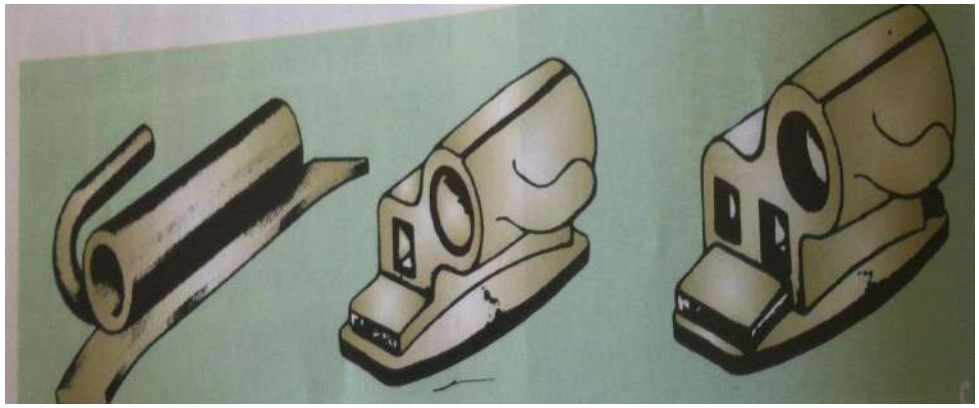
- The disadvantages of ceramic brackets include-

a)They are very brittle and therefore fracture or crack when undue forces are applied.

b)To compensate for their brittleness, their size is increased which tends to increase their bulk

c)They exhibit greater friction at the wire bracket interface than metallic brackets.

BUCCAL TUBES



- Brackets are usually fixed on the anterior teeth and premolars. The attachments that is generally used on the molars is buccal tube or the molar tube. The buccal tube can be weldable i.e. welded to band, which are cemented around the teeth or they can be bondable i.e. attached directly to teeth by using bonding adhesives.
- Buccal tubes can be round or rectangular in cross section. The buccal tube may sometimes have double or triple tubes. These additional tubes are for additional arch wires and for face bow insertion.

LINGUAL ATTACHMENTS-

- Brackets and buccal tubes are attached on the labial or buccal aspect of the teeth. Sometimes it may be necessary to have attachments on the lingual side as well.
- There are various attachments available that can be fixed on the lingual aspect and are called lingual attachments.
- They are usually required for engaging elastics. Examples of lingual attachments include lingual buttons, lingual cleats, eyelets, and ball end hook

LINGUAL CLEAT

LINGUAL BUTTON

BALL & HOOK

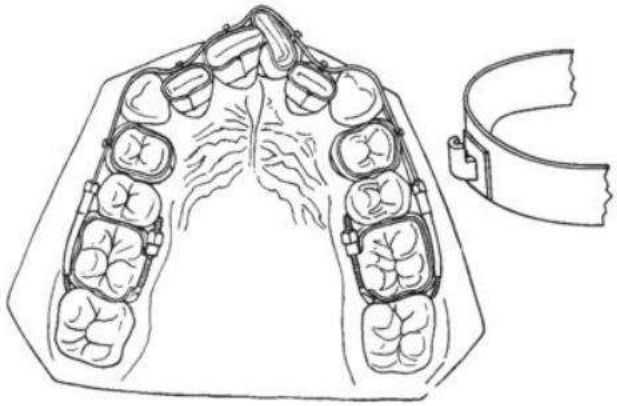
EYELET

LIGATURE WIRES

- They are soft stainless steel wires of 0.009 to 0.001 inches in diameter and are used to secure the arch wire to the brackets. This process of securing arch wire to the brackets is called ligation.
- Ligation is usually necessary in edgewise type of brackets that have a labially facing slot.
- The ligature wire are available in long lengths or are preformed forms into small ligatures. The arch wire can also be secured to the bracket using elastic ligature rings.

LOCK PINS

- They are small pins that are used to secure the arch wire to brackets with vertical slots such as ribbon arch brackets. The lock pins are usually made up of brass. LOCK PIN USED TO SECURE WIRE IN RIBBON ARCH



ACTIVE COMPONENTS

ARCH WIRES

- Arch wires are one of the active components of fixed appliances.

- Ideal requirements of orthodontic arch wires-

1) Spring back: it is the measure of how far a wire can be deflected without causing permanent deformation. It is also called elastic deflection. The arch wire should ideally possess high spring back which results in an increase in its range of action.

2)Stiffness- the presence of a low stiffness provides the ability to apply lower forces and a more constant force over time.

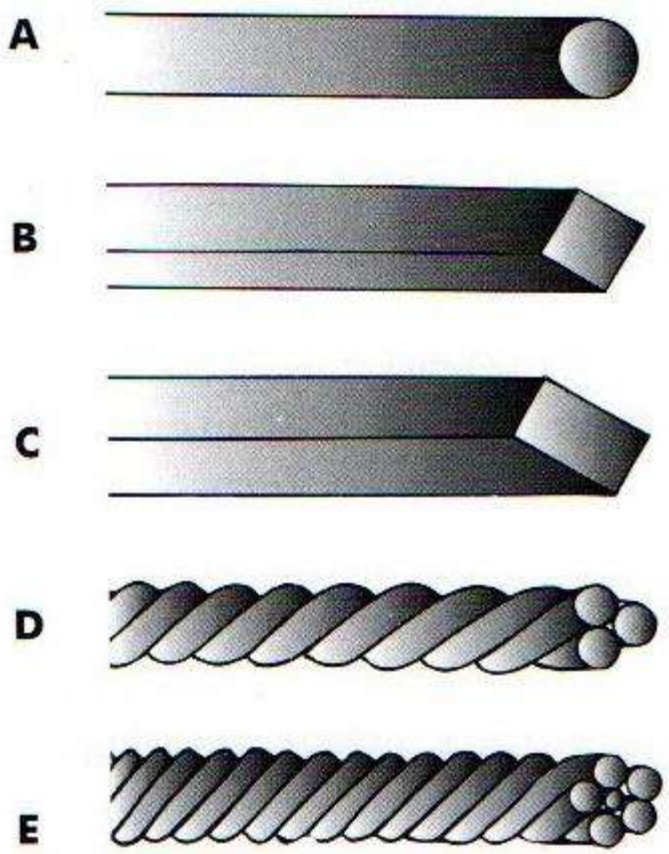
3)Formability- the orthodontic arch wire material should exhibit high formability so as to bend the arch wire into desired configuration such as coils, loops etc.without fracturing the wire.

4)Resilience- it is the amount of force the wire can withstand before permanent deformation. Arch wires should exhibit high resilience so as to increase the working range of the appliance.

5) Biocompatibility and environmental stability- orthodontic arch wires should exhibit resistance to tarnish and corrosion and should be non-toxic. The material should maintain its desirable properties for extended periods of time after manufacture.

6) Joinability- the wire should be amenable to soldering and welding

7) Friction- many tooth movements are accompanied by sliding of the arch wire over the bracket slots. Presence of excessive friction at the wire bracket interface results in undue strain on the anchorage and limitation of tooth movement. The wire should therefore provide least friction at the wire bracket interface.



CROSS-SECTION OF ARCHWIRES. A)ROUND, B)SQUARE, C)RECTANGLE, D)TWISTED, E)CO-AXIAL

CLASSIFICATION OF ARCH WIRES

BASED ON MATERIAL USED

1)Gold and gold alloys
2)Stainless steel
3)Nickel titanium alloys
4)Beta titanium
5)Cobalt chronium nickel alloys
6)Optiflex arch wires

BASED ON CROSS-SECTION

1)Round
2)Square
3)Rectangular
4)Multistranded

Gold And Gold Alloys-

- Prior to 1940, gold was extensively used in the manufacture of orthodontic arch wires.
- The high cost involved led to the invention of gold alloys in which other metals like copper, silver and palladium were added and the percentage of gold reduced.
- Gold and gold alloy arch wires exhibit excellent formability, environmental stability and biocompatibility.
- The drawback of these arch wires include low spring back and high cost.

Stainless Steel-

- **A**ustenitic stainless steel which is sometimes referred to as 18/8 stainless steel is used to make orthodontic arch wires.
- Stainless steel arch wires exhibit adequate strength, resilience, formability, and adequate spring back. They are biocompatible and economical.

Nickel Titanium Alloys-

- They are also called Nitinol (Nickel Titanium Naval Ordinance Laboratory) was invented by William R. Buchler at the Naval Ordinance Laboratory.
- This alloy exhibits super-elasticity and shape memory. Nitinol arch wires exhibit high spring back, high working range and low stiffness.
- Thus these wires on activation produce lower and more constant force on the teeth.
- The disadvantage of Nitinol are that it is resistant to taking a bend, helices or loops cannot be made on them and they cannot be soldered or welded

Beta Titanium-

- Beta titanium was introduced by Jon Goldberg and C.J. Burstone. It is available in tradename of T.M.A. wires.

- These wires exhibit a high range of action and spring back.

- They also permit making of loops and helices due to their high formability. An added feature is that they can be welded.

Cobalt Chromium Nickel Alloys-

- Cobalt chromium nickel alloys drawn onto wires can be used successfully in orthodontic appliances. These alloys are available as **Eligloy.**
- These arch wires exhibit adequate spring back, formability and biocompatible.

Optiflex Arch Wires-

- It is a new type of arch wire developed by M.E.Talass in 1992.
- These arch wires are made of clear optical fibre and are therefore highly esthetic. In addition, they exhibit high resilience.
- The drawback of this wire is that it cannot accept a sharp bend.

Multistranded Arch Wires-

- These arch wires are made up of a number of thinner wires. These wires can be either twisted or coaxial in form.
- The advantage of these multistranded wires is that they exhibit increased flexibility.

ELASTICS AND ELASTOMERICS-

- Elastics- they resemble a rubber band. They are made up of latex rubber and are available in various diameters.

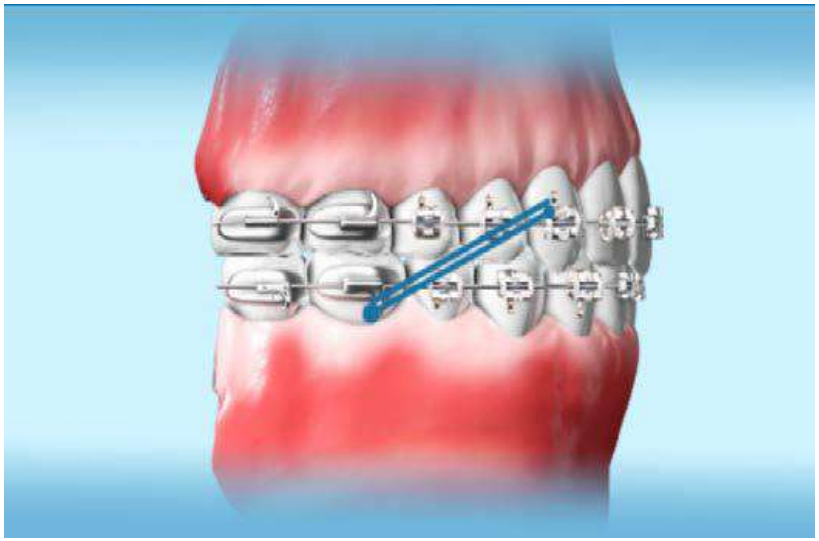
- The force applied by these elastics depends upon their diameter. They are color coded for easy identification.

- Elastics are used for number of purposes such as closure of space, to correct open bites, treatment of cross-bites and to correct inter-arch relationship.

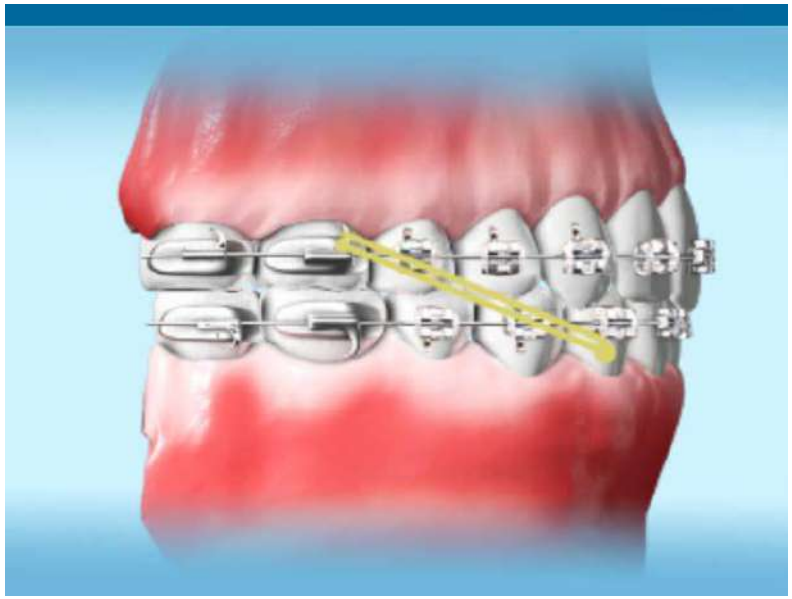
Some of the applications of elastics are as follows-

Class I Elastics- they are intra-arch elastics stretched between molars and anteriors. They are generally used for closure of space and retraction of teeth.

Class II Elastics- they are inter-maxillary elastics stretched between the lower molars and upper anteriors. They are used in treatment of class II malocclusion. They bring about reduction of upper anterior proclination and mesial movement of the lower molars.

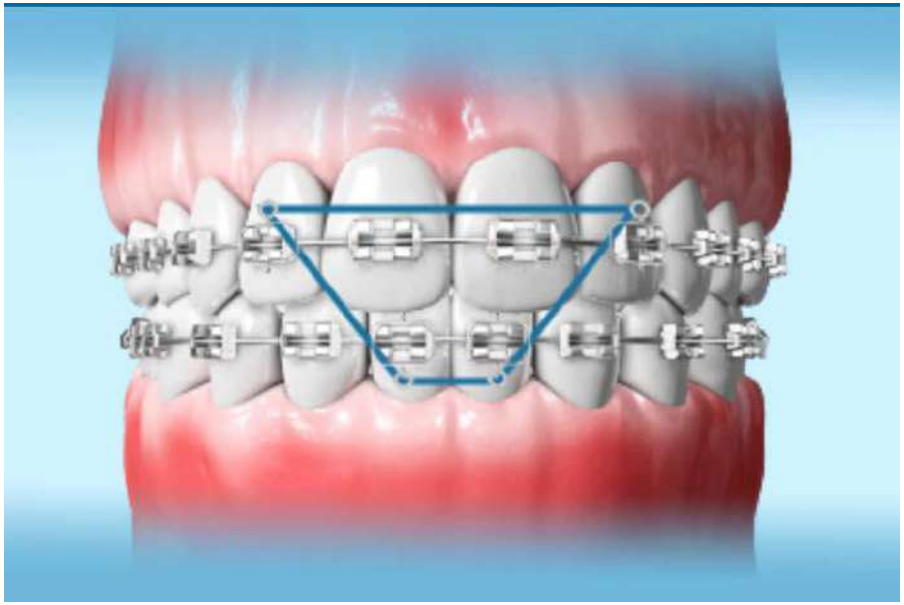


Class III Elastics:- they are intermaxillary elastics that are stretched between upper molars and lower anteriors. They are used in treatment of class III malocclusion to bring about mesial movement of upper buccal teeth and retraction of lower anteriors.



Cross-bite Elastics: inter-maxillary elastics used to treat molar crossbites. They extend between palatal surface of upper molar and the buccal surface of lower molar or vice versa.

Box Elastics- this form of elastic is used to correct anterior open bites. An elastic is stretched between the upper and lower anteriors like a box. The open bite gets corrected by forced eruption of upper and lower anteriors.

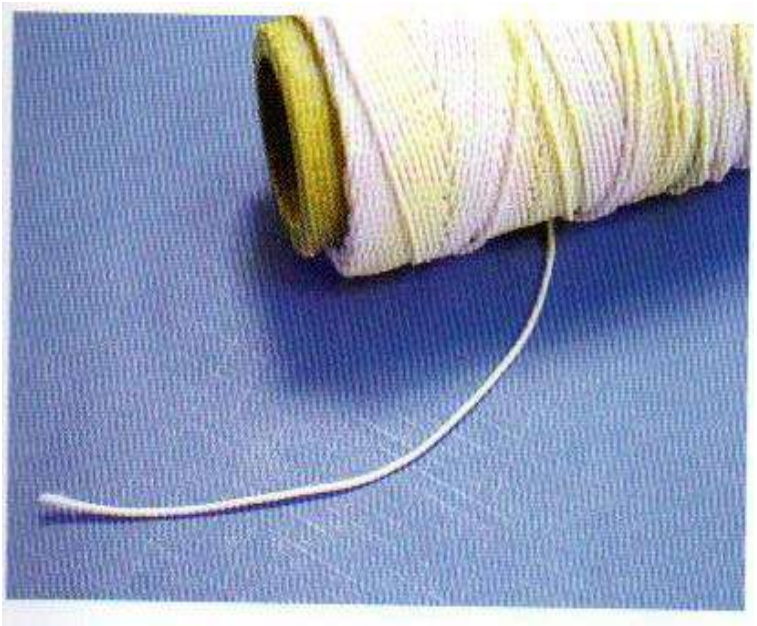


Elastic Chain (E- Chain)- They are elastics that are available of long chains if inter connected rings.

- They are usually made up of synthetic polyurethane material and are available in different forms based on the distance between the rings.
- E –chain is used in the closure of space between teeth by stretching the rings between them.

Elastic Thread- elastic thread is made of a core of latex rubber, surrounded by a sleeve of woven silk and is available in a spool.

- It is cut to desired length and tied between two teeth or two groups of teeth to close space. They can also be used to de-rotate the tooth.

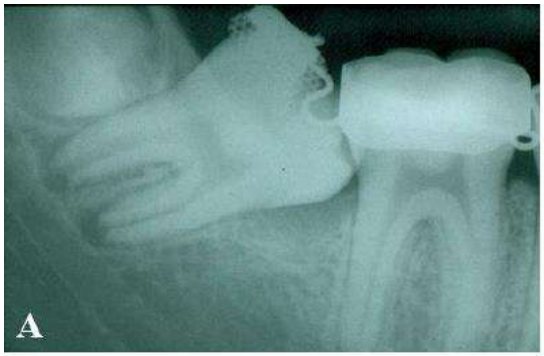


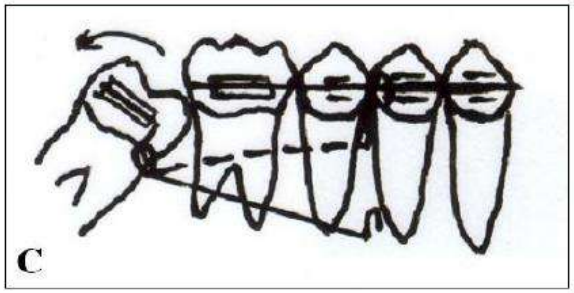
Ligating Rings- arch wires can be secured to brackets using small elastomeric rings called ligating rings. They are available in various colors.

SPRINGS-

Springs are the other active components that can be used to bring about various tooth movements. The following springs are used-

Uprighting springs- they are springs that move the root in mesial or distal direction.





Torquing springs- they are springs that move the root in a lingual or palatal direction

Open coil springs- they are springs that are compressed between two teeth to open up space between them.

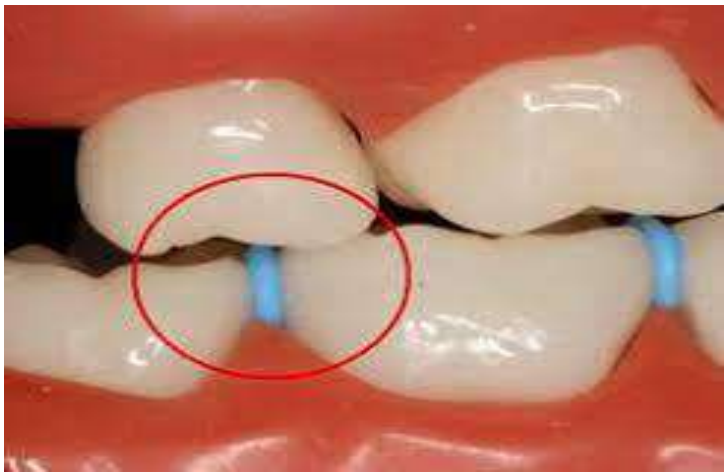
Closed coil spring- they are stretched between teeth to close space

SEPERATORS

Tight inter-dental contact result in difficulties in banding. The teeth should therefore be separated to break tight inter-dental contact. This is achieved by using various types of separators.

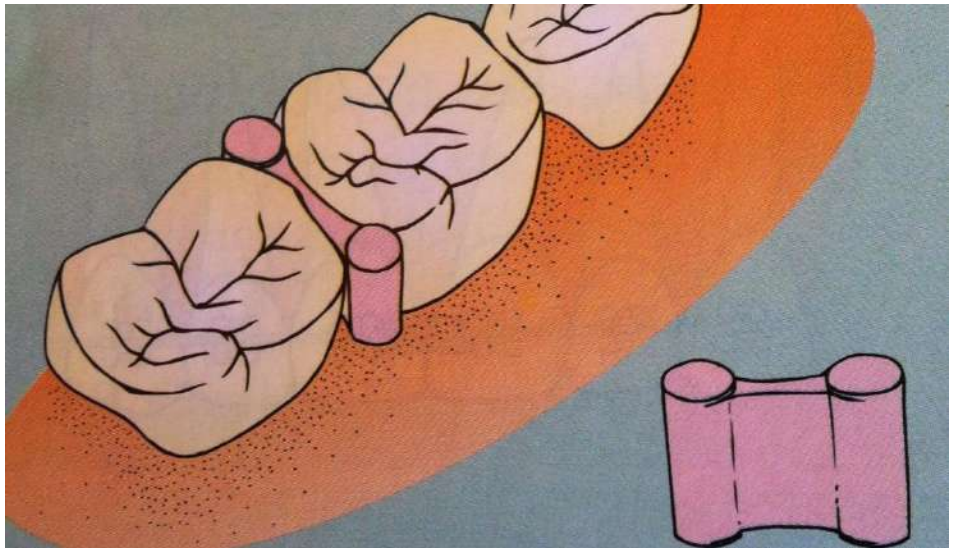
Ring separators- they are small elastic rings that are passed through the contact using special pliers (applicator).

•The stretched elastic ring encircles the inter-dental contact and as it contracts the teeth are separated.



Dumbbell separators- it is dumbbell shaped piece of elastic that is stretched and passed through the inter-dental contact.

- The stretched separator tries to regain its original length and in doing so brings about separation of teeth.



STAGES IN TREATMENT

Leveling and alignment- leveling and alignment signifies bracket alignment in both vertical and horizontal planes of space.

- In addition during this phase of treatment all rotations are corrected. Leveling and alignment are the major treatment objectives during the early stage of treatment.
- Initial leveling and alignment is achieved by use of light round arch wires such as nickel titanium or braided stainless steel arch wire as the apply gentle forces.
- Progressively larger diameter wires are placed to achieve objectives of leveling and alignment.

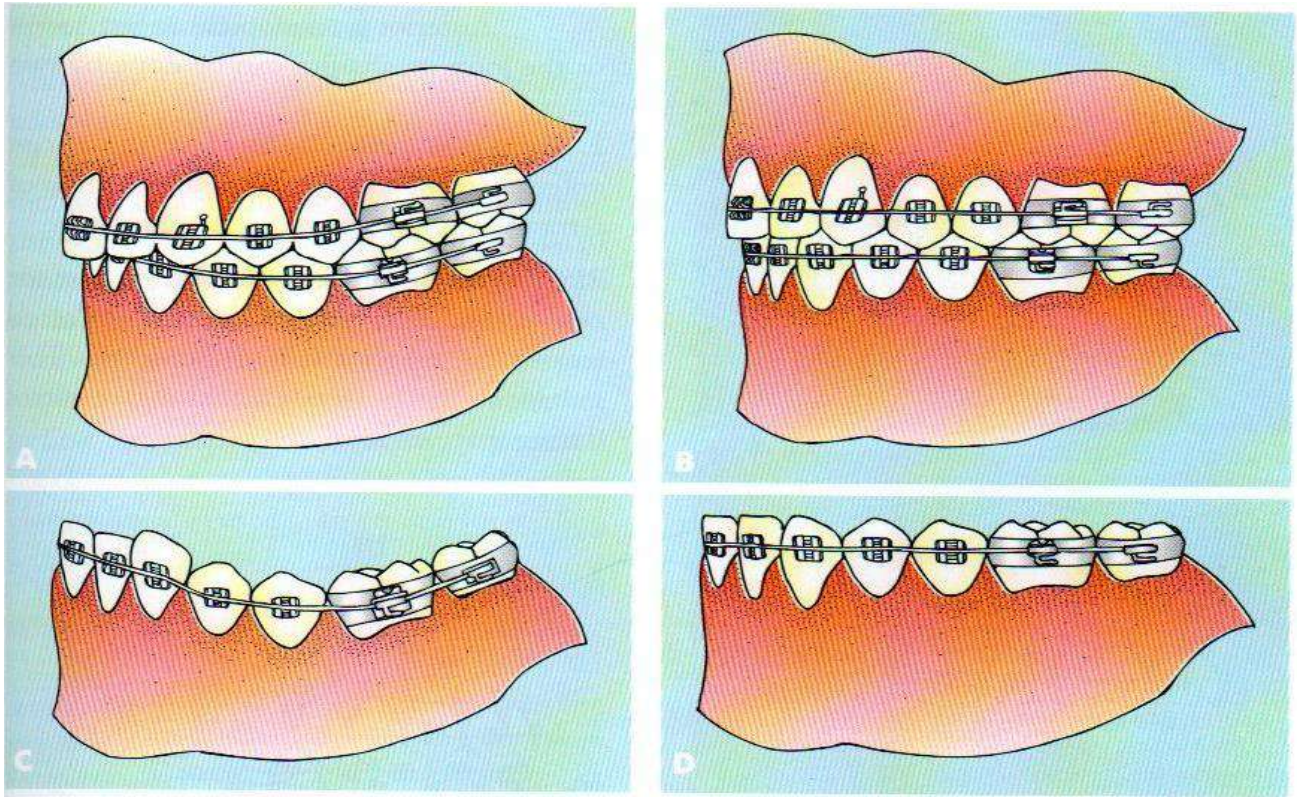
LEVELING AND ALIGNMENT, A)PRIOR TO ALIGNMENT, B)AFTER ALIGNMENT

Over- Bite Reduction: over bite reduction should precede overjet reduction in order to have smooth movement of teeth in the horizontal plane.

- Deep overbite are corrected by :-

Intrusion of anteriors or by extrusion of posterior teeth.

- Incisors can be intruded by using intrusion utility arches and arch wires with anti curve spee in mandibular and exaggerated curve of spee in maxillary arch.
- Posterior extrusion can be achieved by use of bite planes and vertical elastics



A)& B)OVERBITE REDUCTION, C)& D) LEVELLING OF EXCESSIVE CURVE OF SPEE

Overjet Reduction And Space Closure- one of the major objectives of treatment with fixed appliances is to obtain a normal overjet relationship between the upper and lower arches and to obtain a class I canine relationship.

- There is an additional objective of closing any residual space specially in cases where some teeth have been extracted for orthodontic purposes.
- There are 2 types of mechanics used for anterior retraction. They are Friction And Frictionless Mechanics

1)Friction Or Sliding Mechanics- once the bracket slots are aligned it allows the arch wire to slide through the posterior bracket slots.

- Thick rectangular stainless steel wires such as 0.018x 0.025 inches or 0.019x 0.025 inches are used for the purpose of anterior retraction.
- Hooks are soldered onto the arch wire either mesial or distal to the canine and elastics or niti coil springs are applied from this post to the hooks present on the molar bands.
- This results in retraction of the anterior teeth by arch wire sliding through the slots of the posterior brackets.

2)Frictionless Or Loop Mechanics- This type of mechanics relies on spring and loop designs aimed at producing a controlled force system that can be modulated for anterior retraction or posterior protraction depending upon the anchorage need of the patient.

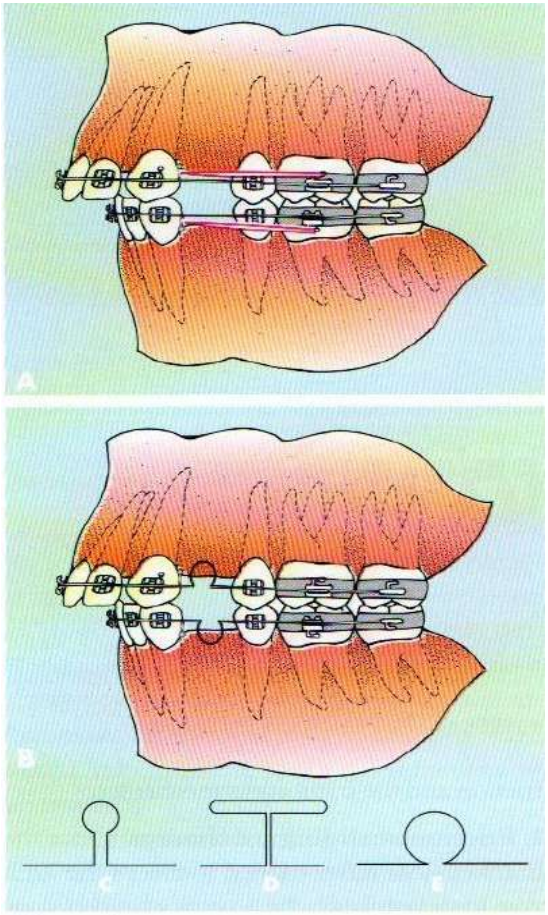
- Various designs of loops are available such as

T loop, Omega loop, Keyhole loop, Tear drop loop.

- Anterior retraction either by friction or the loop mechanics can be done by 2 ways

1)Enmass retraction- here the entire anterior is retracted. This kind of retraction is more taxing on the anchorage.

2)Canine retraction followed by incisor retraction- the canines are first retracted followed by the retraction of the incisors. This enhances posterior anchorage control during space closure.



- A) Sliding mechanics for retraction of anterior teeth.
- B) Archwire with tear drop loop
- C) Key hole loop D) T loop E) Omega loop

DEBONDING

- Debonding involves the removal of the orthodontic attachments & the adhesive resin that was used to bond them.
- The aim should be to restore the surface of the teeth as closely as possible to the pretreatment condition.
- Metal brackets can be debonded by using twin beak debonding pliers that are used to grip the brackets on the mesial & distal aspect at the edge of bonding base & the brackets are cut off at the tooth-bonding base interface.
- In case of ceramic brackets debonding can offer difficulties as these brackets donot flex when sqeezed with debonding pliers.

- The method used to debond is to lift the brackets off using a bracket removing pliers.
- Alternatively thermal debonding can be done where the brackets are exposed to a heat source.
- This results in softening of the adhesive permitting the removal of the brackets.
- Recently lasers has been tried for debonding of the brackets.
- Once the brackets have been removed the residual adhesive that is present on the teeth surface is removed using suitable burs & contra angle hand piece.

- Dome shaped tungsten carbide burs at 30000 rpm using light painting strokes on the tooth effectively removes the adhesive without damaging the enamel.
- Ultra fine diamong burs can also be used but produce surface stratches.
- Once the adhesive has been removed the teeth is polished with prophylaxis paste.

MANAGEMENT OF CLASS II MALOCCLUSION

According to Angle 's classification, class II malocclusion indicates that the mandibular arch (dentition) is in a distal relation to maxilla.

Class II malocclusion is characterized by a class II molar relationship where the distobuccal cusp of the upper first permanent molar occludes in the buccal groove of the lower first permanent molar

It can occur in 2 main forms:

Class II division 1 and division 2

Class II division 1

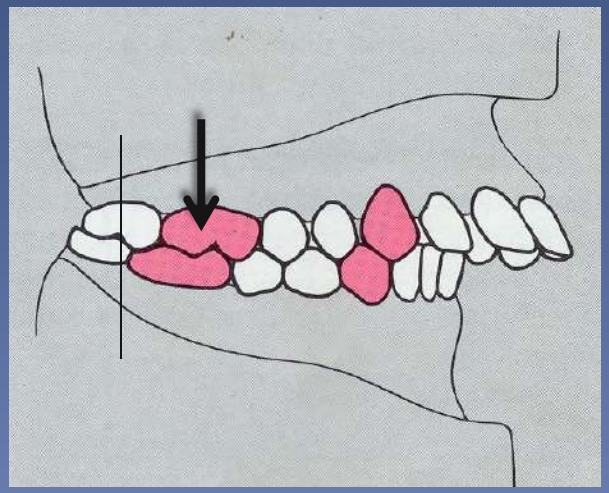
Class II division 2

CLASS II DIVISION 1 MALOCCLUSION:

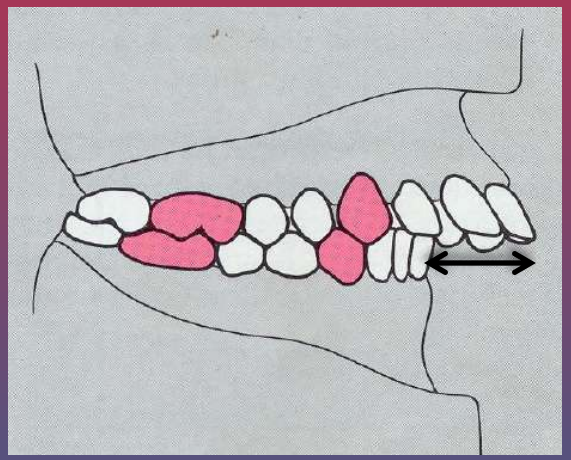
Class II division 1 malocclusion is a condition exhibiting class II molar relationship with proclined maxillary anterior teeth

Features-

1)The patient exhibits a class II molar relation. The molar relation can vary from an end on molar to one which is full fledged class II.



2)The classical feature of a class II division I malocclusion is the presence of proclined maxillary anteriors with resultant increased overjet



3) The patient exhibits

a convex profile

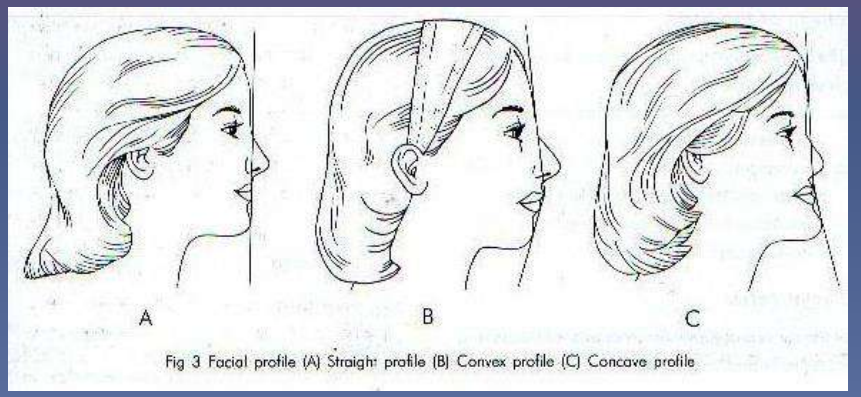
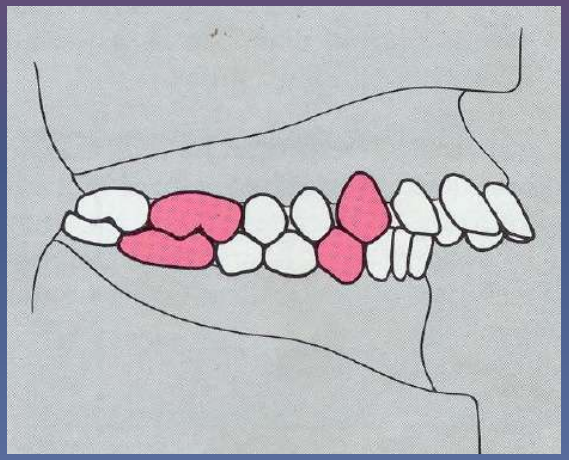


Fig 3 Facial profile (A) Straight profile (B) Convex profile (C) Concave profile

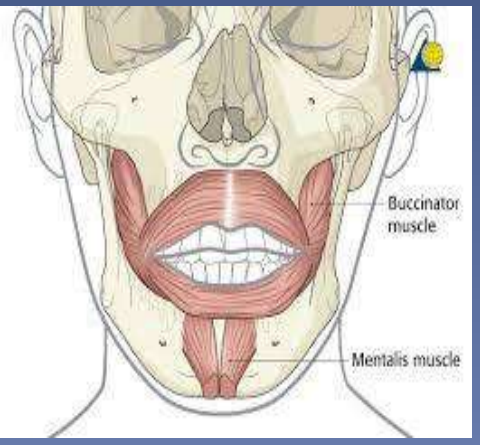
4)Due to proclined upper anteriors, the lower anterior teeth fail to make contact with the palatal surface of the upper anteriors. Thus they are free to erupt leading to an increased overbite.



5)The patient may have a short hypotonic upper lip. In addition the patient may place the lower lip against the palatal surface of the upper incisors. This is called lip trap. The presence of short upper lip along with LIP TRAP increases the tendency for upper anteriors to procline.

6)Patients often **lack an anterior lip seal** due to short upper lip. Restoration of normal lip seal is essential to maintain the teeth in their corrected position.

7)Most class II, division 1 cases exhibit abnormal muscle activity. They **exhibit abnormal buccinator activity** leading to a constricted, narrow upper arch which predisposes to posterior crossbite. A hyperactive mentalis activity is another common finding in class II division 1 malocclusion.



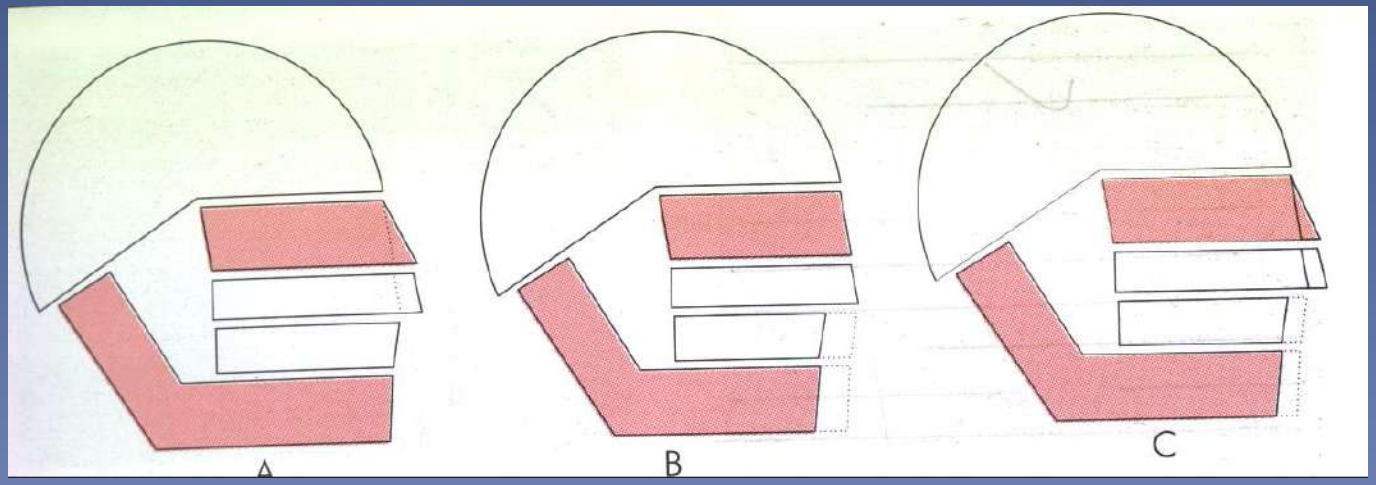
Skeletal features-

A class II malocclusion may be complicated by the presence of abnormal skeletal relationship of the maxilla and mandible. The abnormal skeletal features most often found are-

1)Maxillary protrusion

2)Mandibular retrusion

3)Maxillary protrusion and mandibular retrusion



Treatment objectives-

In class II division 1 malocclusion, the major treatment objectives are to relieve crowding and irregularity of the teeth and to establish stable incisor and molar relationship. The following are the treatment objectives-

a)Reduction of overjet

b)Reduction of overbite

c)Correction of crowding and local irregularities

d)Correction of unstable molar relationship

e)Correction of posterior crossbites if any

f)normalizing the musculature

CLASS II DIVISION 2 MALOCCLUSION

- ✓ *The class II division 2 malocclusion is a condition characterized by a class II molar relationship with retroclined upper centrals that are overlapped by the lateral incisors.*

- Variations of the classical type include retroclined centrals as well as lateral incisors and very rarely include retroclined canines as well.

- Retroclination of upper incisors in a class II division 2 malocclusion is usually a natural dento-alveolar compensation for a class II skeletal pattern in order to decrease the overjet.

Features

Mild forms of class II division 2 malocclusion may be perfectly acceptable with regard to function as well as facial appearance. In severe cases, the bite is often very deep and poses the risk of periodontal trauma in the upper palatal and lower labial aspects.

- Molars in disto-occlusion

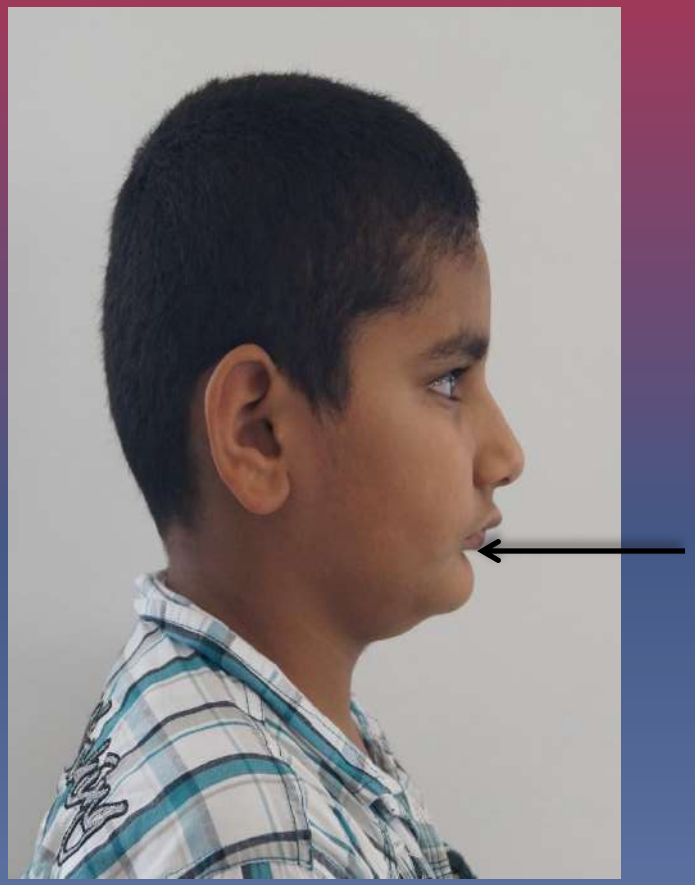
- Retroclined central incisors and rarely of other anteriors as well.

- Deep over bite

- Pleasing straight profile

- Broad square face

- Backward path of closure
- Deep mentolabial sulcus



- Absence of abnormal muscle activity

Div 1
Vs
Div 2

Feature	Division-1	Division-2
Overjet	Increased	Decreased
Profile	Convex	Straight or mildly convex
Lips	Short, Incompetent	Normal
Arch form	V shaped, narrow	U shaped and square
Palate	Deep	Normal depth
Muscle activity	Increased mentalis and buccinator	Normal muscle activity
Path of closure	Normal	Backward
Lower facial height	Normal or increased	Decreased
Mentolabial sulcus	Normal	Deep

Etiology-

Class II malocclusion can occur due to variety of causes. Broadly the etiologic factors can be classified as-

1)PRENATAL

2)NATAL

3)POSTNATAL

Prenatal factors:

- Hereditary- the size, position and relationship of the jaws are to a larger extent determined by the genes. Thus class II malocclusion exhibiting skeletal anomalies such as a prognathic maxilla or a retrognathic mandible can be due to hereditary cause.

- Teratogenesis- administration of certain drugs during pregnancy can result in perverted or abnormal development. The drugs that are capable of such an effect are called teratogens.

- Irradiation- exposure of a pregnant woman to radiation is another cause of altered development of dentofacial complex.

- Intra-uterine fetal posture: one of the factors that seem to play a role in moulding the craino-facial region is the intra-uterine fetal posture. Abnormal position such as hands across the face is found to affect mandibular growth.

Natal factors- trauma can sometimes be induced by improper forceps application during delivery. This results in trauma in the condylar region. The temporomandibular joint in such cases can get ankylosed or fibrosed leading to under-development of the mandible.

Postnatal factors- there are a number of conditions that can influence the normal development of the dento-facial complex. The following are some of them-

a)Traumatic injury to the mandible and temporo-mandibular joint.

b)Long term irridation therapy of the skeletal craino-facial region.

c)Infectious conditions such as rheumatoid arthritis can influence mandibular growth

d)Abnormal function such as oral respiration, abnormal swallowing and habits such as thumb sucking prevent normal muscle activity. These patients have a low tongue position leading to unrestrained activity of the buccinator group of muscles.

Treatment Planning…

Treatment of SKELETAL CLASS II malocclusion-

There are 3 basic approaches to the treatment of class II, division 1 malocclusion.

1)Growth modification

2)Camouflage

3)Surgical correction

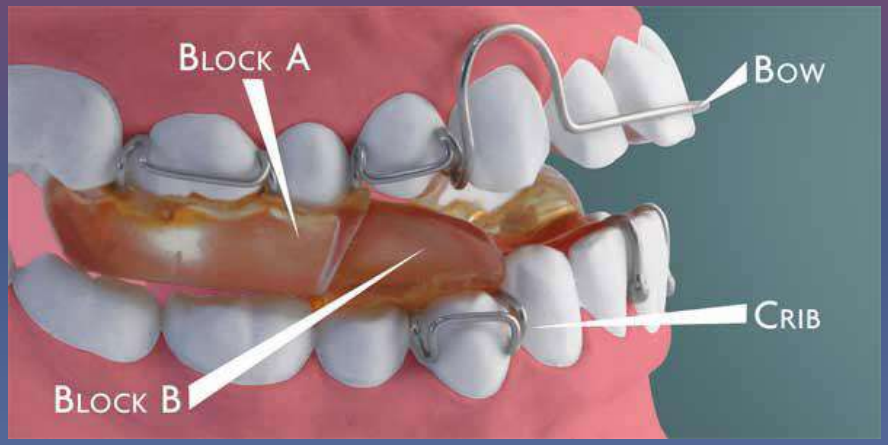
- **Growth Modification-** Class II division 1 malocclusions are often complicated by the presence of underlying skeletal abnormalities. Most often Maxillary Prognathism or Mandibular deficiency occurs.

Maxillary Prognathism

Mandibular deficiency

An important pre-requisite for these growth modification procedures is to accurately diagnose the underlying skeletal discrepancy. Analysis of lateral cephalograms can help establish the skeletal malrelationship.

- Correction of mandibular deficiency- class II malocclusion complicated by mandibular deficiency or retrognathism is treated during the mixed dentition period by use of myofunctional appliances such as activator or functional regulator.



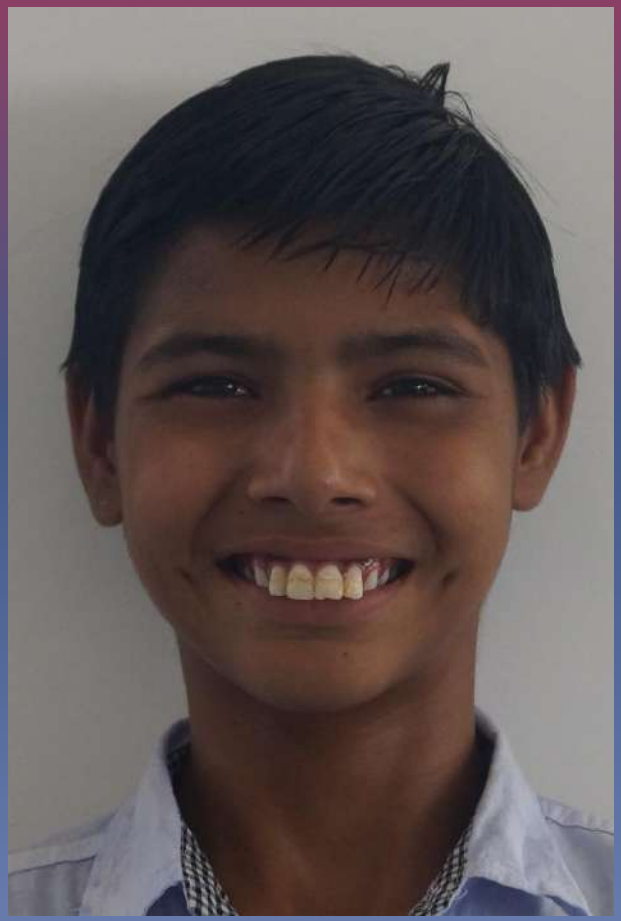
Myofunctional therapy

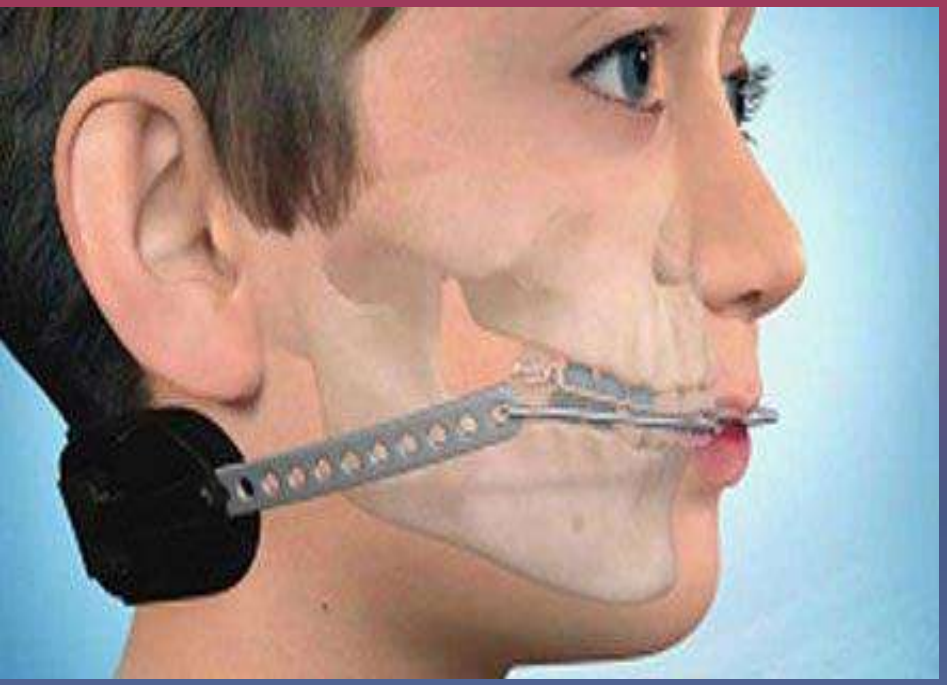
- In case the patient is at the end of the growth period, fixed functional appliances like Herbst appliance or jasper jumper

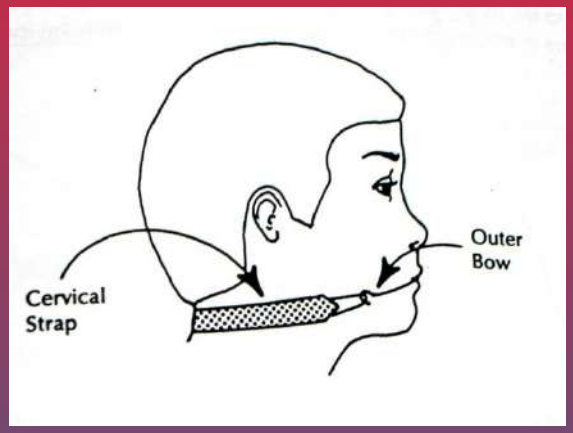
HERBST APPLIANCE

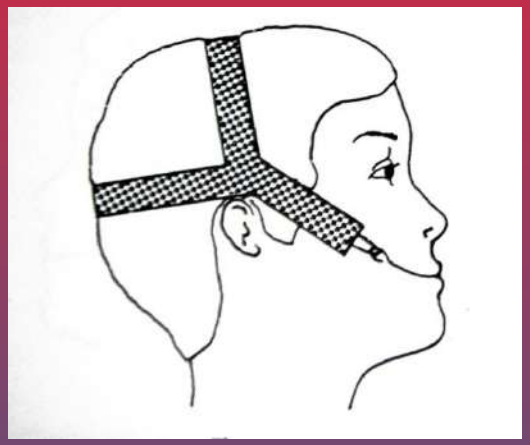
JASPER JUMPER

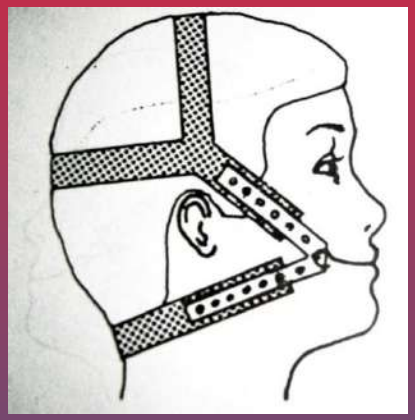
Correction of maxillary prognathism- class II malocclusion exhibiting maxillary prognathism can be intercepted by use of face bow with headgear to restrict further maxillary growth.

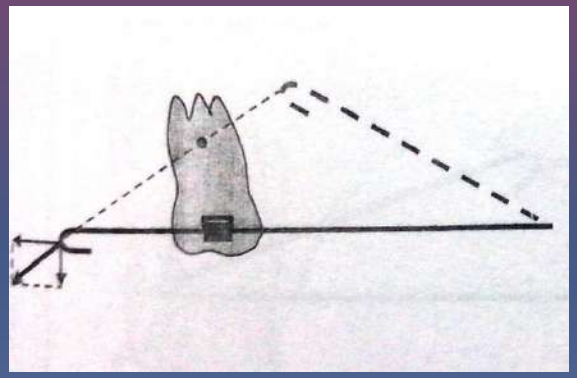


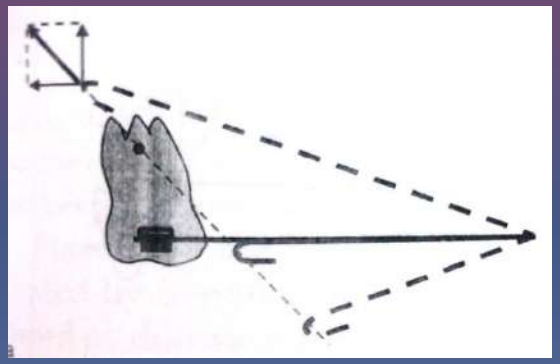


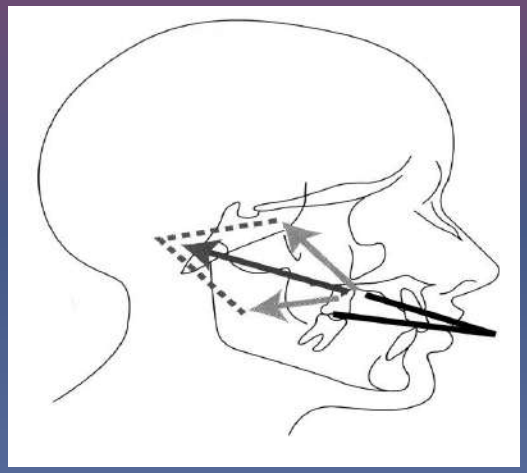












Cervical

High Pull

combination

- In some patients, class II malocclusion is complicated by the presence of both maxillary prognathism as well as mandibular deficiency. In such patients an appliance such as activator with headgear is used to restrict maxillary growth and promote mandibular.

Camouflage

Dental problem is corrected therefore making skeletal problem no longer apparent

In patients who are beyond growth, it is not possible to undertake growth modification procedures. Thus the underlying skeletal discrepancy can be camouflaged by orthodontic tooth movement.

This is often done by extraction of certain teeth and moving the rest of the teeth into the space created.

- With extraction of teeth it is possible to obtain correct molar and incisor relationship despite the fact that the underlying skeletal discrepancy is not addressed.

- Thus the concept implies that major skeletal changes are not possible after the cessation of growth and that the orthodontist achieves the best possible occlusion under the given limitations of the skeletal jaw relation.

- The repositioning of teeth is likely to have a favourable effect on the facial esthetics of the individual.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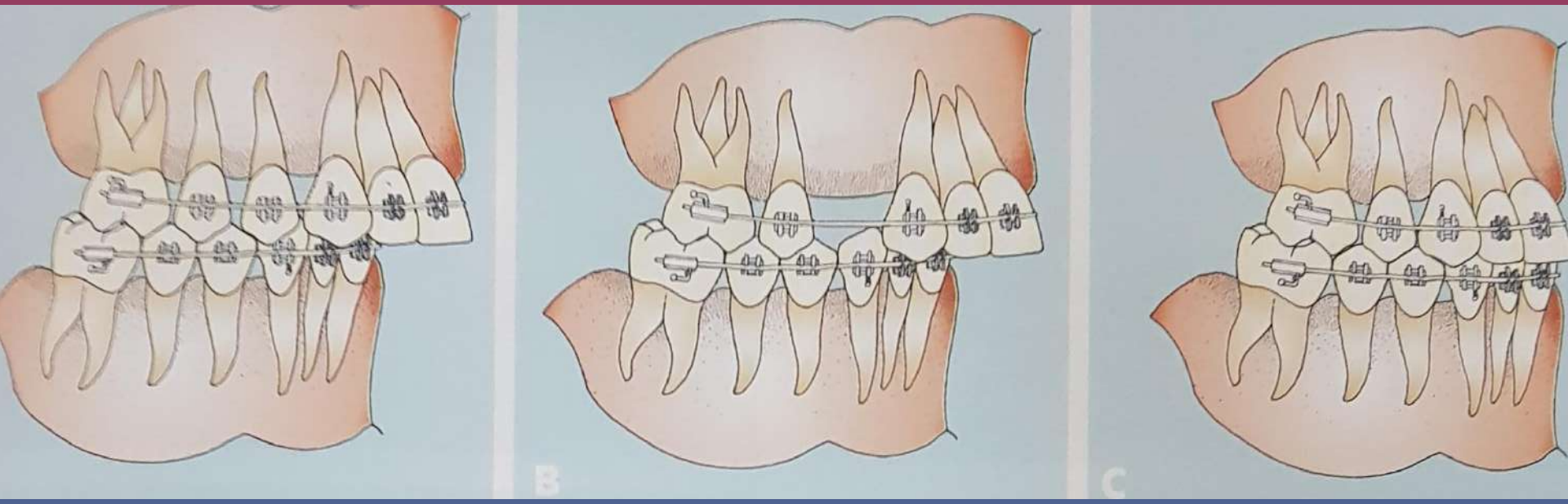
B
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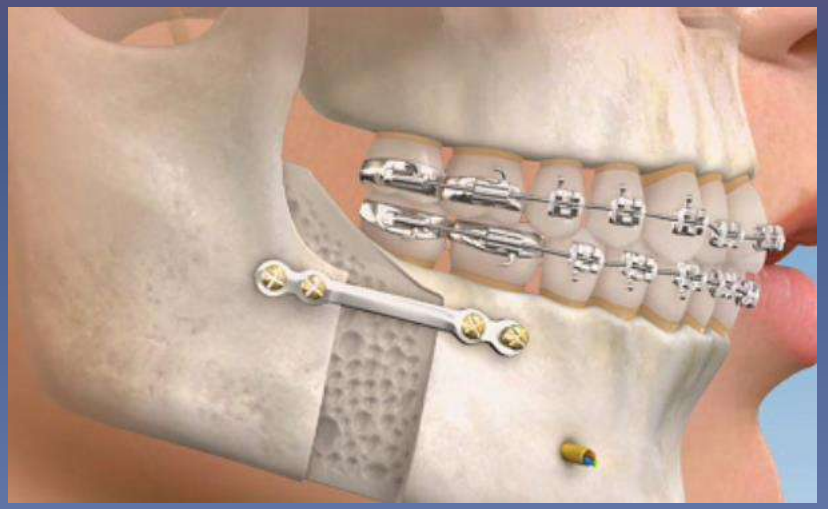
- The teeth that are most frequently extracted are the first premolars.

- In case of a well-aligned lower arch with a class II molar relation with excellent inter-cuspation, it is possible to reduce the overjet and obtain stable results by extracting first premolars only in the upper arch.

- In case space is required in the lower arch to correct unstable end on molar relation or lower crowding, rotations or excessive proclination, both upper and lower first premolars are to be extracted.

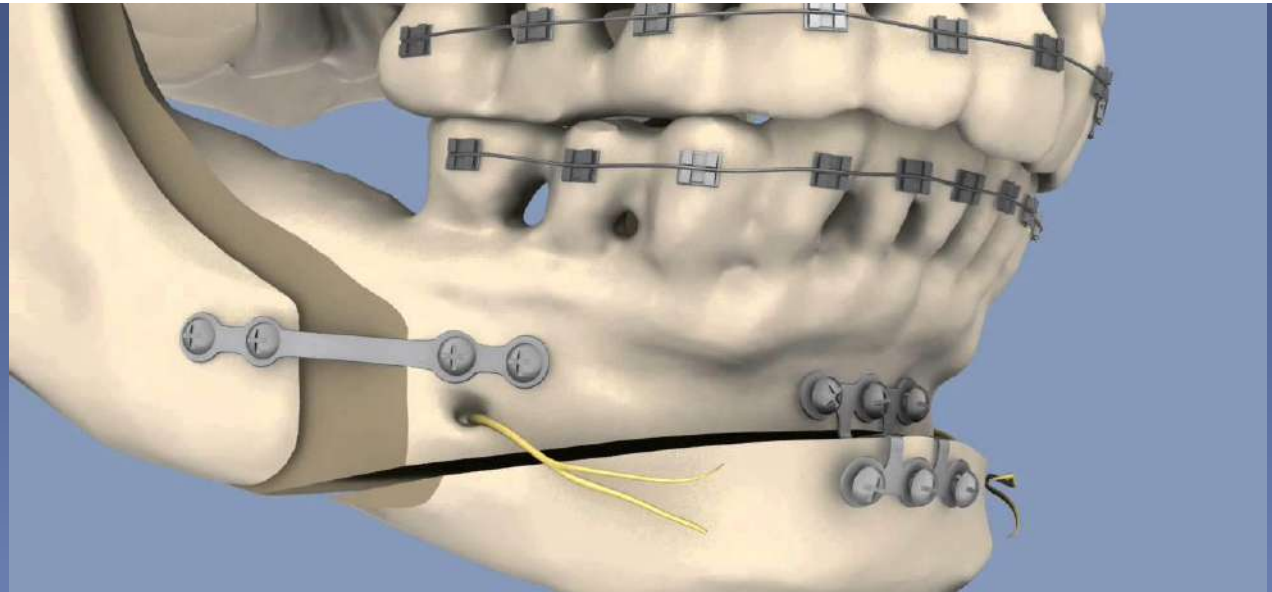
Surgical correction-

In patients exhibiting severe skeletal malrelationships, surgery may be ideal treatment modality. Based on underlying skeletal pattern a maxillary set back or a mandibular advancement is undertaken after the completion of growth.

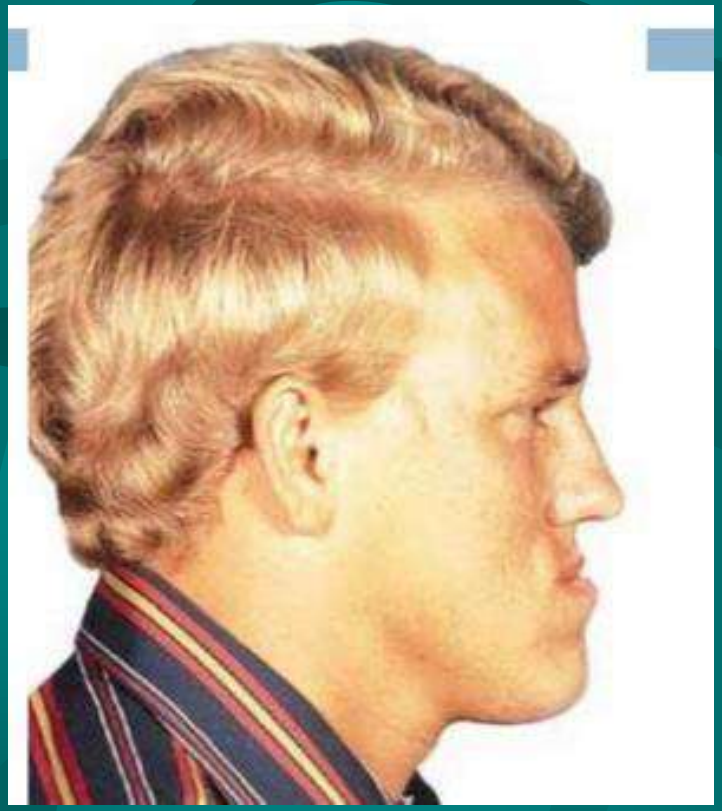


Surgical treatment

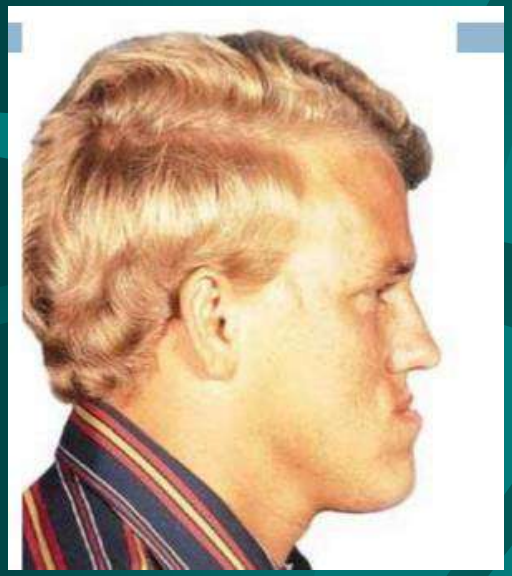

Skeletal retrognatia
After BSSO (lower jaw advancement), the bite is corrected, but the profile is still retrognatic.
After BSSO and chin advancement. An ideal profile is achieved.

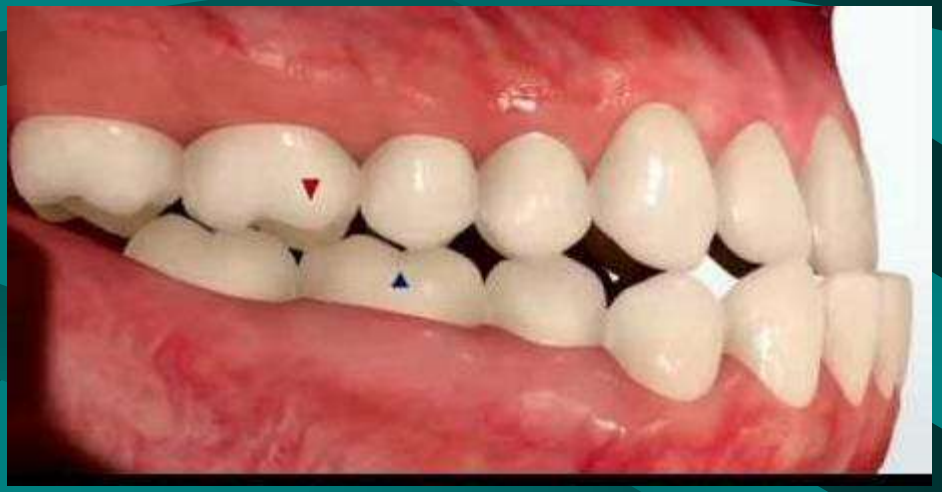


TREATMENT OF CLASS III MALOCCLUSION



- According to angle class III relationship refers to a condition where the mesio – buccal cusp of the upper first molar occludes bet^{n} the mandibular first & second molars.





- Mandible is in mesial relation to maxilla
- Easy to identify but difficult to treat

FEATURES

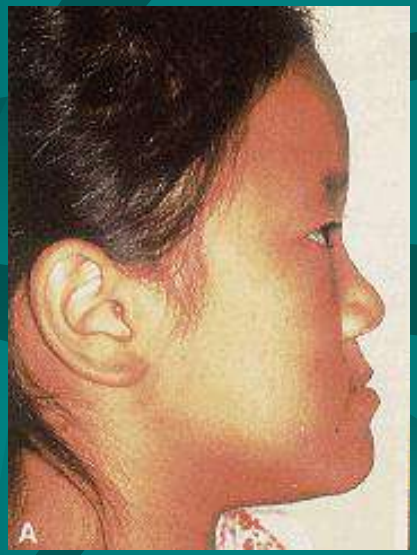
- Class III molar

- Incisors may be edge-to-edge

- Narrow upper arch/ broad lower arch so anterior/ posterior crossbites are common

- Upper teeth crowding is commonly seen

- Concave Profile



- Vertical grower

- Open bite is usually present. Few cases may have deep overbite

- Type of malocclusion i.e. psuedo class III characterized by occlusal prematurties resulting in habitual forward positioning of mandible. These patients exhibit forward path of closure.

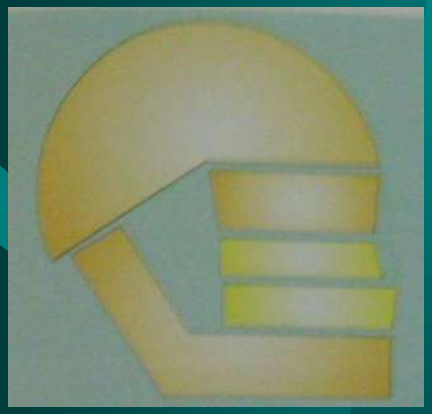
Skeletal features of Class III Malocclusion

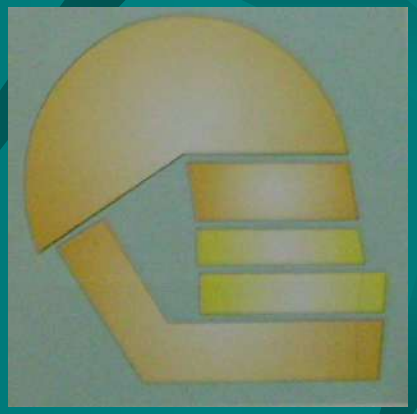
- Class III malocclusion may manifest with various combination of skeletal and dentoalveolar components.

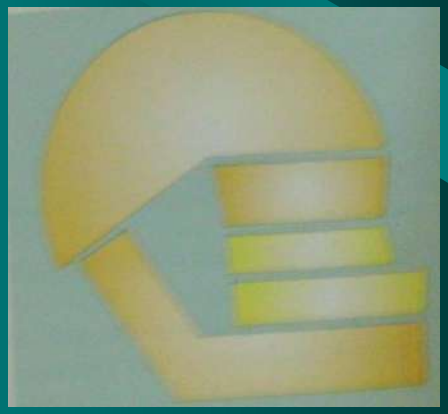
➢ Short or Retrognathic maxilla

➢ Long or Prognathic mandible

➢ Combination of above







ETIOLOGY

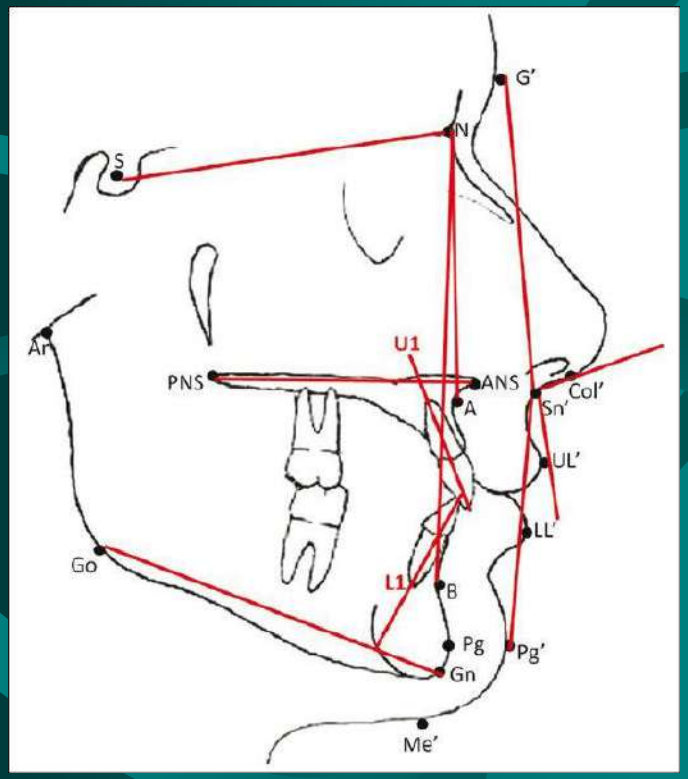
- Class III malocclusion is usually inherited. It has very strong genetic basis
- Environmental factors such as postural habit & Mouth breathing also believed to be the contributing factor.
- Other factors includes forward positioning of mandible due to occlusal prematurities or enlarged tonsils

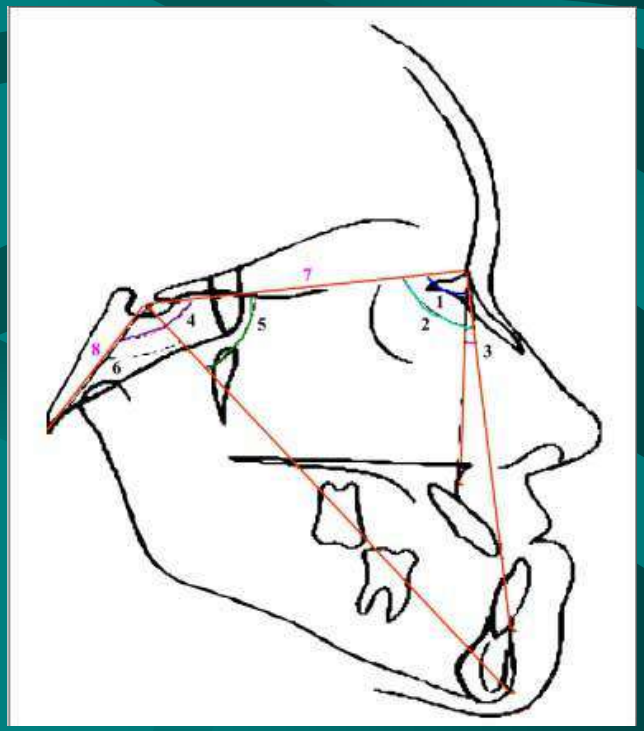
DIAGNOSIS

- Diagnostic procedure should help in determining type of class III malocclusioni.e. Skeletal, dental, true, pseudo
- Clinical examination should include observation of path of closure
- Lateral Cephalogram is valuable for diagnosis

- Dental class III malocclusion are characterized by lack of sagittal skeletal discrepancy.

- In case of skeletal Class III patient has smaller SNA and larger SNB
- Have negative ANB





TREATMENT

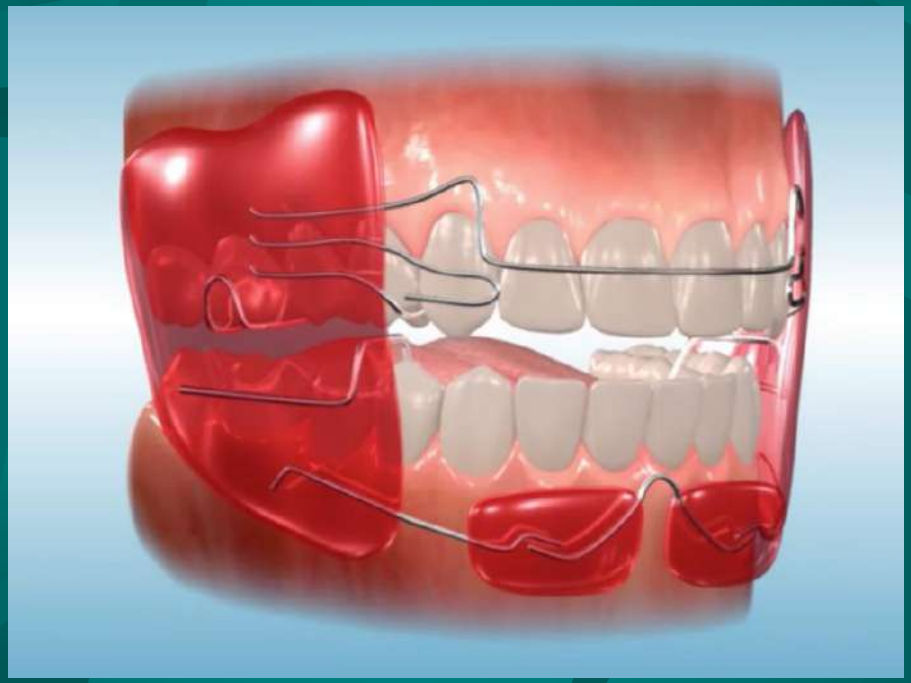
Recognised and treated early due to following reason :

- Early age make it possible to intercept the abnormal skeletal pattern

- Class III malocclusion is characterized by anterior crossbite result in retarted maxillary growth due to locking of maxilla within mandible

Interception during growth

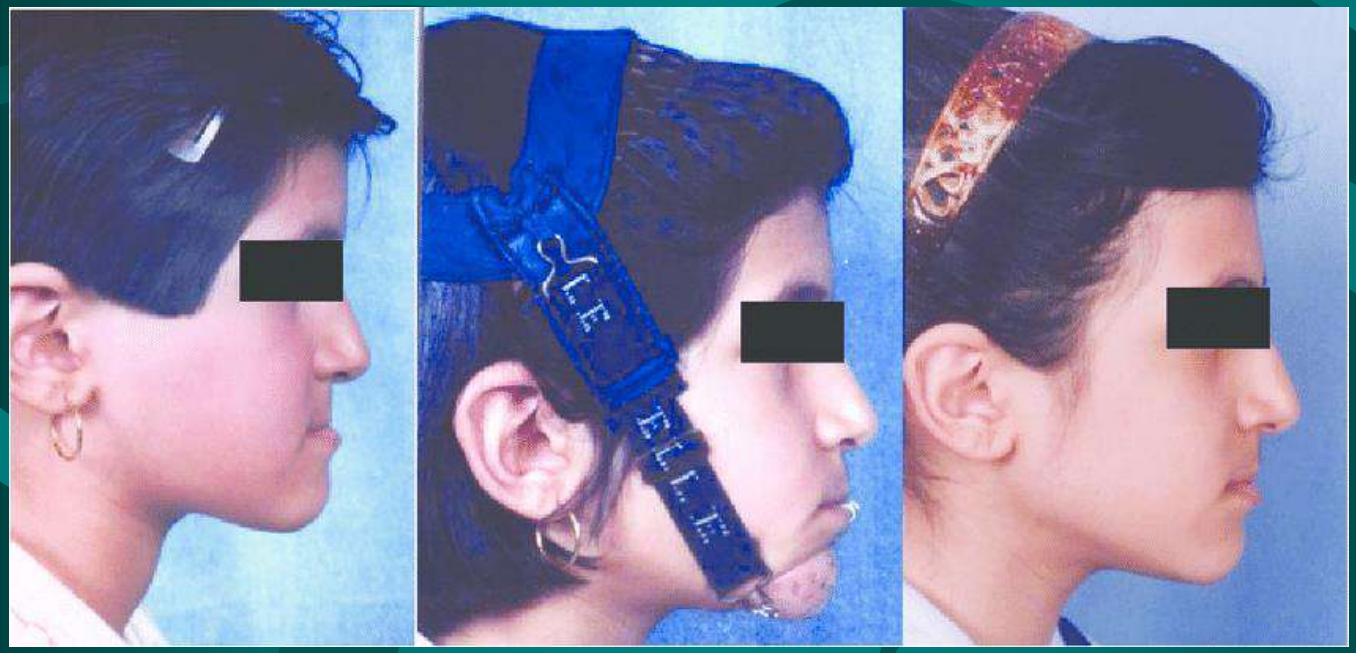
- Aims in creating more favourable environment of growth which can further eliminate the further chance of orthognathic surgery
- Myofunctional therapy: Frankel III



- It incorporates vestibular shield in upper and lower sulcus.
- Maxillary shield is placed away from vestibule to enhance growth and mandibular shield is placed touching the alveolus to restrict growth.

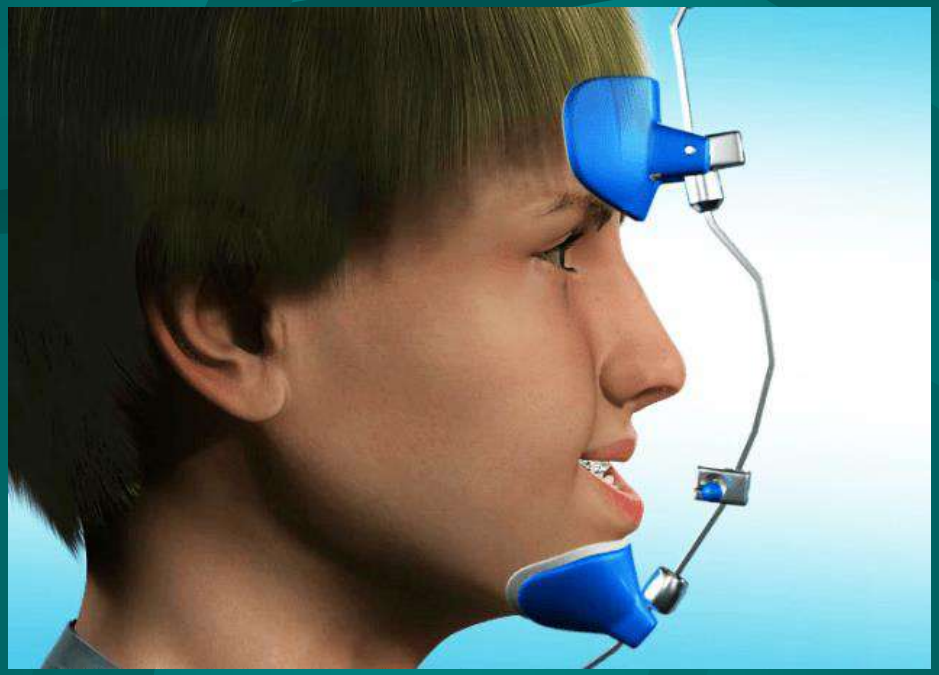
Chin cup therapy:

- Commonly used with protrusive mandible and retrusive maxilla
- Effect of chin cup include backward position of mandible, redirection of mandible growth

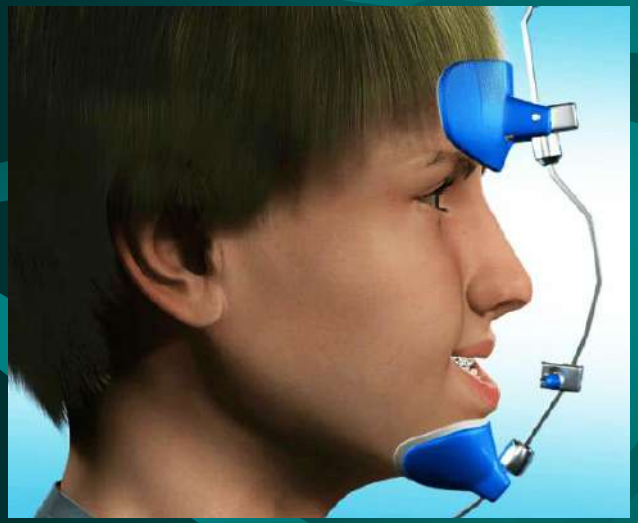


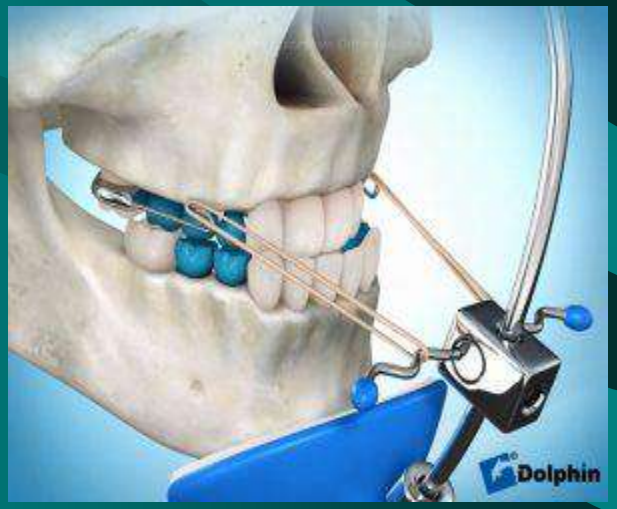
Face mask therapy

- Face mask or reverse headgear is used to treat skeletal Class III due to retrognatic maxilla and hyperdivergent growth pattern.



- Facemask consist of two pads that take anchorage from forehead and the chin.
- They are connected together by midline wire frame that has hook which help in anchoring elastic that stretch from intraoral splint. This help in protraction of maxilla.



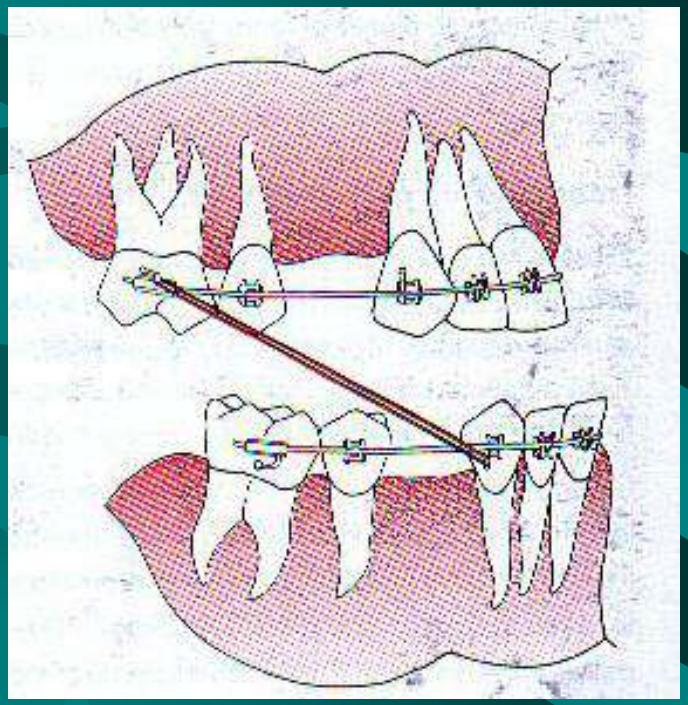


- Facemask is used with force of 300-400 grms per side, wearing time 12-14 hrs a day.
- The protraction elastic usually stretch from intraoral hooks that is close to maxillary canine to hook of facemask frame.
- It is believed to produce protraction of maxilla

Treatment using Fixed Appliance:

- Choice of extracton is Lower first premolar followed by fixed Mechanotherapy.
- This is orthodontic camouflage of underlying skeletal malocclusion.

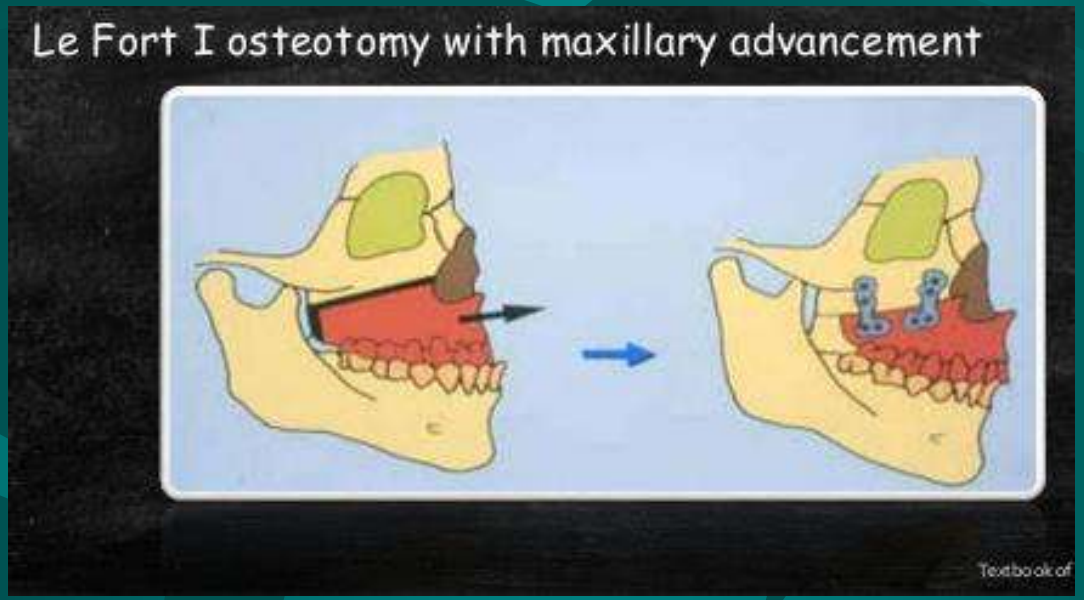
- In case of arch length & tooth material disrepancy, extraction in both archs are required
- Class III elastics are used to retract lower incisors.

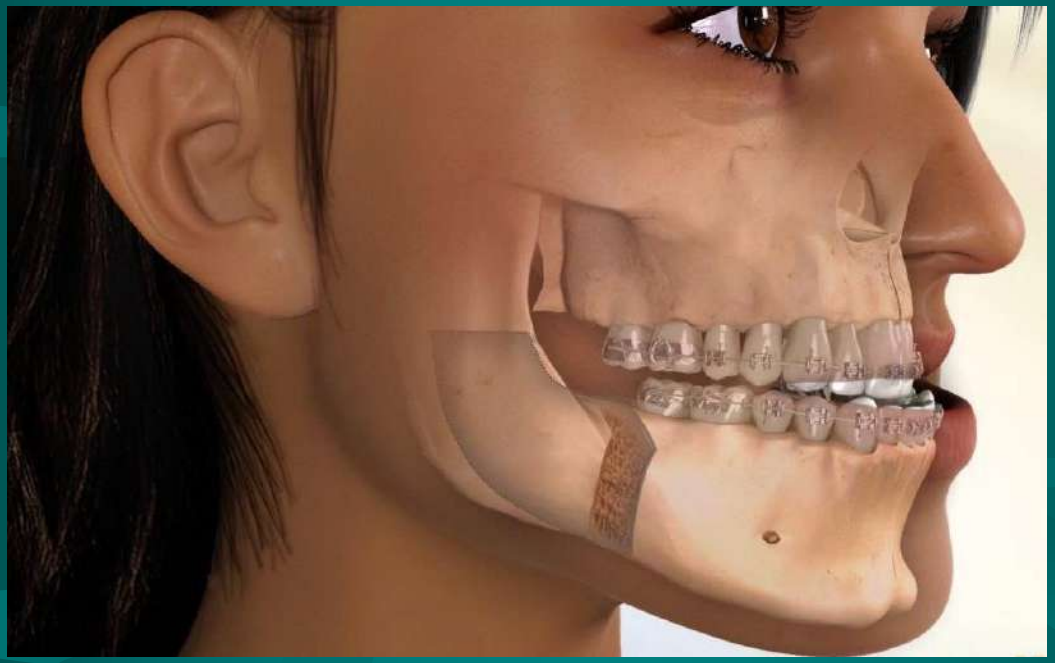


- Pseudo class III can be treated by removal of occlusal prematurities

Treatment after growth:

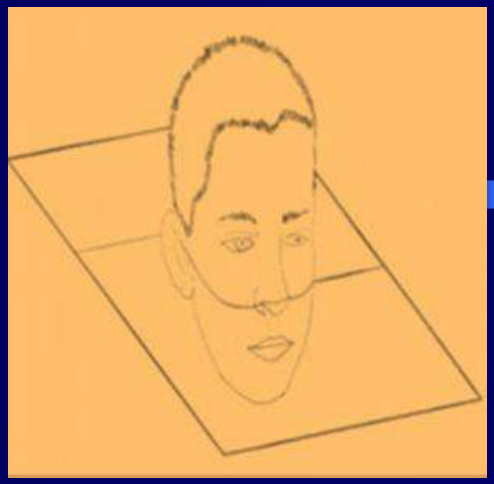
- Treated by surgical procedure
- Class III due to maxillary deficiency is corrected by max advancement procedure such as Lefort I Osteotomy
- Class III due to mandibular prognathism is corrected by BSSO with mandibular setback





MANAGEMENT OF CROSS BITE

Introduction



- Crossbite is term used to describe abnormal occlusion in transverse plane.

- The term is also used to describe reverse overjet of one or more anterior teeth.

Definition

- *GRABER has defined cross bites as a condition where one or more teeth may be abnormally malposed buccally or lingually or labially with reference to opposing tooth or teeth.*

Classification.

- Based on their location as:

1.Anterior

a. Single tooth

b. Segmental

2. Posterior:

a. Unilateral

b. Bilateral

- Based on the nature of the cross bites

1. Skeletal

2. Dental

3. Functional

Anterior cross bite

- Malocclusion resulting from lingual position of maxillary anterior teeth in relation with mandibular anterior teeth.
- Most of cases reported are in permanent teeth however this malocclusion can also be present in decidious teeth.
- Anterior cross bite can involve in single teeth or a segment of arch

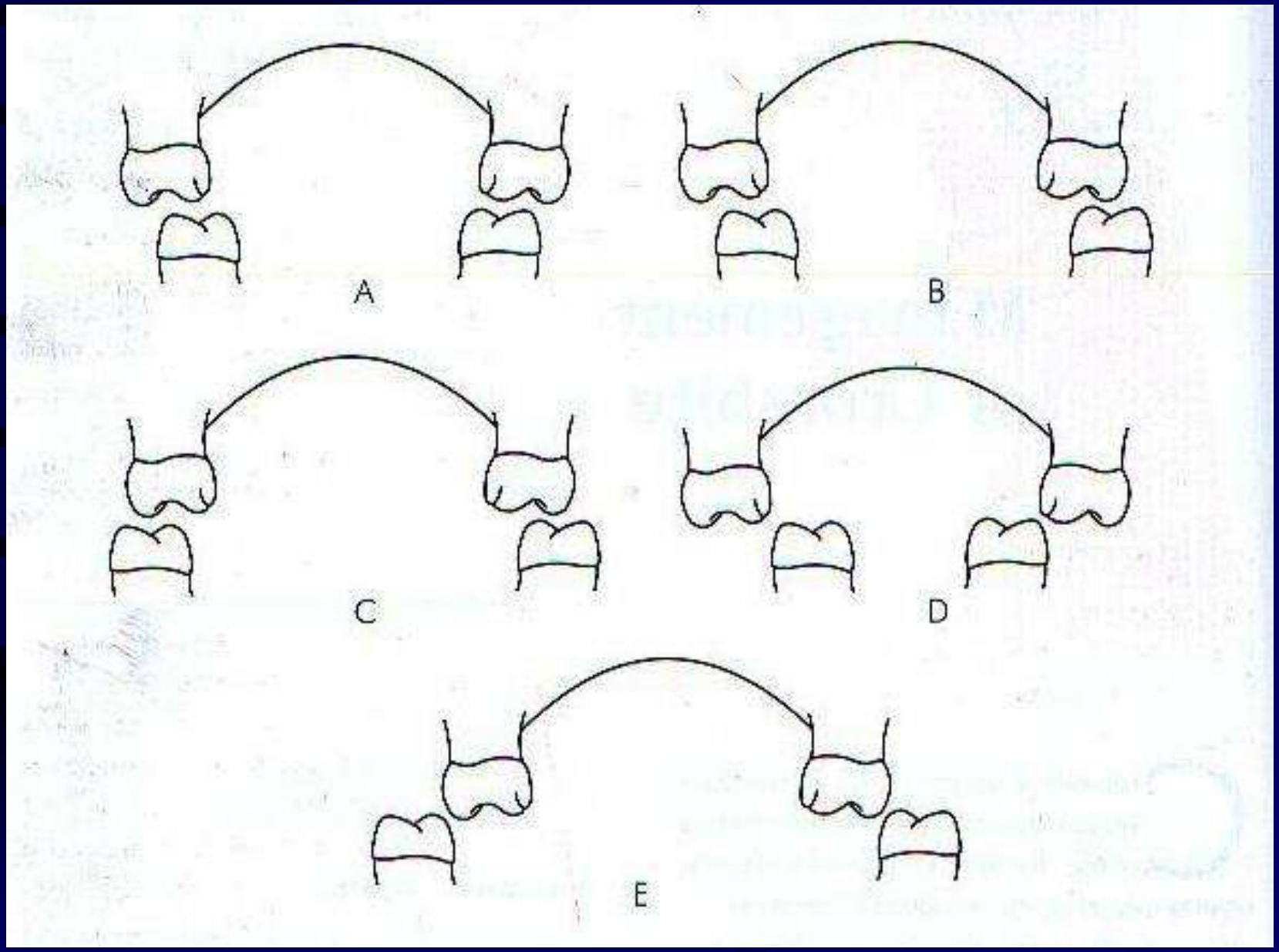
Posterior cross bite

- Refers to abnormal transverse relationship between upper and lower posterior teeth.
- Instead of mandibular buccal cusps occluding in central fossae of maxillary posterior teeth, they occlude buccal to maxillary buccal cusps.

- Post cross bite occurs as a result of lack of coordination in the lateral dimension between upper and lower arches
- Posterior cross bite can be unilateral which involve one side or bilateral which involve both side

- Buccal non- occlusion: form of cross bite where maxillary posteriors occlude entirely on the buccal aspect of mandibular posteriors. This condition is called as scissor bite

- Lingual non occlusion: form of cross bite where the maxillary posteriors occlude entirely on lingual aspect of the mandibular posteriors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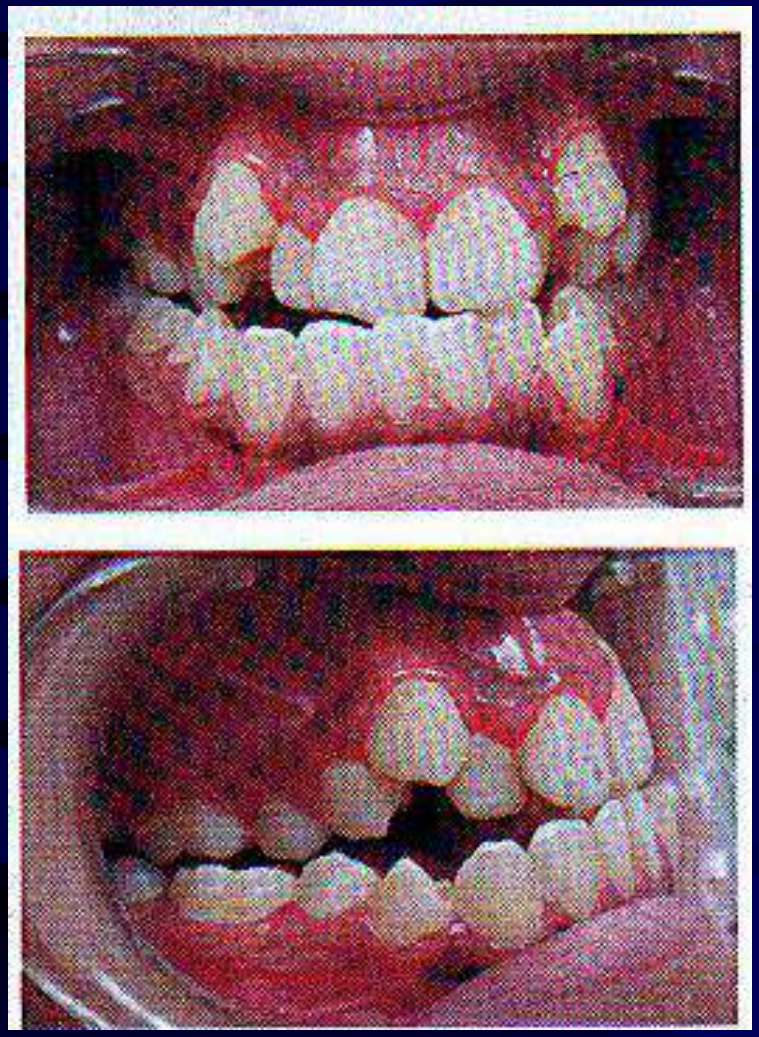
Skeletal crossbite

- Associated with a discrepancy in the size of maxilla and mandible.
- This kind of crossbite is usually inherited or may be result from defective embryological development.
- Skeletal anterior cross bite are usually result of retarted maxillary growth or maxilla that is backwardly placed, excessive mandibular growth.
- Skeletal posterior cross bite are usually characterized by a narrow arch



Skeletal crossbite

Dental Crossbite

- This is localised condition where one or more teeth are abnormally related to that of opposing arch.
- Various factors includes: lingual eruption path of maxillary teeth, trauma to decidious teeth which leads to displacement of tooth bud, delayed eruption of deciduous teeth
- Tooth material arch length discrepancy can result in crowding and lingual positioning of upper teeth leading to dental crossbite

Functional crossbite

- Presence of occlusal inteference can result in deviation of mandible during jaw closure
- Habitual forward positioning of mandible (Pseudo class III) may lead to an anterior cross bite.
- Pseudo class III result from an early dental interference that forces the mandible to move forward to obtain maximum intercuspation

Etiology of crossbite

- Persistance of a deciduous tooth leading to deflection of erupting successor on palatal side.
- Crowding or abnormal displacement of one or more teeth
- Retarded development of maxilla in sagittal as well as transverse direction
- Narrow upper arch
- Collapse of the upper arch in defect like CLP

- Sagittal discrepancies of the jaws such as forwardly positioned mandible.

- Presence of habits such as thumb sucking and mouth breathing can cause lowered tongue position. Tongue is no longer able to balance between the forces of muscles thus leading to narrowing of upper arch which finally leads to crossbite.

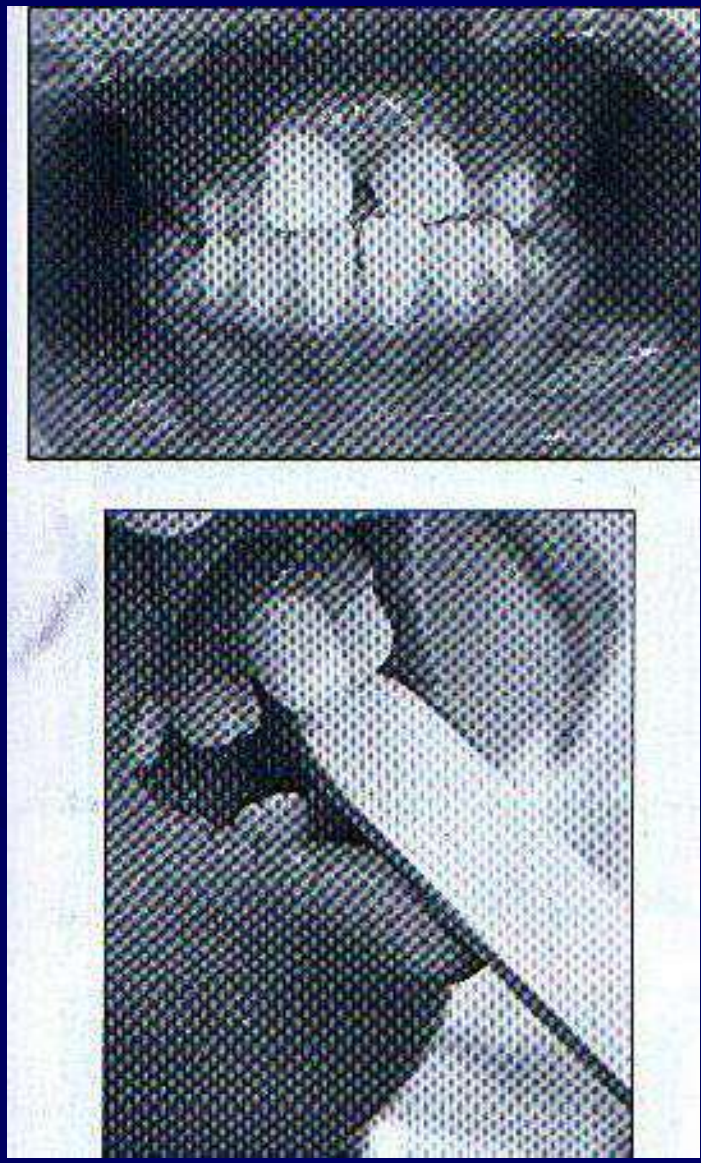
Treatment of cross bite

Treatment of anterior cross bite

TONGUE BLADE

- Developing cross bite can be successfully treated using a *tongue blade.*

- It can be used in case where sufficient space is available for the tooth to brought into alignment.



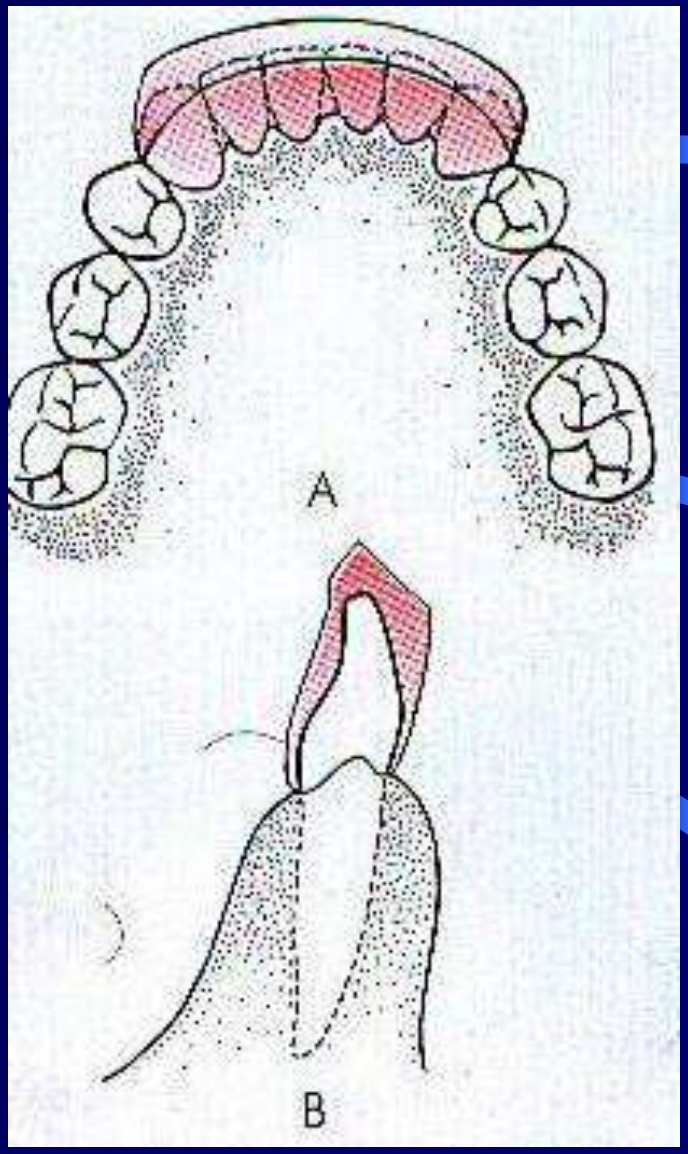
- Tongue blade is flat wooden stick resembling ice cream stick placed inside the mouth contacting the palatal aspect of the tooth in cross bite. Patient is asked to move the stick upward and forward. This is continued for 1-2 hours for about 2 weeks. As this malocclusion is recognised in early stages by dentist so this can be treated successfully by this form of therapy.

Catlan's appliance/ lower Anterior incline plane

- Inclined planes constructed on lower anterior teeth can be used to treat maxillary teeth in crossbite.

- These inclined planes can be made of acrylic or cast metal and can be designed to treat a single tooth or segment of upper arch in cross bite.

- The inclined plane are designed to have 45 degree angulation which forces the maxillary teeth in crossbite to a more labial position.

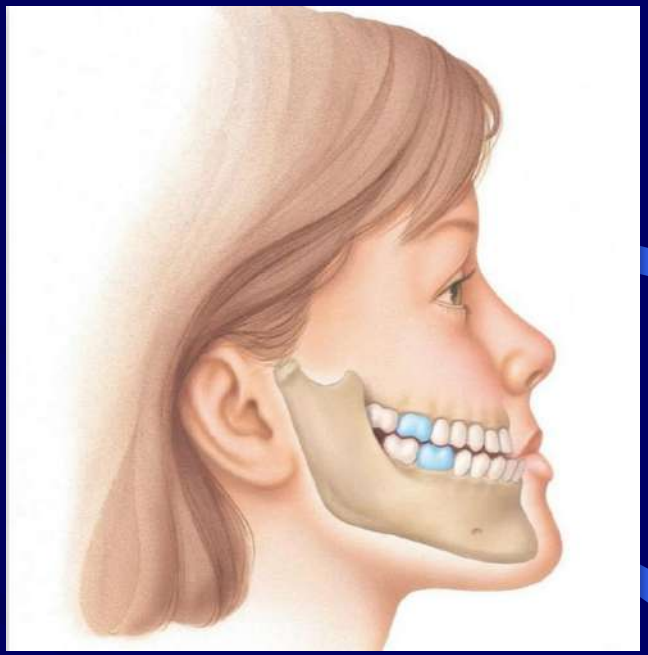


- It indicated when adequated space exists in the arch for the alignment of maxillary teeth in crossbite. They are to be used only in those cases where the cross bite is due to palatally displaced maxillary incisor.
- It has disadvatages which includes: Speech problem, dietry restrictions.
- If it is used more than 6 weeks it can result in anterior open bite due to supraeruption of the posteriors
- The appliance may need frequent recemtation.

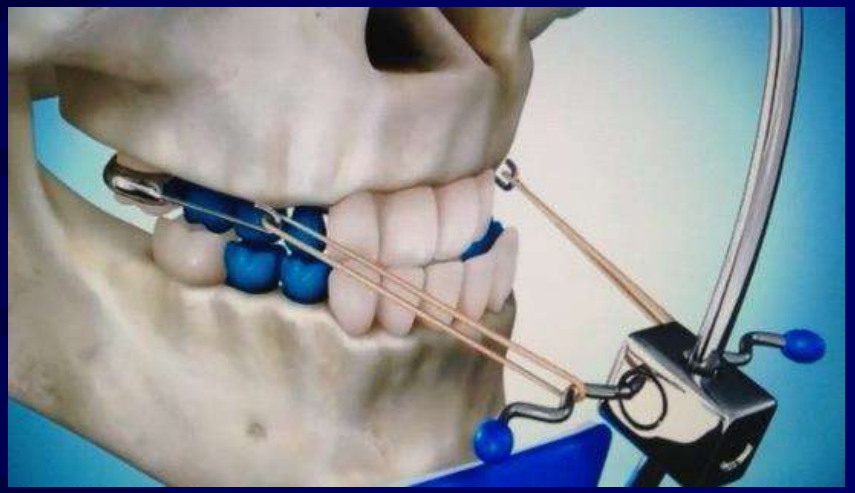
Double cantilever (Z Spring)

Treatment of anterior cross bite during growth period

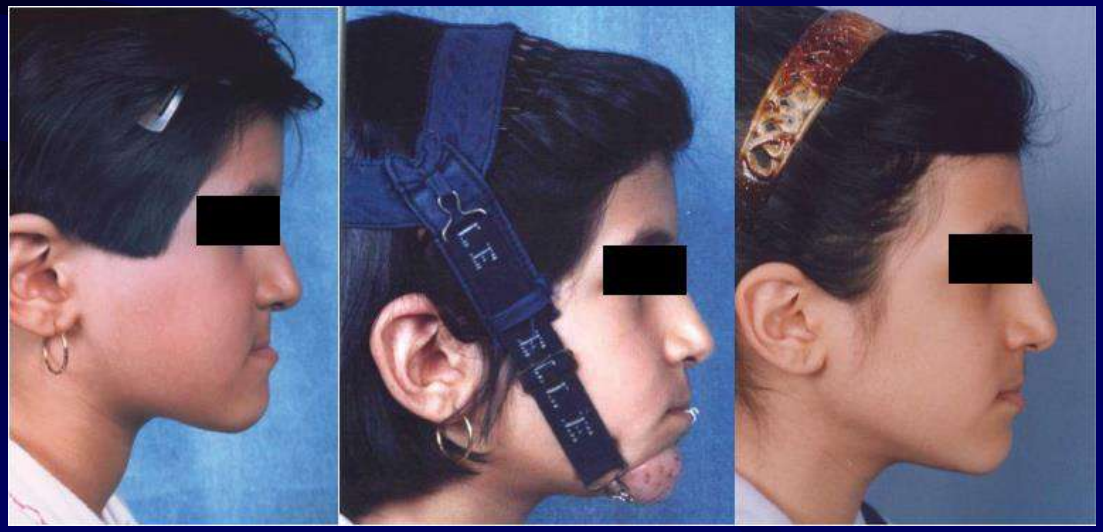
- Anterior cross bite in growing age is due to retropositioned maxilla an due to excessive mandibular growth.



- It can be intercepted during growth by the use of face mask and chin cap



Face mask for maxillary protraction



Chin cup to restrict mandibular growth

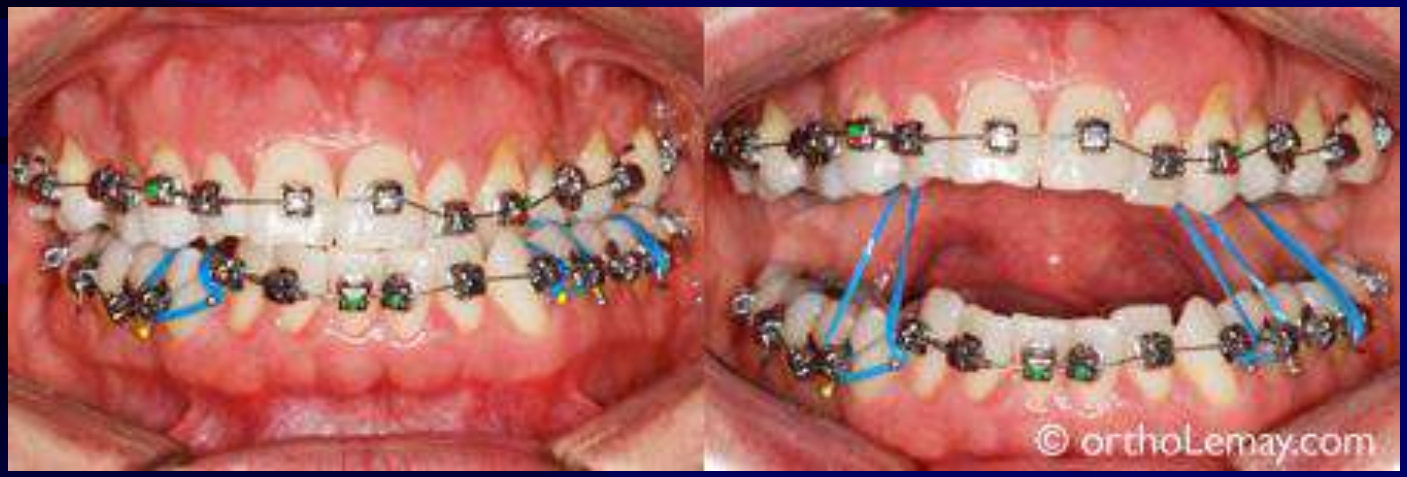
Fixed appliance treatment of anterior cross bite

- Achwire are used to treat cross bites

Treatment of posterior cross bite

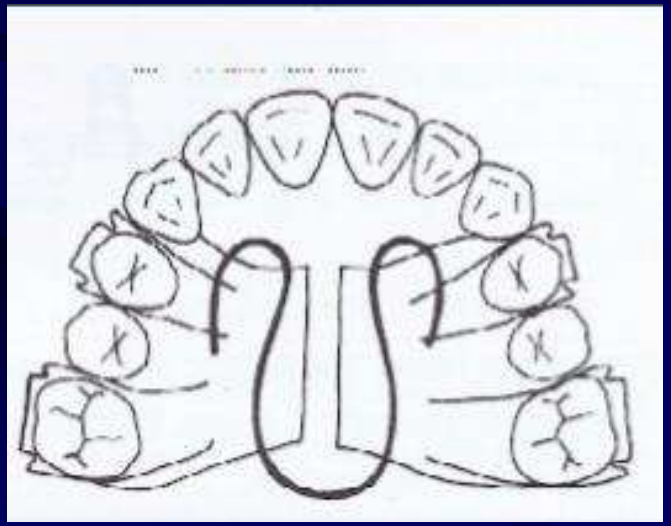
Crossbite Elastics

- Crossbite elastics are worn from maxillary palatal surface and mandibular buccal surface.



Coffin spring

- Designed as omega shape wire placed on mid palatal area, free end are embedded in the acrylic on the slope of the palate
- On activation it bring dentoalveloar expansion

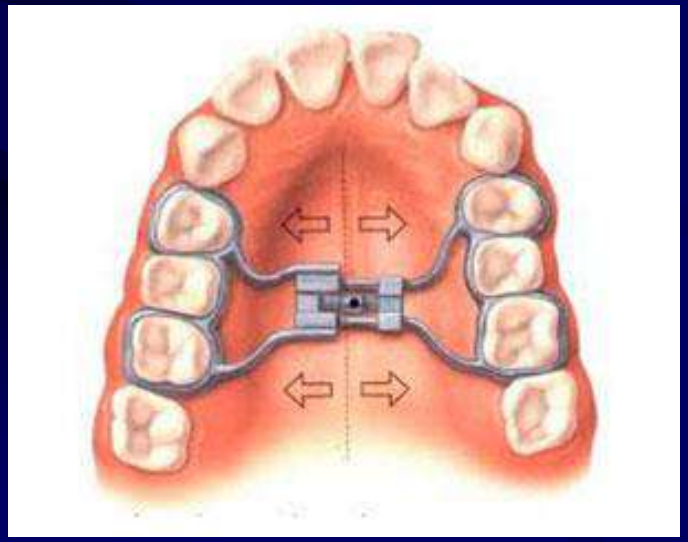


Quad helix

- Consist of four helix
- Capable of dento alveloar expansion

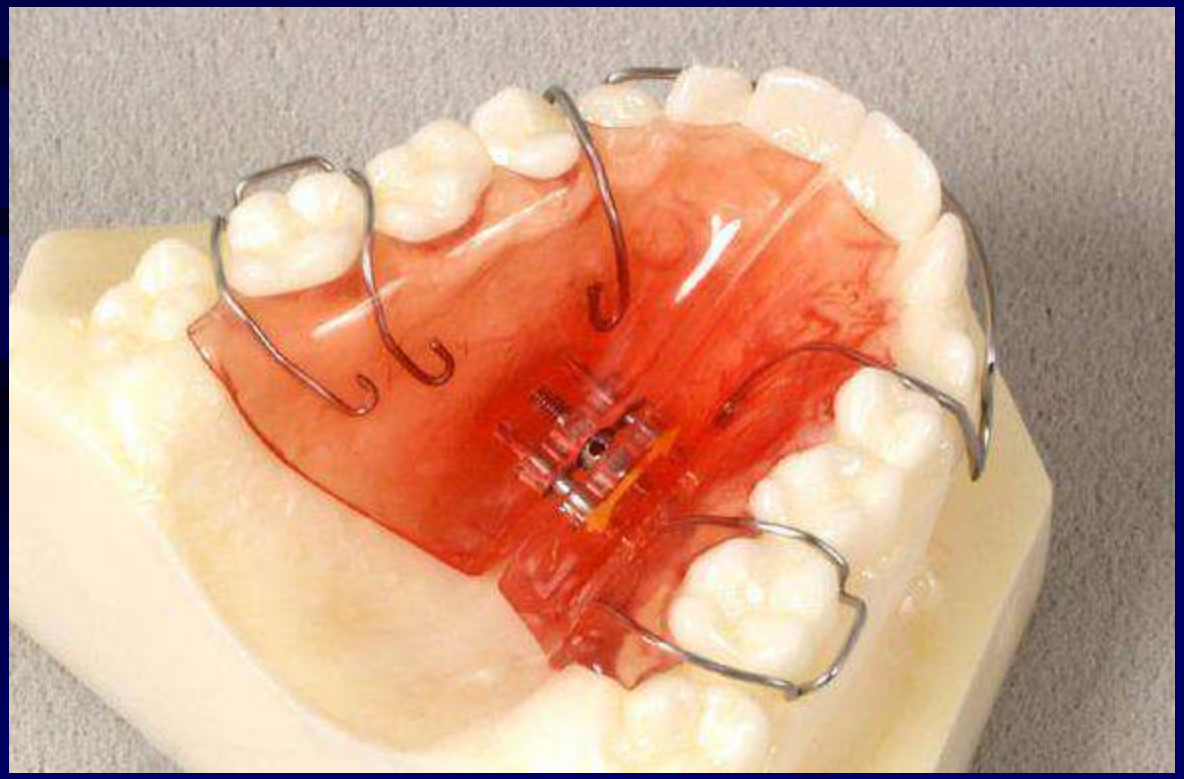
RME

- Bilateral skeletal cross bite characterised by deep palate, narrow maxilla can be treated byrapid maxillary expansion where mid palatal suture is split.
- Done by various expansion appliances activated at regular intervals.



Removable plate

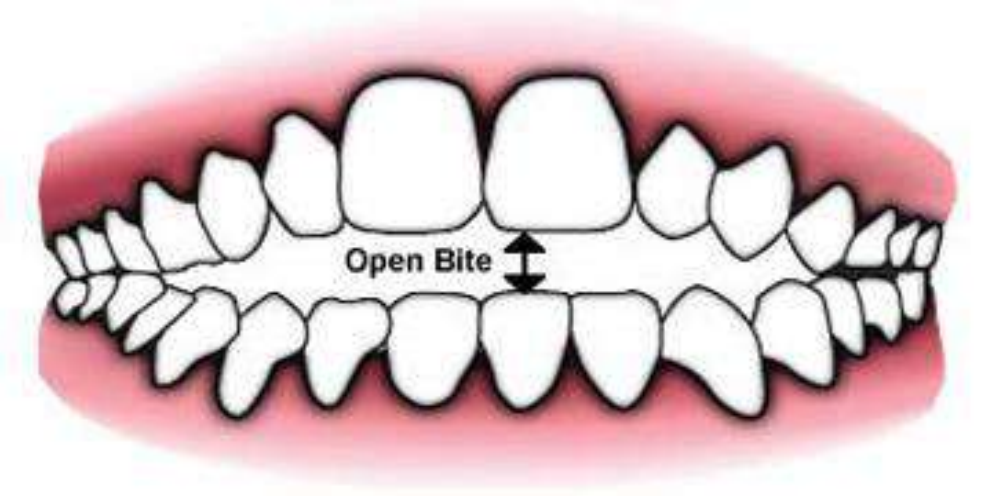
- Jack screw is incorporated.
- Appliance consist of split acrylic plate, jack screw, adams clasp on posterior to retain plates



Fixed appliance

- Using expanded archwirwe in fixed orthodontic treatment

Management Of Open Bite



Definition & Introduction

- Malocclusion occurs in three planes:

  Sagittal, Transverse, Vertical

- Open bite is a malocclusion that occur in vertical plane.

- An open bite is said to exist when there is a lack of vertical overlap between the maxillary & mandible teeth.

- Open bite can exist in the anterior as well as the posterior region called as anterior open bite and posterior open respectively.

Classification:

(i) *Based on the location*

(1) Anterior open bite

(2) Posterior open bite

(ii) *Based on the dental or skeletal components involved*

(1) Skeletal open bite

(2) Dental open bite

Etiology

(1) Prolonged thumb-sucking might be a cause of anterior open bite. Its frequency, posture, intensity have the influence over the severity of open bite

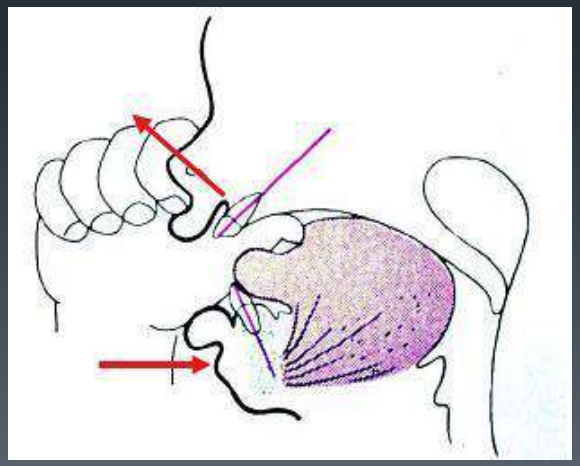
(2) Tongue – Thrusting habit

(3) Nasopharyngeal air-way obstruction & associated mouth – breathing

(4) Inherited factors

(i) Increased tongue size

(ii) Abnormal skeletal growth pattern of maxilla & mandible



Anterior open bite

- It is a condition where there is no vertical overlap between upper & lower anterior.

- Anterior openbite are esthetically unattractive during speech when tongue is pressed during speech

Classification:

(1) Skeletal
(2) Dental

Features Of Skeletal Anterior open Bite

(1) Long face due to ↑ lower anterior face height

(2) Incomplete lips

(3) An ↑ mandibular plane angle

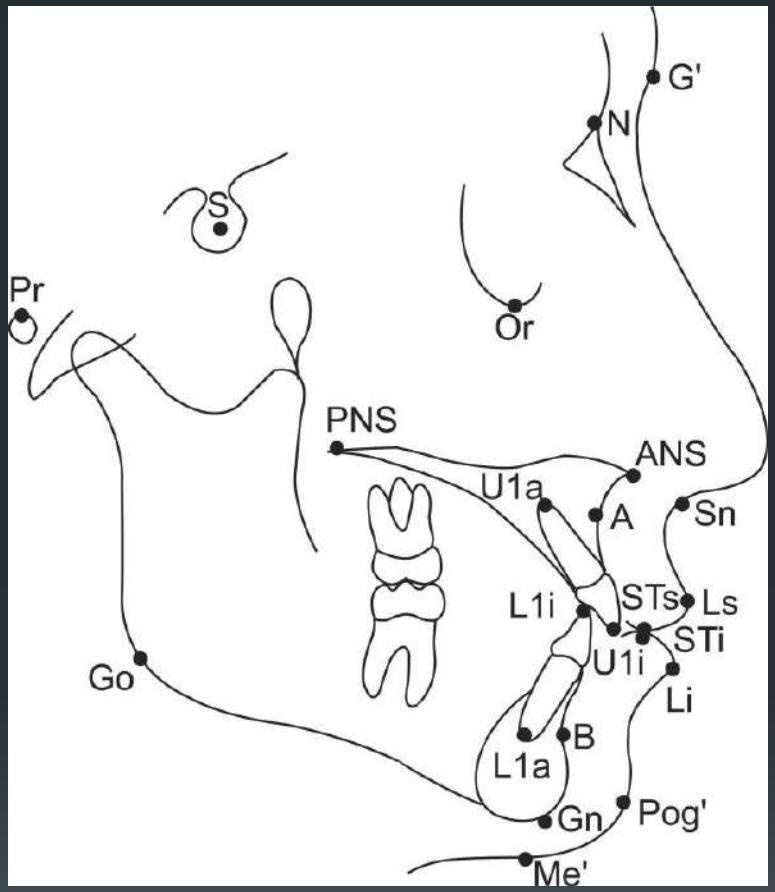
(4) An ↑ gonial angle

(5) Marked ante gonial notch

(6) A short mandible is a possibility

(7) Maxillary base may be more inferiorly placed

(8) The angle formed by the mandibular & maxillary planes is also ↑ed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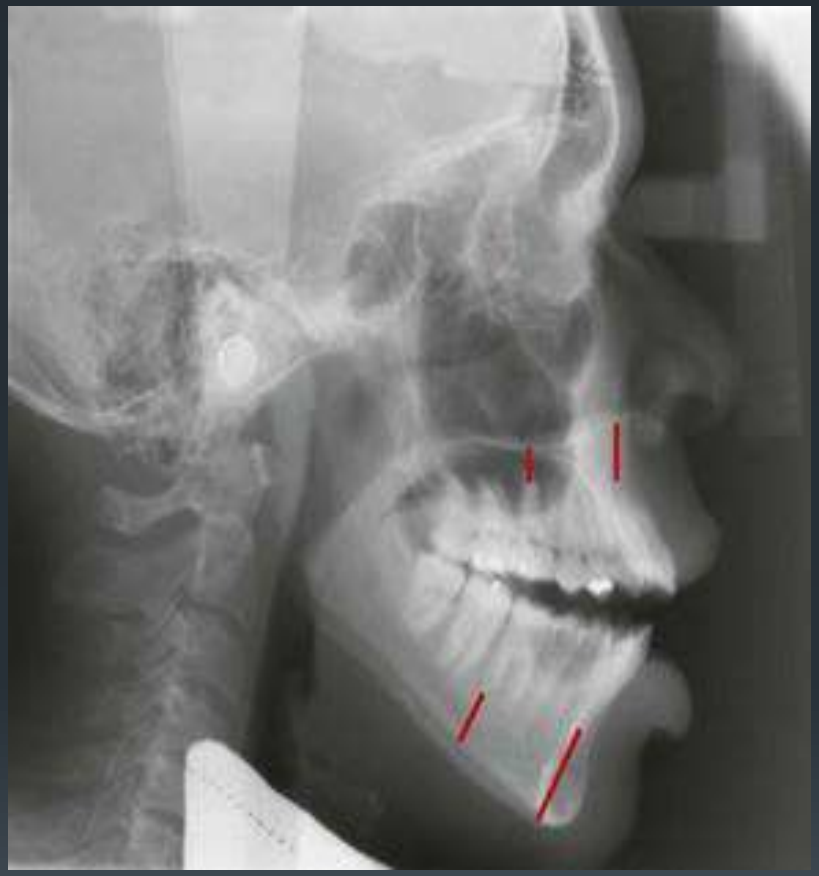


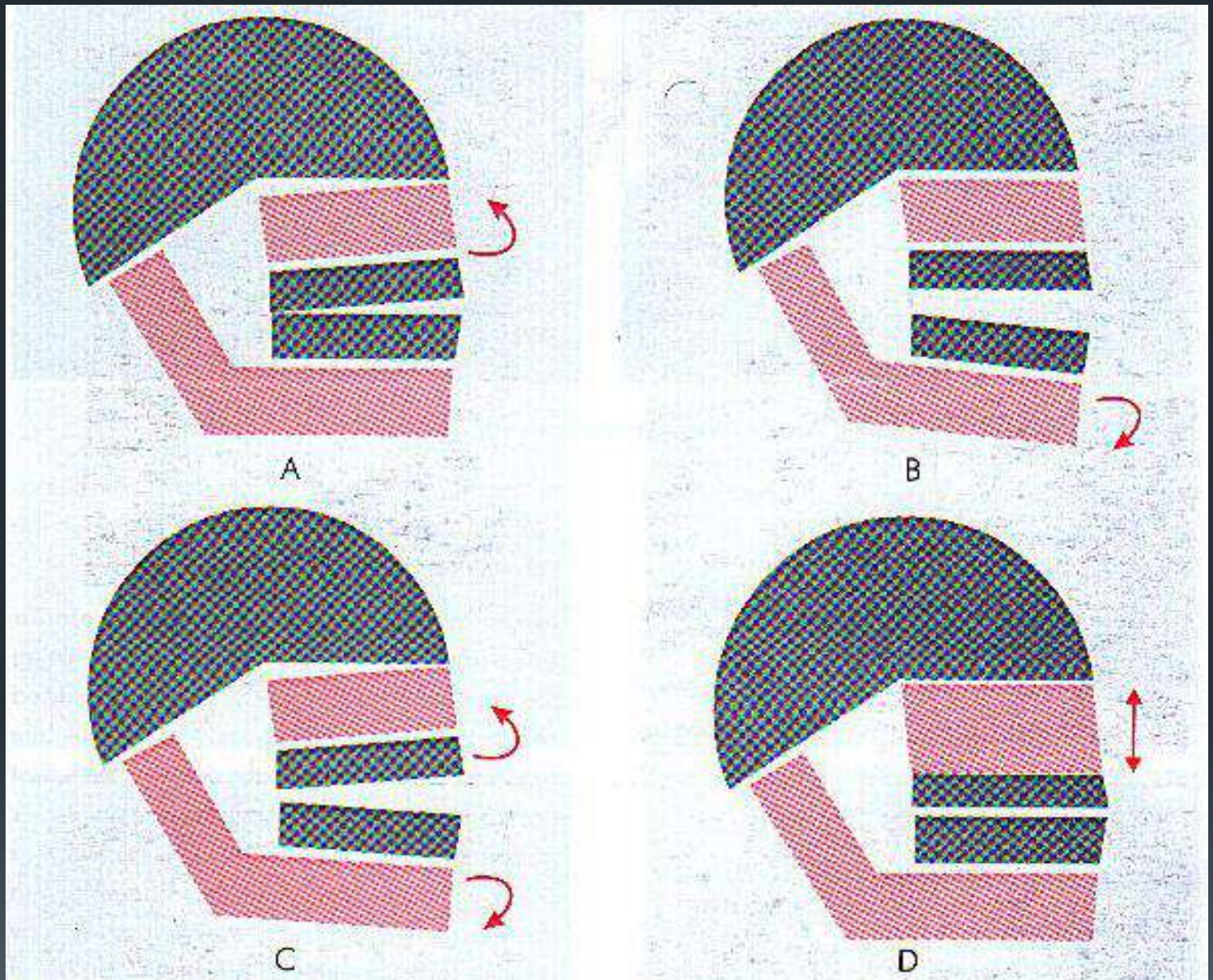


Fig 3 Skeletal anterior open bite (A) Due to counter-clockwise maxillary rotation (B) Due to clockwise mandibular rotation (C) Due to combination of A & B (D) Due to vertical maxillary excess

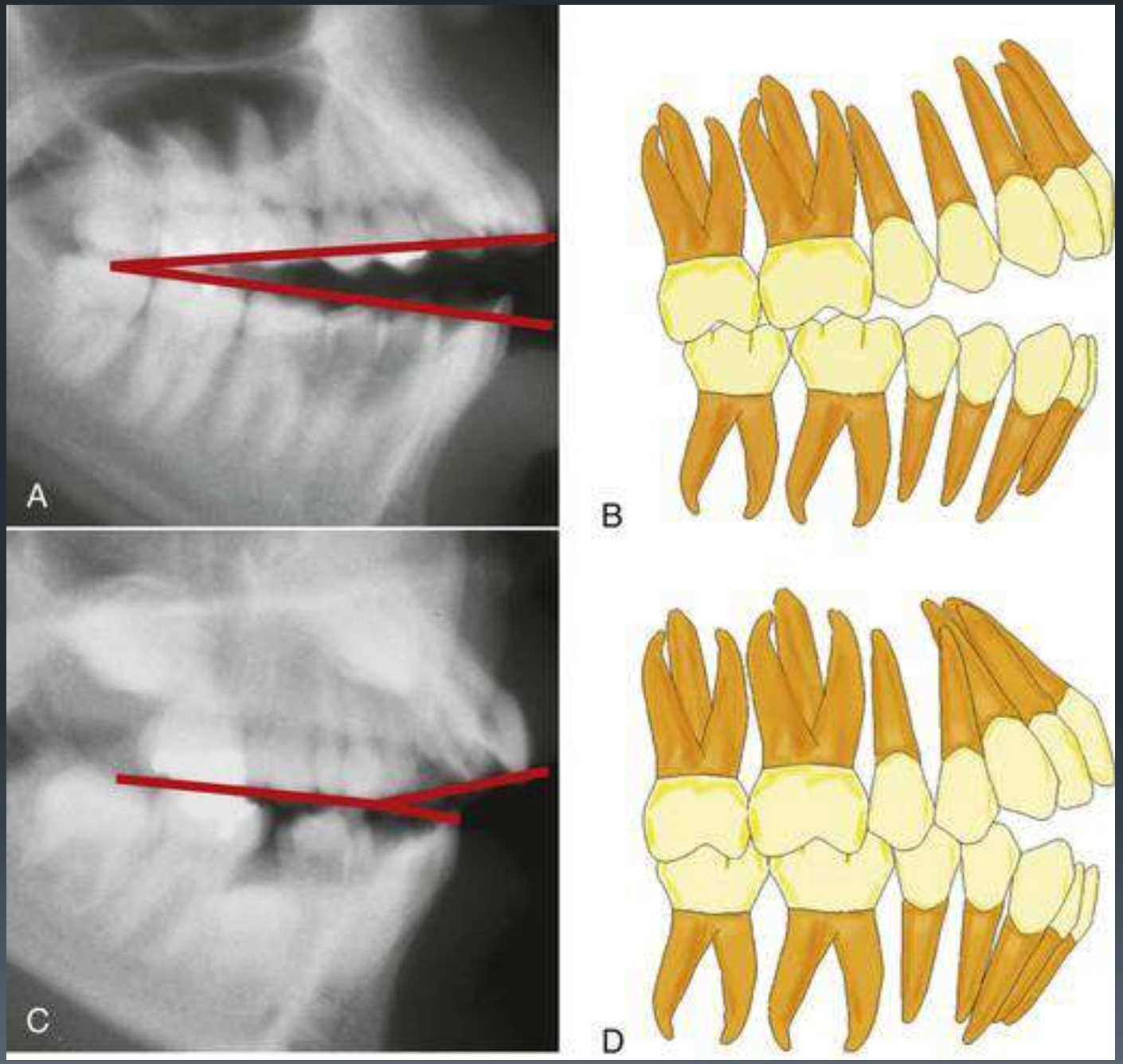
Features Of Dental Anterior open Bite

(1) Proclined upper anteriors

(2) Upper and lower anterior fail to overlap each other resulting in a space between max and mandibular anteriors

(4) Narrow maxillary arch is a possibility

(5) “Fish Mouth” appearance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C
D

Treatment of Anterior open bite

Remove of the cause

- Tongue spikes are valuable aid in control of lateral tongue thrust.
- Once the habit is intercepted, spontaneous improvement often follows.
- Habit breaking appliance: Tongue crib/ spikes can be removable or fixed

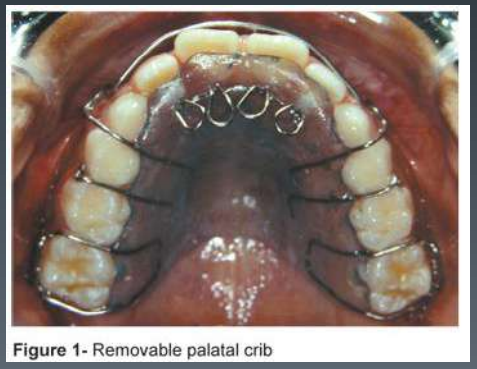


Figure 1- Removable palatal crib

Myofunctional Therapy

- Functional appliances such as FR IV or a modified activator
- This appliances incorporate bite blocks interpose between the posterior teeth
- Patients exhibiting downward & backward rotation of the mandible with increased vertical growth benefit from therapy using vertical pull head gear with chin cup if treated during mixed dentition period.

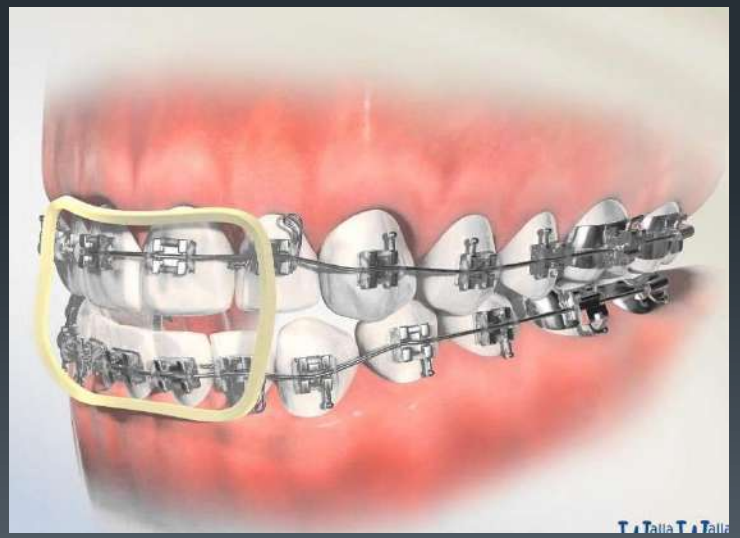
Posterior bite plane

- A posterior bite plate can be added to the upper or lower arch to aid in the correction of anterior open bites by disoccluding the anterior teeth to allow relative intrusion of the posterior teeth.

Orthodontic Therapy

- Mild to moderate open bites can be managed by using fix mechanotherapy in connection with **BOX ELASTIC**

- This form of elastic application consists of an elastic thread that is stretched between the upper & lower interiors.



Surgical correction

- Skeletal open bite in adults are treated by surgical procedures involving maxilla & mandible

Posterior open bite

- *It is a condition characterized by lack of contact between posteriors when the teeth are in occlusion.*

Etiology

- Mechanical interference with eruption. It may be either before or after the teeth emerge from the alveolar bone. It may be caused by ankylosis of the tooth to the alveolar bone which can occur spontaneously or due to trauma. After tooth erupts from bone it can also be due to presence of thick soft tissue(cheek , tongue) which can be an obstacle to eruption

- Second possible cause for it may be disturbance of itself. Sometimes expected amount of eruption doesn't occur due to lack of eruptive force.

Treatment

The primary aim is to remove cause

(i) *Lateral tongue spikes* are valuable aid in control of lateral tongue thrust

(ii) Once the habit is intercepted, spontaneous improvement often follows, the posterior can be forcefully extruded

(iii) In case of posterior open bite due to infra occlusion of ankylosed teeth, it is best treated by crown on posteriors to restore normal occlusion level

MANAGEMENT OF SOME COMMON MALOCCLUSIONS

Setting up Goals

- To treat patient's **chief complaint**
  - -Enlisting the treatment objective
  - -Assesment of growth potential
  - -Assesment of etiologic factors

Treatment Planning

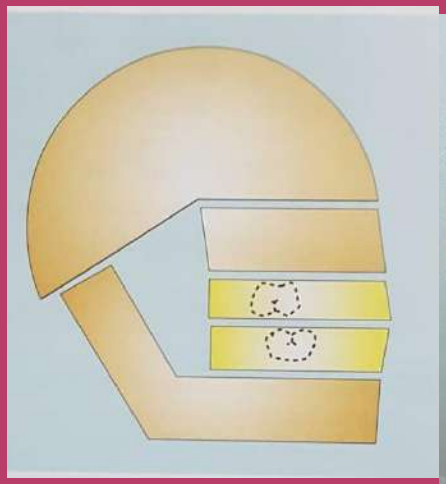
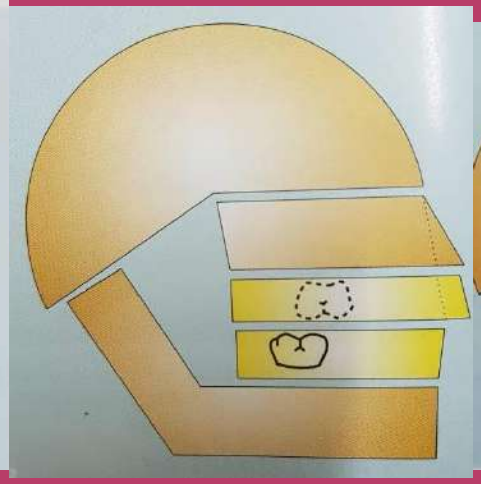
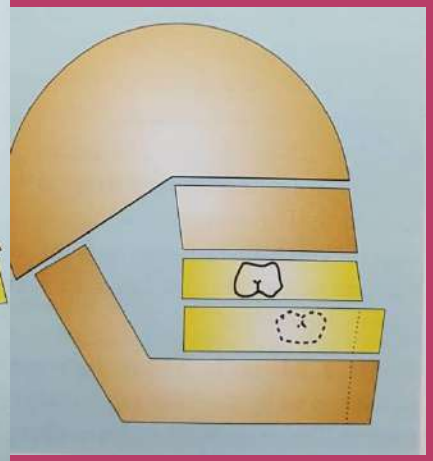
- Planning space requirments
  - -Correction of crowding
  - -Rotation
  - -Levelling the curve of spee
  - -Correction of proclination
  - -Molar correction
  - -Space for anchorage loss

Planning Extractions

Angle's Class 1
-Normal sagittal inter arch relationship
-Extraction of teeth from both arches is advised.

Angle's Class 2
- Forwardly placed upper arch/ backwardly placed lower arch
- Extrn from U-arch is advised to reduced proclination

Angle's Class 3
- Avoid extraction in upper arch as it may affect forward development of maxilla
- Extraction from lower arch is advised.

MIDLINE DIASTEMA

MANAGEMENT OF MIDLINE DIASTEMA:

Midline diastema refers to midline line spacing between the two maxillary central incisors.

It is one of the most frequently seen malocclusions that is considered easy to treat but often difficult to retain.

Causes of midline diastema

1) Transient malocclusion

Ugly-duckling stage: transient midline diastema as a result of erupting canines.

- Midline spacing can occur during the mixed dentition period associated with eruption of permanent canines i.e ugly duckling stage.

As the developing permanent canines erupt, they displace the roots of the lateral incisors mesially. A resultant distal divergence of the crowns of the two central incisors causes midline spacing. This condition usually corrects by itself when canines erupt and the pressure is transferred from the roots to the coronal area of incisors.

- Midline spacing can occur as a part of generalized spacing seen in deciduous dentition.

The spacing seen in deciduous dentition is normal and helps in accommodating larger sized permanent teeth.

2)Tooth material-

Arch length discrepancy: a disparity in which the arch length exceeds the tooth material can result in midline diastema. This includes conditions such as missing teeth, microdontia, macrognathia and extractions with resultant drifting of adjacent teeth.

Midline diastema : A) as a result of generalized spacing. B) bilateral missing missing maxillary laterals. C) bilateral peg laterals

3)Abnormal frenal attachments:

The presence of a thick and fleshy labial frenum can give rise to midline diastema.

This kind of frenal attachment prevents the two central incisors from approximating each other due to the fibrous connective tissue interposed between them.

4)Pressure habits: habits such as thumb sucking, tongue thrusting etc., also predispose to midline diastema. These patients generally present with proclination and generalized anterior spacing.

5)Midline pathology: spacing in the midline can be caused by soft tissue and hard tissue pathologies such as cysts, tumors and odontomes.

Presence of an mesiodens between the roots of the two central incisors also predispose to midline diastemas.

6)Iatrogenic: midline diastemas can occur when certain therapeutic procedures are undertaken. The appearance of midline spacing is an important prognostic sign during **rapid maxillary expansion** and it indicates the opening of the intermaxillary suture.

7)Racial predisposition: the presence of midline spacing also has a racial and familial background. The negroid race shows the greatest incidence of midline diastema.

Diagnostic aspects:

A blanch test is performed to diagnose a fleshy labial frenum. It is done by pulling the upper lip outwards. Presence of thick and fleshy frenum is confirmed by the blanching of the tissue in the incisive papilla region palatal to the two central incisors.

Presence of notching in the inter-dental alveolar bone as seen on a radiograph is also diagnostic of a thick and fleshy frenum. Midline radiographs are valuable aid in diagnosing midline pathologies.

Treatment of midline diastema:

The treatment of midline diastema is done in three phases-

- Removal of cause
- Active treatment
- Retention

The first phase involves REMOVAL OF ETIOLOGY.

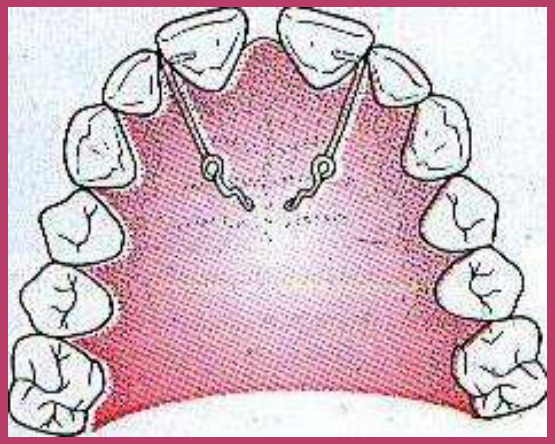
- ✓ Habits should be eliminated using fixed or removable habit breakers.
- ✓ Unerupeted mesiodens should be extracted.
- ✓ Frenectomy should be performed to excise thick fleshy frenum.

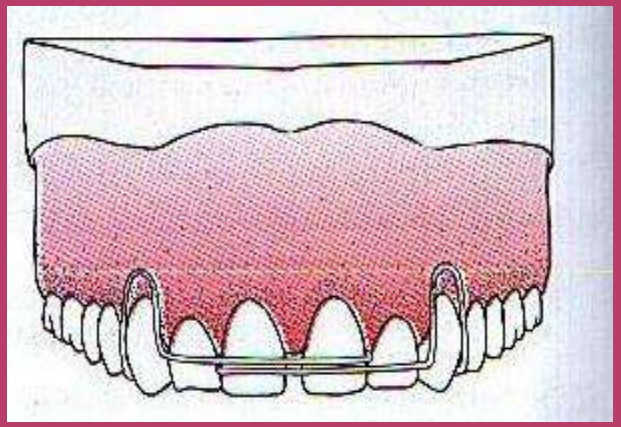
Second phase consists of ACTIVE TREATMENT.

It can be done using removable applainces or fixed appliances.

Removable appliances to treat midline diatema-

Finger springs can be given distal to the two central incisors. An alternative would be to use a Split labial bow made of 0.7mm hard stainless steel wire. The labial bows are made to extend upto the distal aspect of the opposite central incisors.





Fixed appliances to treat midline diastema:

Fixed appliances incorporating elastics or springs bring about the most rapid correction of midline diastema.

- ✓ Elastics can be stretched between the two central incisors in order to close the space.
- ✓ An alternative is to stretch a closed coil spring between the two central incisors.
- ✓ M shaped springs incorporating three helices can be inserted into the two central incisor brackets. This spring is activated by closing the helices.

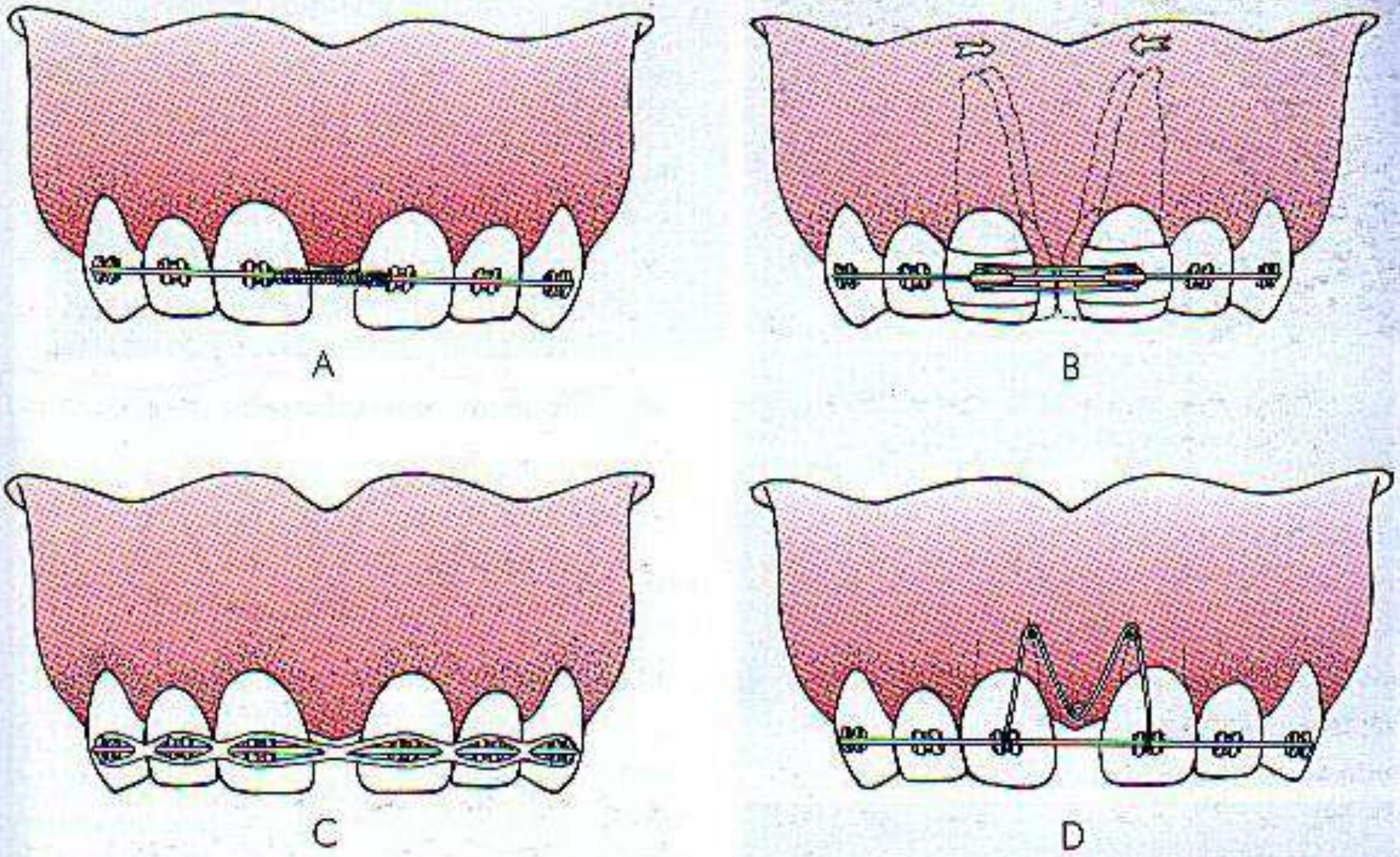


Fig 6 Treatment of midline diastema using fixed appliance (A) Closed coil spring (B) Elastics (C) Elastic chain (D) M shaped springs

The third phase of treatment involves

RETAINING THE TREATED MALOCCLUSION.

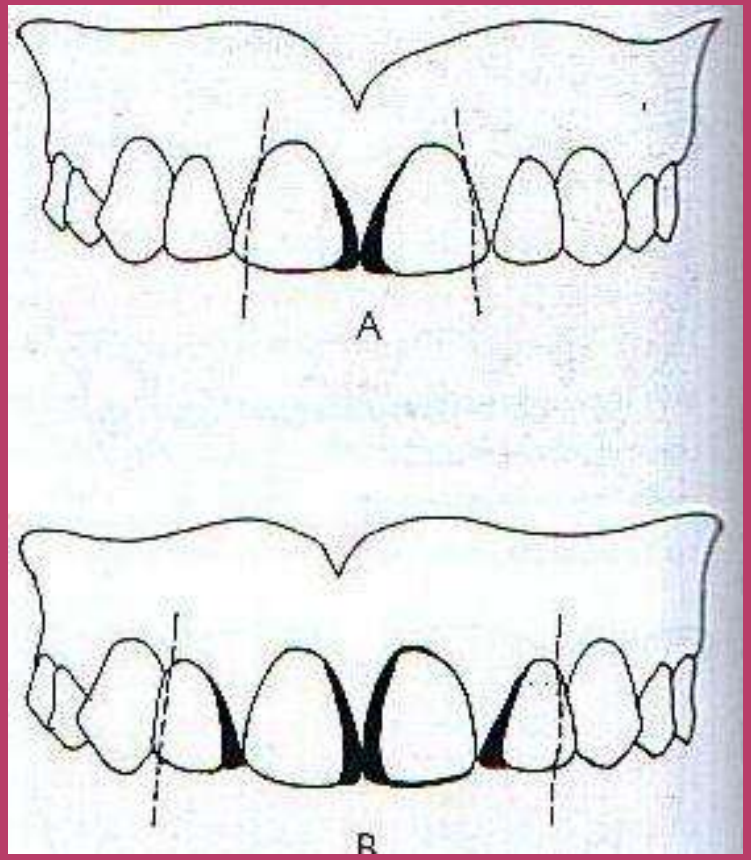
- ✓ Midline diastema is often considered easy to treat but difficult to retain.
- ✓ The key to its successful management is the elimination of the etiologic factors involved.
- ✓ Most orthodontists recommend long term retention using suitable retainers.
- ✓ Since prolonged retention is indicated, it is advisable to use lingual bonded retainers.
- ✓ The other retainers that can be used include banded retainers and Hawley retainers.

Fixed lingual retainer

Role of cosmetic restorations:

Esthetic composite resins are generally used to close midline diastema especially in adult patients. It requires gradual composite build up on the mesial surface and stripping of the distal surface of centrals and laterals in order to achieve a natural shape and size of the teeth.

Prosthesis/crown: presence of peg shaped laterals or teeth with other anomalies of shape and size require prosthetic rehabilitation. Missing teeth should be repalced with fixed or removable prosthesis.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SPACING

The presence of spacing between teeth is one of the commonly seen manifestation of a class I malocclusion.

The presence of spacing is a normal feature of deciduous dentition and is considered as a positive prognostic sign.

In the permanent dentition the presence of spacing between the teeth is abnormal. The space can be in a localized area or the entire arch can exhibit spacing.

Etiology:

- Generalized spacing usually occurs as a result of disproportion between arch length and tooth material. Presence of increased arch length or a reduction in tooth material can result in space between the teeth. Conditions such as oligodontia and microdontia therefore lead to spacing.

Maxillary spacing due to microdontic lateral incisors

- Spacing can occur as a result of alteration in tooth morphology. Abnormal tooth form such as peg shaped laterals can predispose to spacing.

- Deleterious oral habits such as thumb sucking and tongue thrusting can cause spacing in anterior region.

- The presence of an abnormally large tongue, a condition termed macroglossia can predispose to spacing.

- Presence of pathology and cystic lesions between the teeth can cause spacing.

- Premature loss of permanent teeth can cause spacing.

Diagnosis :

The routine orthodontic diagnostic aids should be employed for diagnostic purposes.

Model analysis can yield valuable information about arch length tooth material discrepancy.

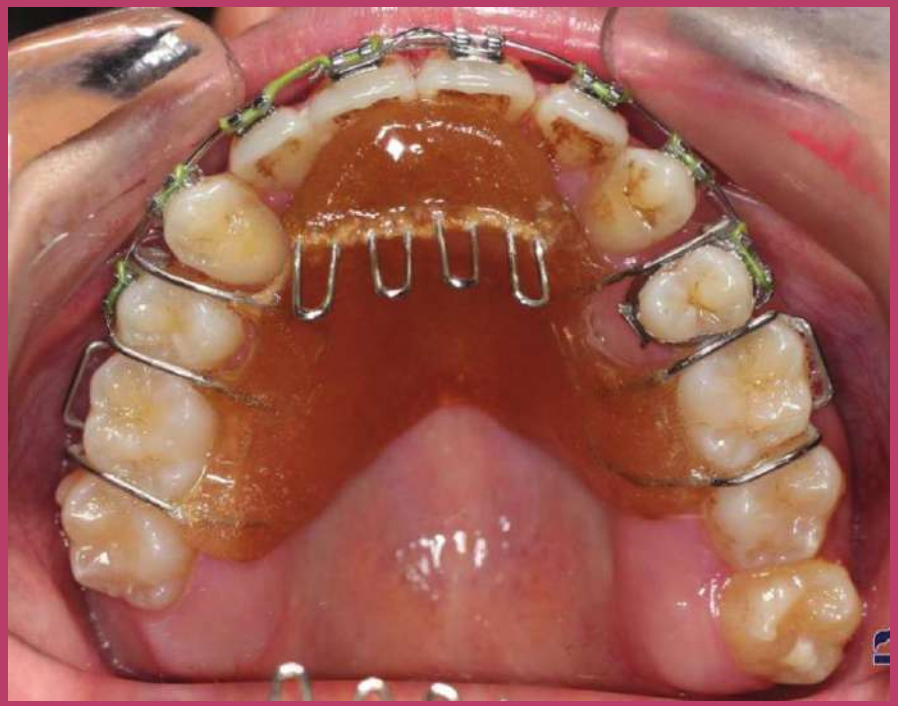
Radiographic examination should be carried out to diagnose bony pathology or unerupted teeth that may cause spacing.

Treatment:

Removal of the etiology- the cause for the spacing should be diagnosed and adequate steps are taken to eliminate the same.

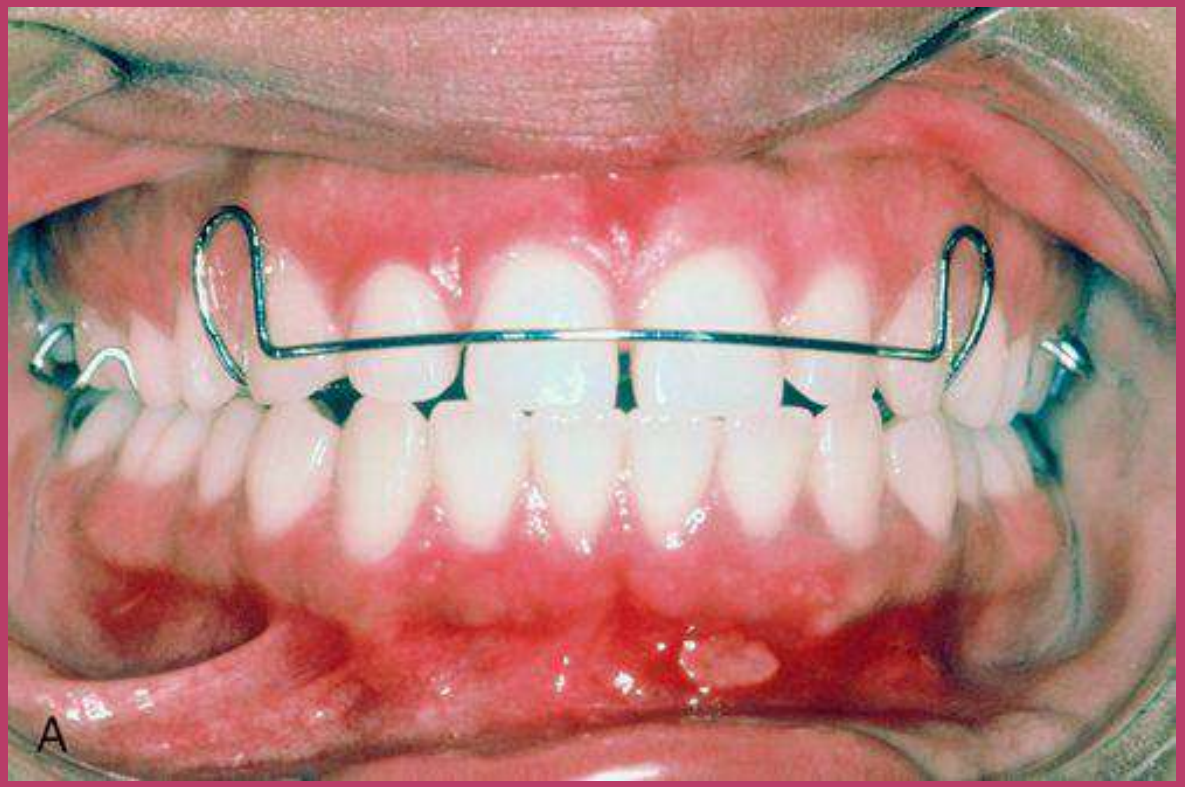
In case of spacing as a result of abnormal pressure habits, habit breakers may be employed to intercept the habit.

In case of bony pathology or cystic lesions, they should be eliminated.

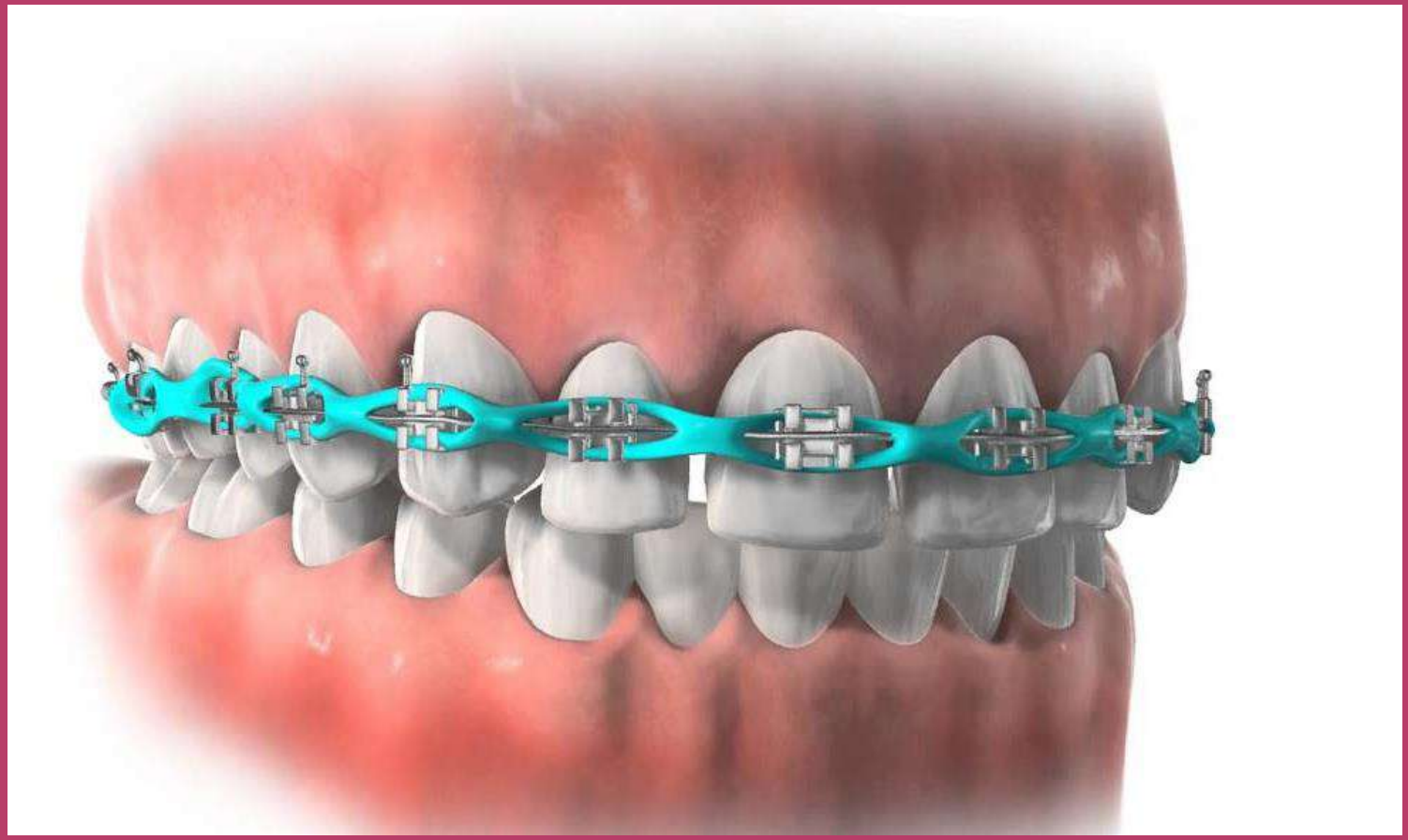


Use of removable and fixed appliances:

Active removable appliances incorporating labial bows can be used to close spaces that occur in conjunction with proclination.



- Fixed appliances with elastic chains or elastic thread are most effective in closure of generalized spacing.



Use of crowns and prosthesis:

Spacing that occurs as a result of microdontia can be treated using suitable crowns. A condition that is quite frequently encountered involving the maxillary lateral incisors are peg shaped or small teeth with resultant spacing the rest of the teeth due to drifting.

CROWDING

- Crowding is another common manifestation of a class I malocclusion.
- Crowding usually occurs as a result of disproportion between tooth size and arch length.
- A relative decrease in arch length or an increase in tooth length can result in crowding.

Etiology:

- Arch length- tooth material discrepancies are due to decreased arch length or an increase in tooth material.

- Presence of supernumerary or extra teeth can result in a crowded arrangement teeth.

- Prolonged retention of deciduous teeth can result in eruption of their successors in an abnormal location. The presence of an over retained deciduous tooth along with its permanent counterpart can cause crowding

Crowding due to over retained lower deciduous canine

- Abnormalities in size and shape of teeth can lead to a crowded arch. Teeth that are abnormally large can predispose to crowding.

- Premature loss of a deciduous tooth invariably results in drifting of adjacent teeth into the extraction space. An example of such a condition is the early loss of second deciduous molars. In these cases first permanent molar drifts into the extraction space. Thus second premolar do not have adequate space erupt and may do so in an abnormal position predisposing to crowding.

- Late lower labial segment crowding occurs commonly in mid to late teens. This is noticed even in persons who had very nicely aligned teeth with no crowding or even mild spacing. However if a person had mild crowding to start with we can expect it to progressively get worse during this period.

CAUSES OF LATE LOWER INCISOR CROWDING[1]

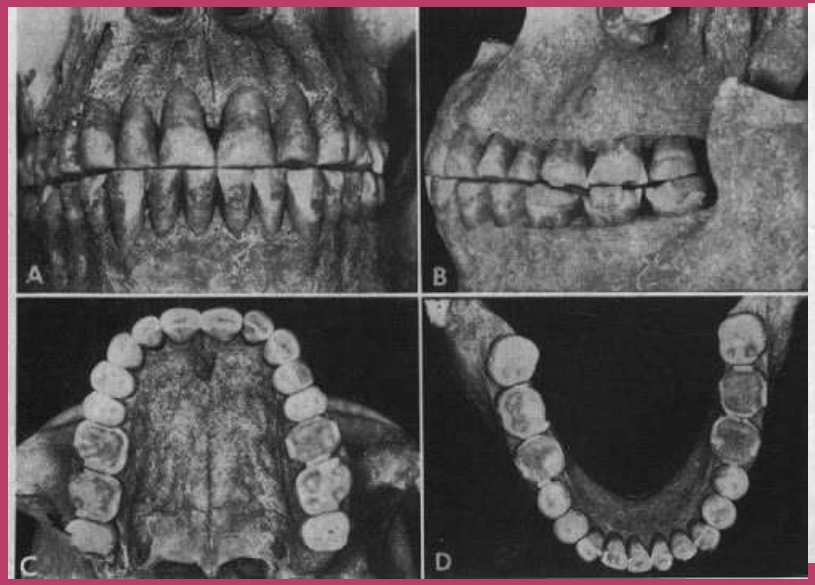
1)LATE MANDIBULAR GROWTH- It is believed that mandible may grow further in a forward direction after maxillary growth had stopped. This forward growth of the mandible may sometimes be accompanied by growth rotation which further worsens the situation. As the mandible grows forward the mandibular dentition is pushed lingually therby reducing the arch length and predisposing to crowding.

2*) REDUCTION OF INTERCANINE WIDTH*:

A reduction in inter canine width is noticed after the age of 9. This continues into teenage and into adulthood at a reduced rate. This is supposed to be responsible for the late lower anterior crowding.

4) LACK OF APPROXIMAL ATTRITION:

Lack of approximal attrition in modern man is believed to cause late lower anterior crowding.



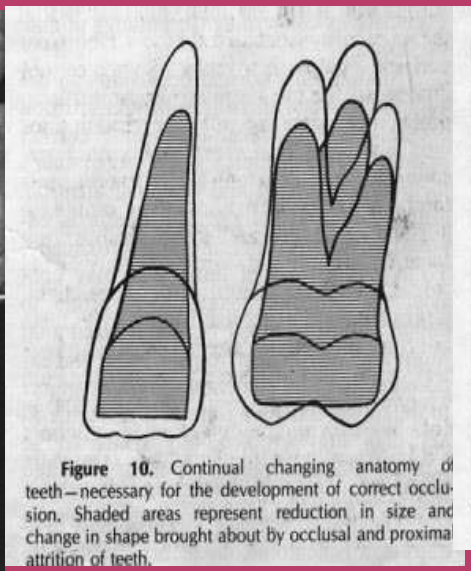


Figure 10. Continual changing anatomy of teeth—necessary for the development of correct occlusion. Shaded areas represent reduction in size and change in shape brought about by occlusal and proximal attrition of teeth.

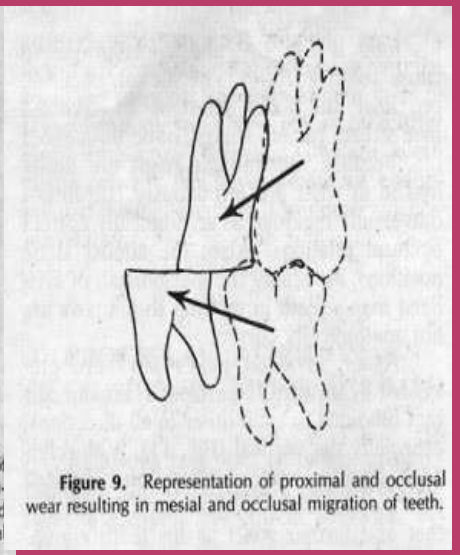


Figure 9. Representation of proximal and occlusal wear resulting in mesial and occlusal migration of teeth.

5) *ROLE OF MANDIBULAR THIRD MOLARS*:

Mandibular third molars are been implicated in the lower anterior crowding. This is believed to occur in 2 ways. One is the erupting third molar applies a mesial force causing crowding. The other theory is that the mandibular third molar prevents the distal movement of the dentition as a response to the late mandibular growth and therefore causes crowding.

Diagnosis:

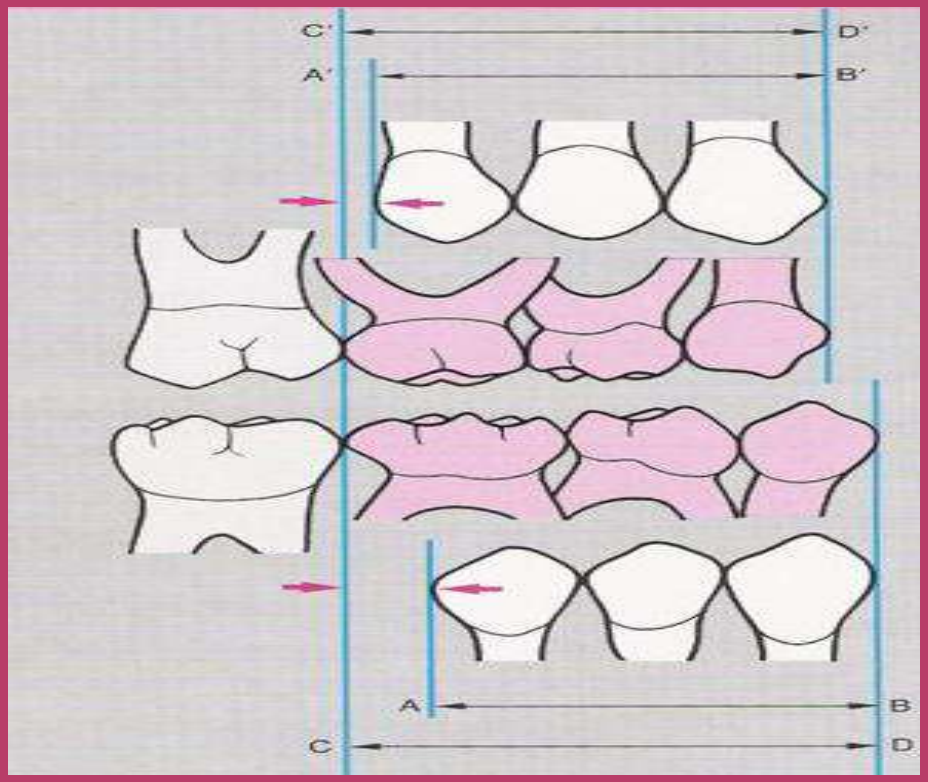
Clinical examination should be carried out to determine the extent and location of crowding. Model analysis can be of use in determining the mount of arch length- tooth material discrepancy.

Treatment:

Mild incisor crowding may be seen in the mixed dentition phase due to presence of large incisor permanent incisors and primary molars. Most minor crowding resolves spontaneously during transition from the deciduous to the mixed dentition phase. Early loss of primary mandibular canine is an indication of arch length deficiency.

In these patients mandibular incisors have to be retained in place with an lingual arch to prevent them from tipping lingually and there by increasing the possibility of crowding.

- Another approach I children who exhibit moderate incisal crowding during mixed dentition is the use of leeway space. This is done by preventing the mesial movement of the permanent first molar and therby utilizing that space to decrowd the anteriors.



Gaining space: crowded teeth require space for their normal alignment. On an average for every 1 mm of crowding, an equal amount of space is required for correction. Thus the amount of crowding should be calculated and the means of obtaining this space should be determined. The various methods of gaining space include proximal stripping, expansion, extraction, molar distallization, derotation and uprighting of posterior teeth and proclination of upper anteriors.

Use of removable appliances:

One of the provision for space is made teeth can be moved to normal non crowded positions by using removable appliances that incorporate coil springs, canine retractors, and labial bows.

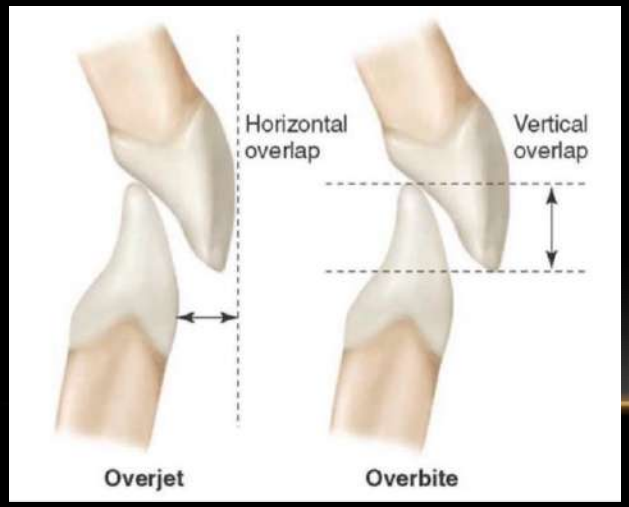
Use of fixed appliances:

Fixed appliances offer better control in treatment of crowding. Fixed appliances that make use of multilooped arch wires or resiliant nickel titanium wires are very effective in correction of crowding.

MANAGEMENT OF DEEP BITE

INTRODUCTION

- *Maxillary arch is larger then mandibular arch so it overlap the mandibular arch.*
- *Overlap is both in horizontal and vertical plane*
- *Horizontal overlap is called as overjet & vertical overlap is called as overbite*
- *The condition where vertical overlap is excess is known as DEEP BITE*



Normal Overjet & Overbite

DEEP BITE

- *Deep bite is one of the frequently seen malocclusions that can occur along with other associated malocclusions.*

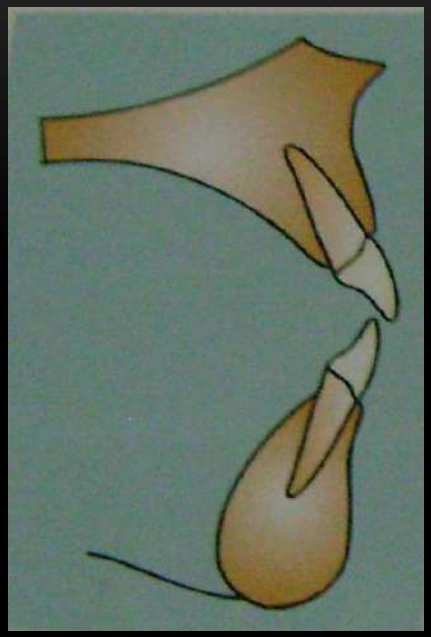
- *It is said to be one of the most damaging malocclusions when considered from the viewpoint of the future health of the masticatory apparatus and the dental units.*

Graber has defined deep bite as a condition of excessive overbite, where the vertical measurement between the maxillary and mandibular incisal margins is excessive when the mandible is brought into habitual or centric occlusion.

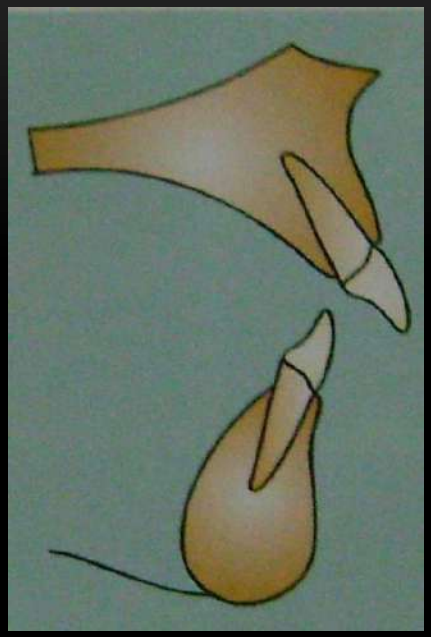
Deep overbite can be of two types: Incomplete & Complete overbite.

Incomplete overbite is an incisor relationship In which the lower incisors fail to occlude with either the upper incisors or the mucosa of the palate when the teeth are occluded.

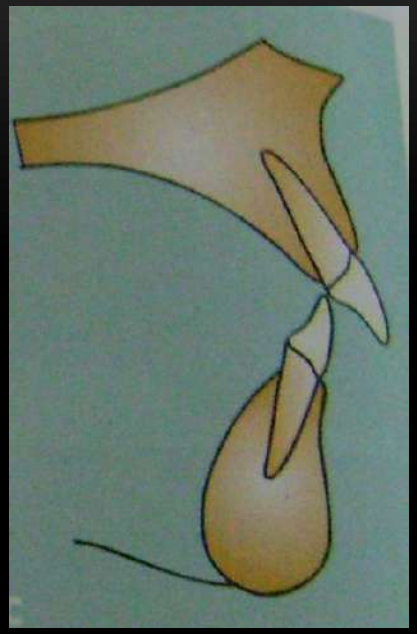
Complete overbite is a relationship in which the lower incisors contact the palatal surface of the upper incisors or the palatal tissue when the teeth are in centric occlusion



Normal overbite



Incomplete overbite



Complete overbite

CLASSIFICATION

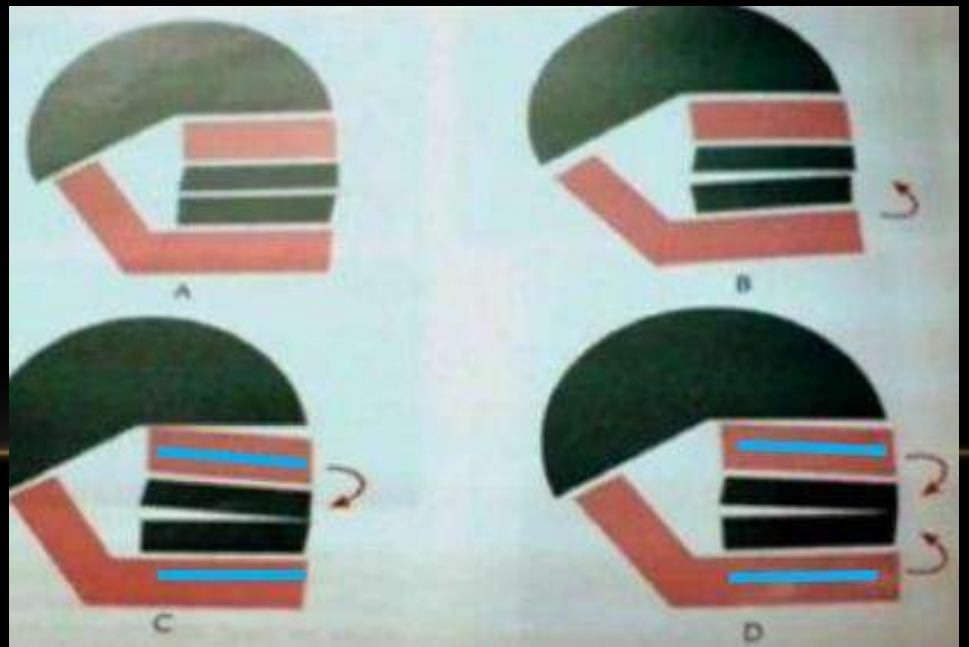
Deep bite can be broadly classified into-

1)Skeletal deep bite

2)Dental deep bite

Skeletal deep bite-

Deep bites are usually of genetic origin. This kind of deep bite is caused by upward and forward rotation of the mandible. The deep bite can be further worsened by a downward and forward inclination of the maxilla.



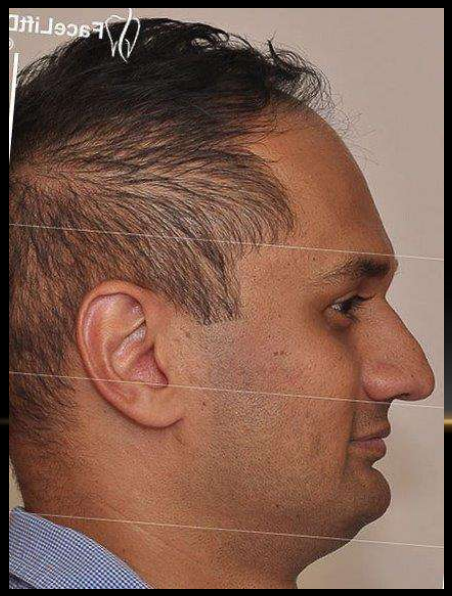
Skeletal deep bites are characterized by the presence of following features-

a)Patient exhibit a horizontal growth pattern.

b)The anterior facial height is reduced.

c)A reduced interocclusal clearance (freeway space)

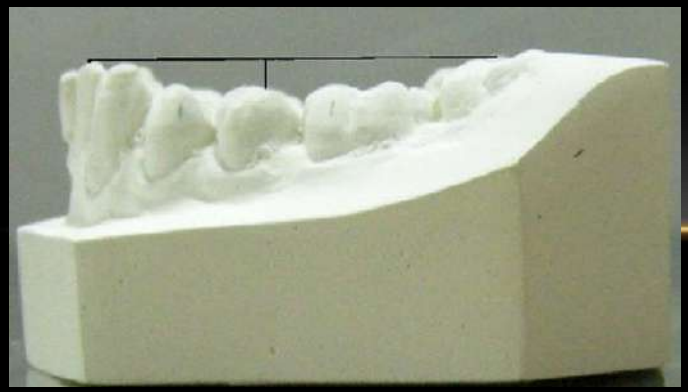
d)A cephalometric examination reveals that most of the horizontal cephalometric planes such as mandibular plane, F.H. plane, S.N.plane are parallel to each other.



Dental deep bite- this kind of deep bite is characterized by the absence of any skeletal complicating features that are seen in skeletal deep bites.

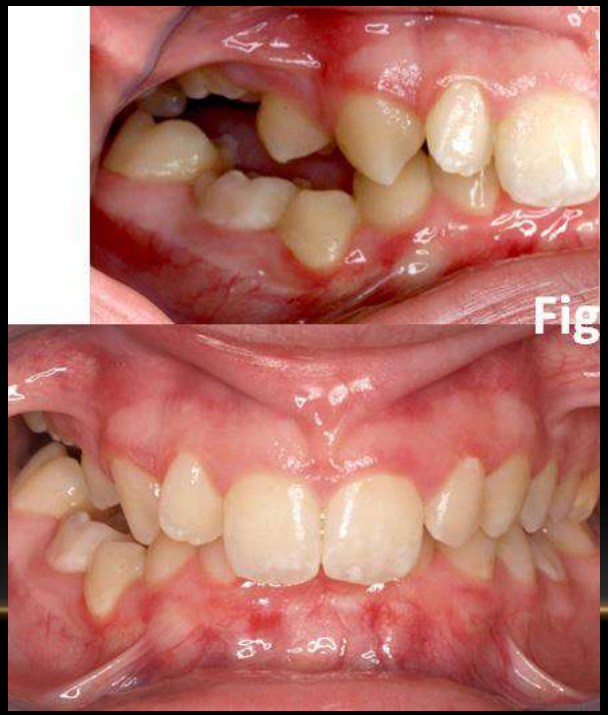
- Dental deep bites can occur due to over-eruption of anteriors or infra-occlusion of molars.

1)Deep bite due to over eruption of lower anteriors- Dental deep bites associated with over-eruption is usually seen in class II malocclusion. The presence of an increased overjet allows the lower incisors to over erupt until they meet the palatal mucosa. These patients hence exhibit an excessive curve of spee. The inter-occlusal clearance is usually normal as the molars are fully erupted.



Deep bite due to infra-occlusion of molars: Deep bites can occur due to infra occlusion of molars.

- The presence of a lateral tongue thrust may prevent the molars from erupting to their normal occlusal level. It can occur due to premeture loss of posterior teeth. Deep bites caused by infra-occlusion of molars are characterized by the presence of partially erupted molars(i.e., reduced crown height) and large inter occlusal clearence.



infra-occlusion of molars

DIAGNOSIS

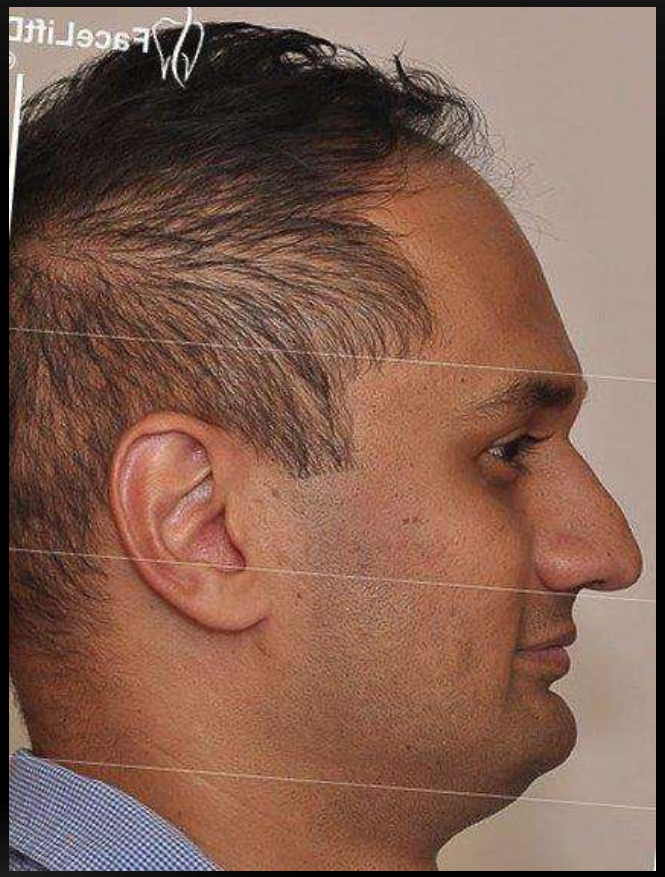
The routine diagnostic aids such as

- Clinical examination

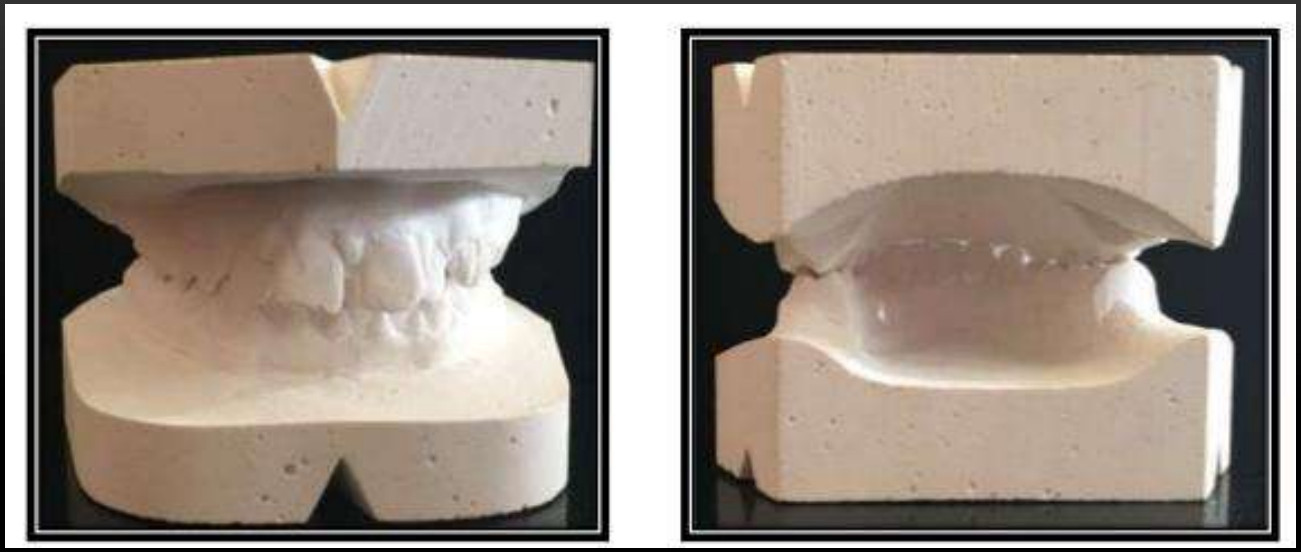
  Facial profile

  Facial height

  Mentolabial sulcus



Study models



Lateral cephalogram are used for the diagnostic exercise. Lateral cephalometric analysis of the skeletal pattern helps in diagnosing a skeletal deep bite. These patients show a reduced mandibular plane angle as well as a reduced anterior facial height

FACTORS TO BE CONSIDERED IN TREATMENT OF DEEP BITE

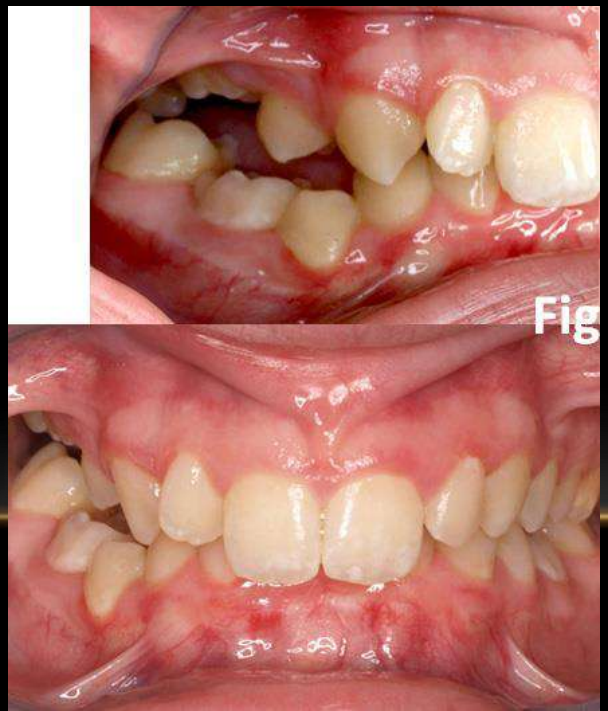
Deep bites are usually corrected by intrusion of the anterior teeth or by the extrusion of posterior teeth. There are certain factors that help in deciding whether to intrude the anteriors or extrude the molars-

Lip relationship: Patients with deep bite who exhibit a short upper lip or a gummy smile should be treated by intrusion of the anteriors. In patients exhibiting normal upper lip with only 2-3mm of maxillary incisal edge exposed, it is ideal to extrude the molars.

- Consideration of vertical facial height- Extrusion of one or more posterior teeth usually results in downward and backward rotation of the mandible. Thus an increase in anterior facial height occurs. This can be a benefit in treating skeletal deep bites with excessive horizontal growth and upward rotation of the mandible.

Consideration of inter-occlusal space: The average inter-occlusal space is 2-4mm in premolar region. *Presence of an increased inter-occlusal space is an indication that the molars are not fully erupted*. In such patients the deep bite can be treated by *extrusion of posterior teeth*.

The orthodontist should not reduce a normal inter-occlusal clearance by extrusion of molars as it can result in fatigue of the muscles of mastication that get stretched and predispose to relpase. The presence of a normal inter-occlusal clearance is therefore and indication of intrusion rather than extrusion of molars.



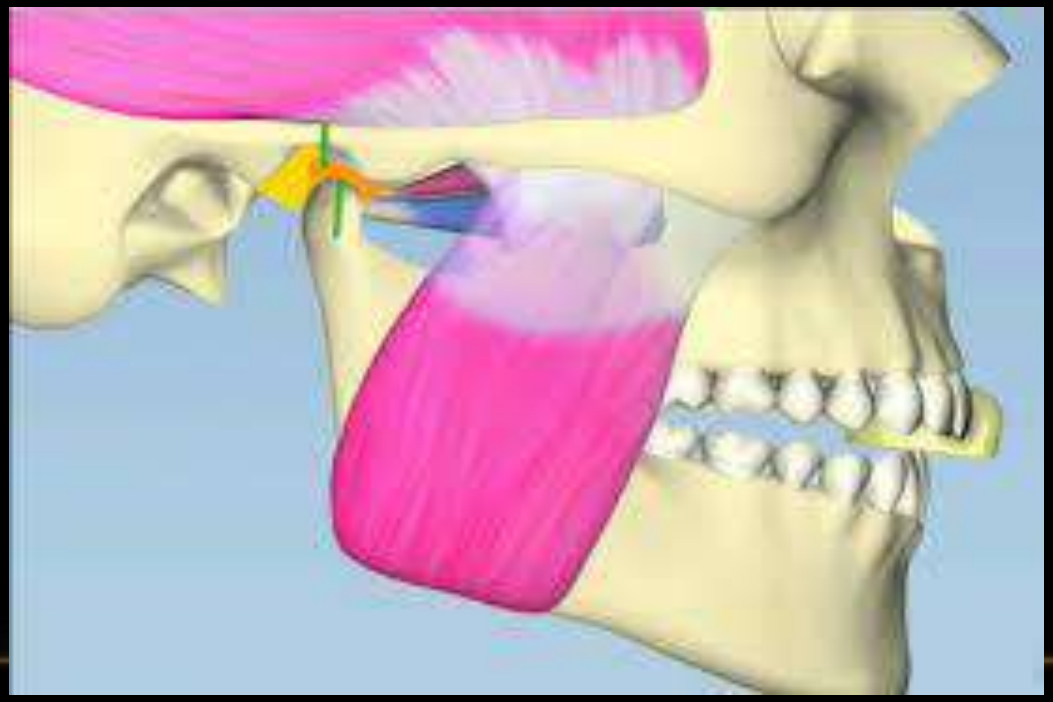
TREATMENT OF DEEP BITE

Deep bites can be treated by using

Removable, Fixed or Myofunctional appliances.

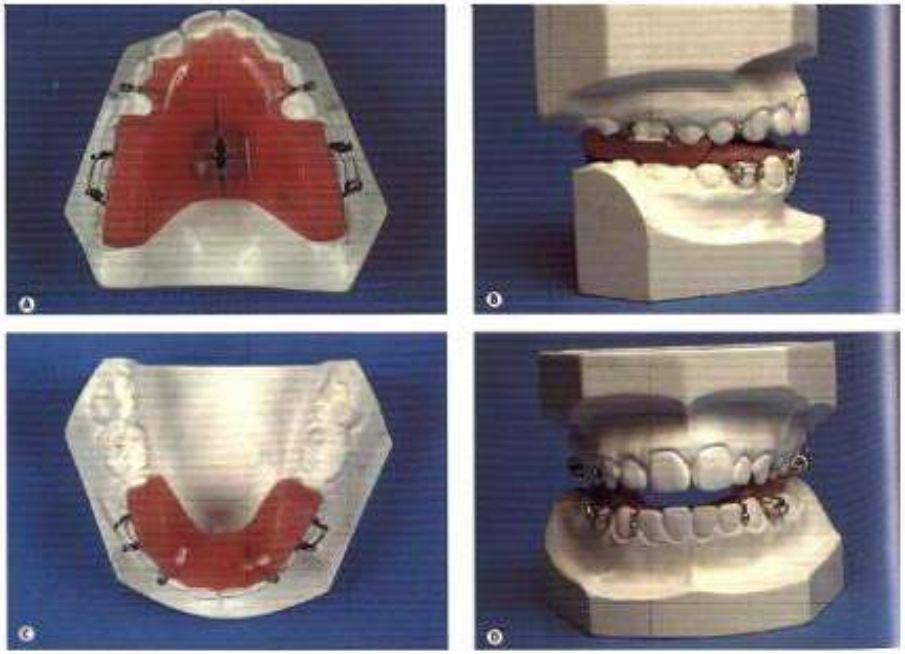
Removable appliances- anterior bite plane is a modified Hawley‘s appliance with a flat ledge of acrylic behind the anteriors. When the patient bites, the mandibular incisors contact the bite plane thus disoccluding the posteriors that are free to erupt.

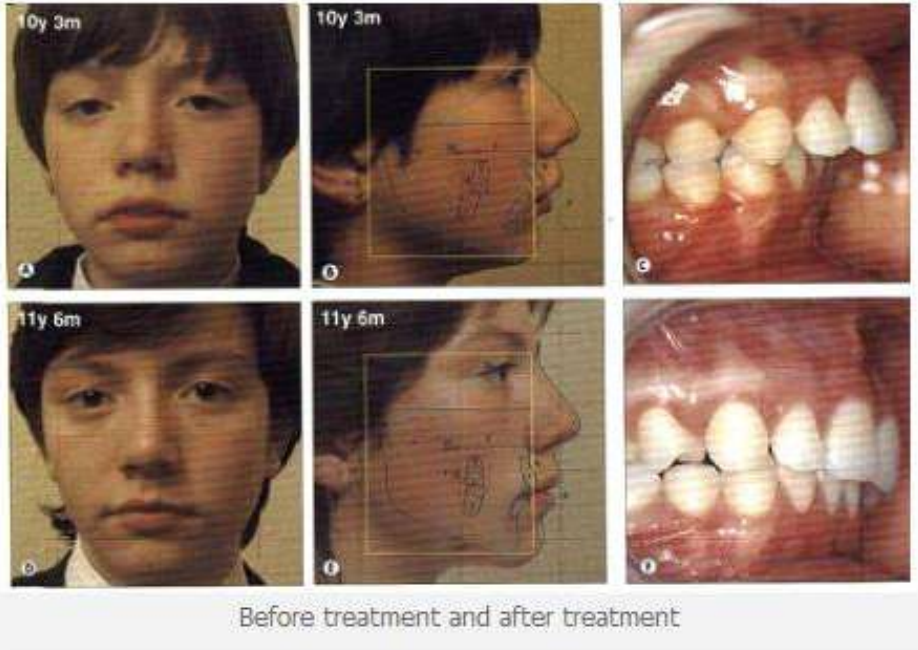
- The anterior bite plane consists of Adam's clasps on the molars, which help in retaining the appliance. A labial bow is also incorporated to counter any forward component of force on the upper anteriors.
- The height of the anterior bite plane should be just enough to separate the posteriors by 1.5 to 2mm. As the posterior teeth erupt the height of the bite plane is gradually increased.



Myofunctional appliances-

Deep bites can be diagnosed to be due to infra-occlusion of molars can be treated by an activator designed and trimmed to allow the extrusion of these teeth. The inter-occlusal acrylic is trimmed gradually to encourage the eruption of the posterior teeth. Bionator can also be used for a similar purpose.



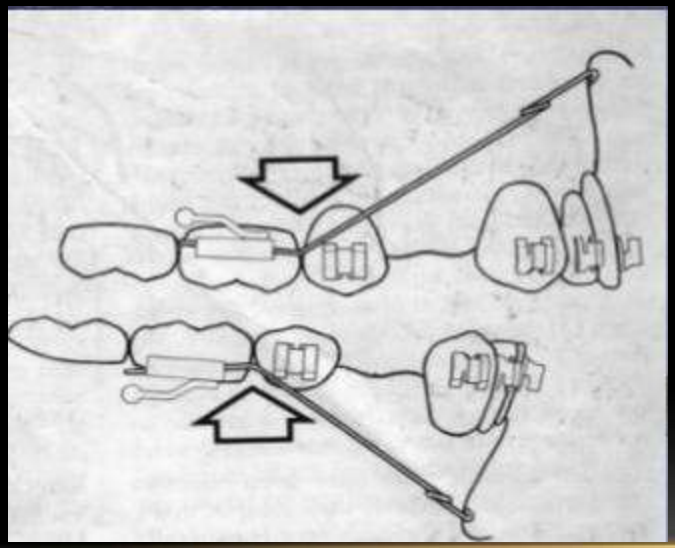


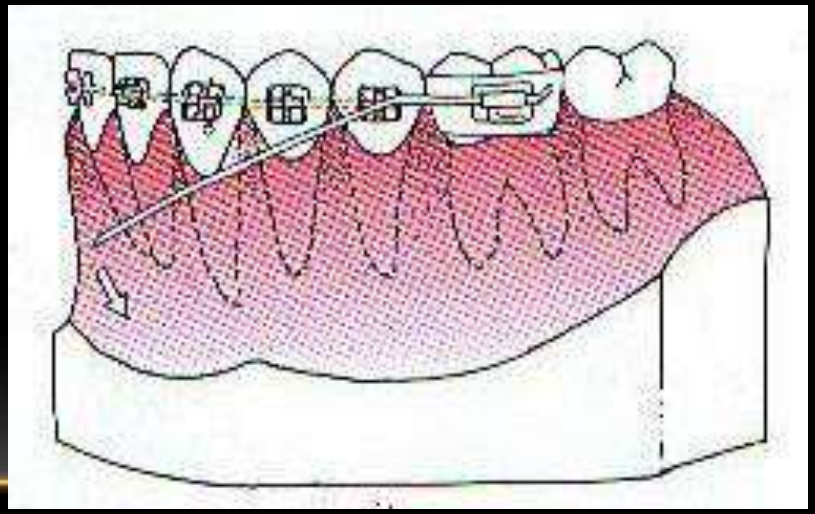
Before treatment and after treatment

Fixed appliance therapy-

Fixed orthodontic appliances can be used to intrude anteriors. The following are some of the methods used in fixed appliances to treat deep bite-

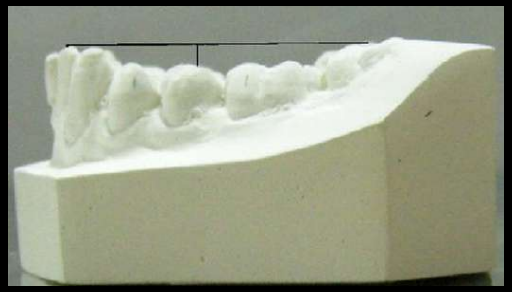
Use of anchorage bends- anchorage bends are given in the arch wire mesial to the molar tubes so that anterior part of the wire lies gingival to the bracket slot. Thus when these arch wires are pulled occlusally and engaged into the brackets, a gingivally directed intrusive force is exerted on the incisors, which reduces the deep bite.



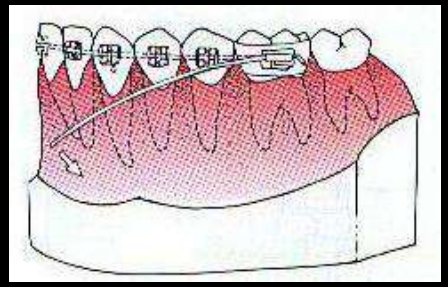


Use of arch wires with reverse curve of spee-

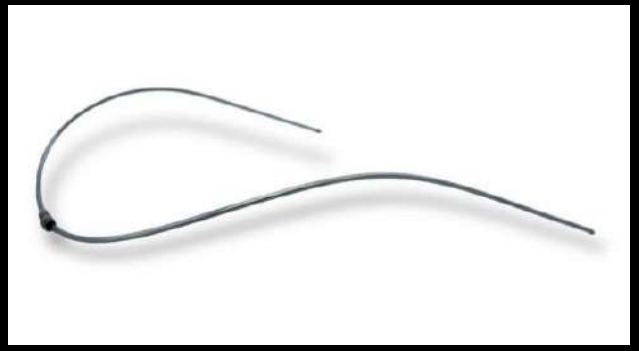
- Resiliant arch wires that have been curved in a direction opposite to that of the curve of spee can be used to intrude anteriors.
- When these arch wires are inserted into the molar tubes, the anterior segment curves gingivally. The anterior segment if forced occlusally into the bracket slot resulting in an intrusive force on the incisors.

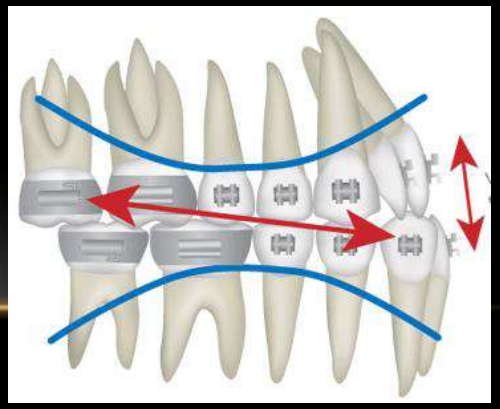


curve of spee

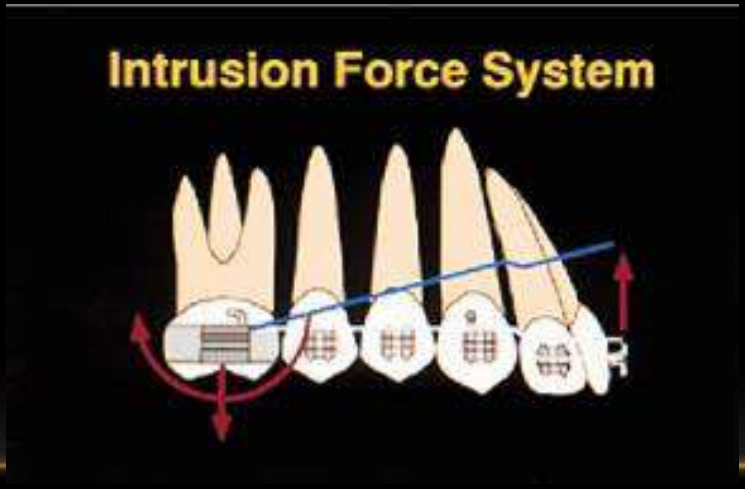


Reverse curve of spee





- Use of utility arches- utility arches are arch wires that are bent in such a way that they bypass the buccal segment and are engaged on the inciosrs. These arches can be used to perform a number of tooth movements including intrusion of incisors, protraction or even retraction of incisors. They are activated by giving a V bend in the buccal segment of the wire so as to produce an intrusive force on the anteriors



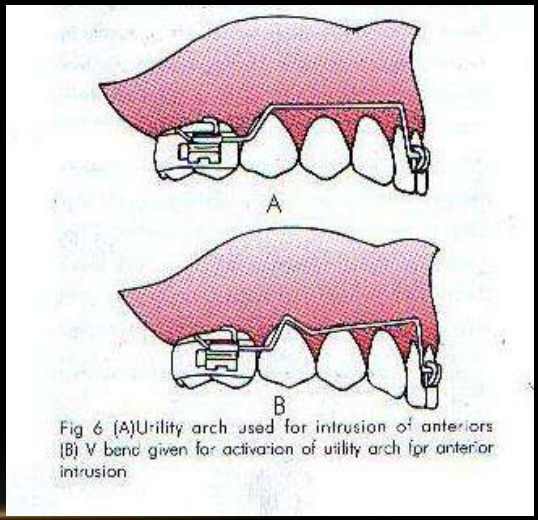


Fig 6 (A)Utility arch used for intrusion of anteriors (B) V bend given for activation of utility arch for anterior intrusion

THE END!

Thanks for your attention.

Removable Orthodontic Appliances

CONTENTS

- Removable orthodontic appliances are those that can be inserted and removed from oral cavity by patient at will or by an orthodontist for adjustment.

Development of Removable Appliances

- In United States, Victor Hugo Jackson was the chief proponent of removable appliance.
- Europe - ***Removable appliances***
- U. S. - ***Fixed appliances***

DEVELOPMENT IN EUROPE

- Angle's emphasis on precise positioning had less impact.
- Social welfare systems
- Precious metal for fixed less available
- Establishment of ***National Health Service*** (1948)

In European mid twentieth century removable appliances differentiated into

- Activators or functional appliances
- Active plate

At present removable appliances are indicated for three major uses:

- *Growth modification*
- *Limited (tipping) tooth movements*
- *Retention*

Advantages

- Can be removed on socially sensitive occasions
- Patient can maintain good oral hygiene; the appliance can also be kept clean.
- Majority of the malocclusions which requires tipping can be readily treated.
- Bite planes can be incorporated into it

- Can be fabricated in laboratory utilizing less chair side time
- Simple malocclusions can be treated by general practitioner
- Relatively inexpensive
- Damaged appliances that apply undesirable forces can be removed

Disadvantages

- Patient co-operation is very important for the success of treatment.
- Capable of only tipping movement
- Lower removable appliances are not well tolerated
- Multiple rotations are difficult
- In extraction cases it is difficult to close residual spaces
- Greater chances of appliance being misplaced or damaged

Case selection

Occlusion

Do not attempt in severe Class II and Class III malocclusion particularly skeletal discrepancies

The patient

- Co-operative patient with good oral hygiene
- Where Frankfort mandibular angle is very high or low
- Where extensive treatment of lower arch is needed
- Where teeth has to be moved bodily
- Where there is extensive rotation
- Where soft tissue pattern is unfavorable

Classification of Removable Appliances

- Broadly classified into intra oral, extra oral, or combination.

INTRA ORAL

- ***Simple appliances*** – Oral Screen, Inclined plane
- ***Unimaxillary plate appliances*** for maxilla or mandible.
  - Active plate
  - Retention plate

EXTRA ORAL

- ***Bimaxillary appliance*** – these are double plates with intermaxillary connection like activator, bionator and functional regulator
  - Chin cap
  - Head gear

COMBINATION

- Maxillary appliance with face mask for maxillary protraction.

Active Plate

- The removable appliance used at present were developed before World War II. At that time there were two distinctly different devices:

1. **The active plate** – uses force within the appliance.
2. **The activator** – used muscular forces.

Of Historical Importance

- Coffin plate (1881) , with spring which was then made PIANO wire.
- Norman Kingsley (1880) first described his plate for "JUMPING THE BITE"
- Pierre Robin (1902) constructed the first Split plate
- In England J.H Badcok (1911) described expansion screw

Basic components of Active plate

- **Active elements**
  - Labial bow
  - Springs
  - Screws
  - Elastics
- **Retentive elements**
  - Clasps
- **The base plate**

Labial Bows

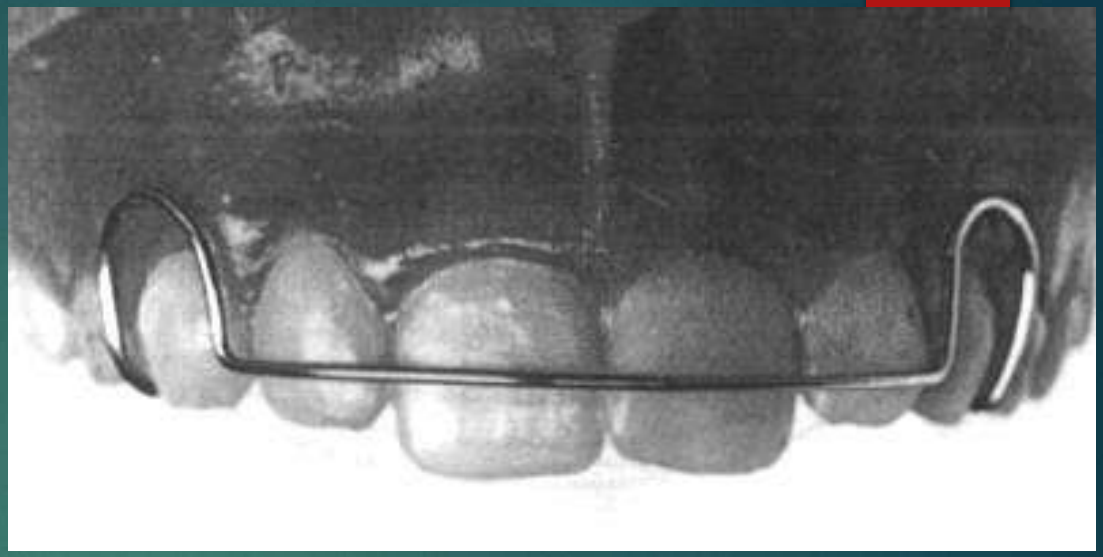
Parts of labial bow

1. Incisor segment
2. Vertical loops
3. Cross over section
4. Retentive arm

Incisor segment

- Usually in the junction of middle third and incisal third
- Right angle bend at the distal third of lateral incisors or mesial third of canine.
- Contacts only the most prominent teeth

Vertical loops



- Consists of parallel vertical legs joined by a smooth curve.
- Its usually 9 – 12 mm, extending 2 – 3 mm above the gingival margin.
- At the gingival level the loop is 1-1.5 mm away

Uses:

- Move teeth lingually.
- Restraining action on lip
- Support for soldered springs, bar loops or for hooks to attach elastic bands
- Friction of labial wire against the anterior teeth act as clasp to enhance the fit of the plate.

The various types of Labial bows

- Short labial bow
- Long labial bow
- Split labial bow
- Reverse labial bow
- Roberts retractor
- Mills retractor
- High labial bow with apron springs
- Fitted labial bow

Short Labial Bow

- Constructed using 0.7 mm stainless steel wire.
- Retentive arm distal to canine.
- It is very stiff and exhibits low flexibility

Indication

- Minor overjet reduction
- Anterior space closure.
- Retention

Activation - compressing the "U" loops.

Long Labial Bow

INDICATIONS

- Minor anterior space closure
- Minor overjet reduction
- Closure of space distal to canine
- Guidance of canine during retraction
- Retention

Split Labial Bow

- Split in middle 2 separate buccal arms having U loop
- Increased flexibility

INDICATIONS

- Anterior retraction
- Modified form for closure of midline diastema

ACTIVATION compressing U loop 1-2 mm at a time

Reverse Labial Bow

- The U loops are placed distal to the canine
- Free ends of the U loop are adapted occlusally between first premolar and canine

High labial bow with apron springs

- Consists of a heavy wire labial bow (0.9 or 1 mm) that extends into the buccal vestibule
- Apron springs made of 0.4 mm wire are attached

USES

- Retraction of one or more teeth
- Cases of large overjet due to increased flexibility

ACTIVATION

- Apron spring is activated by bending it towards the teeth (3 mm)

DISADVANTAGES

- Difficulty in construction
- Risk of soft tissue injury

Fitted Labial Bow

- Adapted to confirm to the contours of labial surfaces
- Used only as a retainer

Roberts Retractor

- Flexible bow constructed from 0.5 mm diameter wire inserted into a stainless steel tubing to give support
- Consists of a coil of 3 mm diameter mesial to canine

Indication

In patients with severe overjet of over 4 mm

Activation

- The bow is adjusted by bending the vertical limb below the coil
- As the incisor moves palatally, the bow will drop anteriorly and the level of horizontal part should be adjusted

Mills Retractor

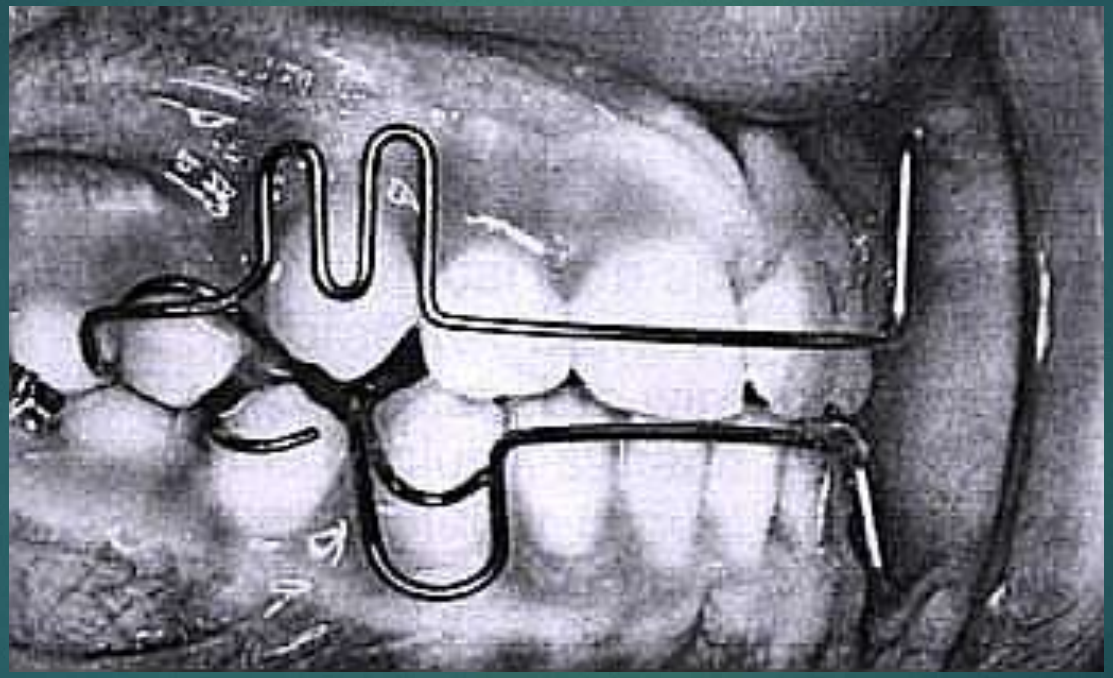
- Called as ‘extended labial bow’.
- Extensive looping increases the flexibility

- Indicated in patients with large overjet
- Disadvantages

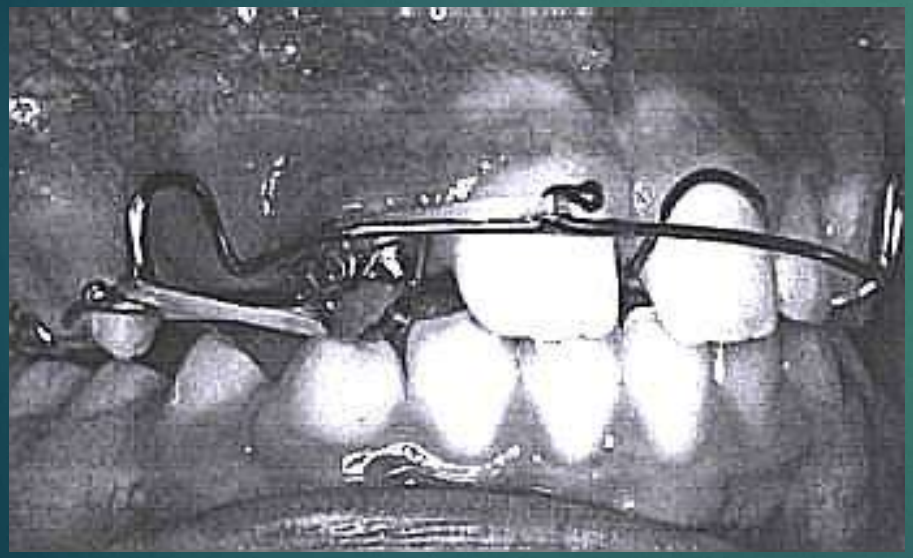
  - Difficulty in construction

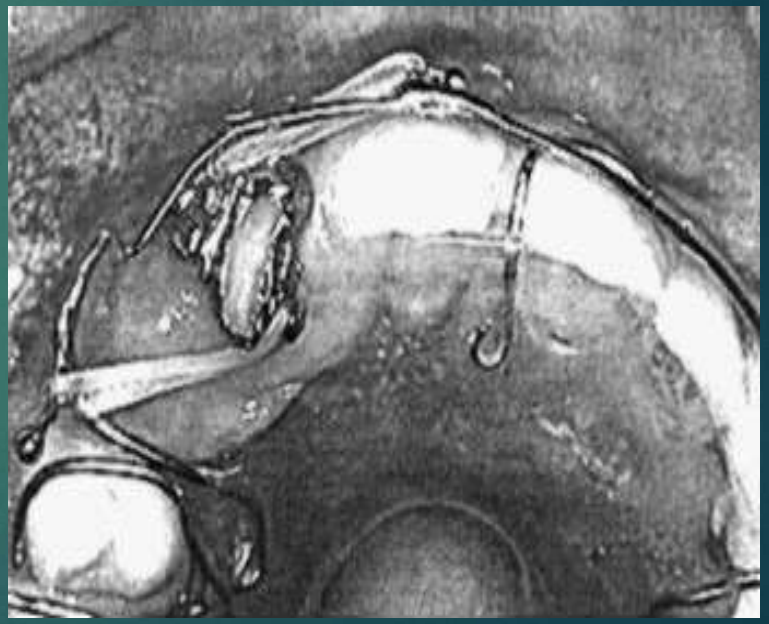
  - Poor patient acceptability

Labial wire with M loop

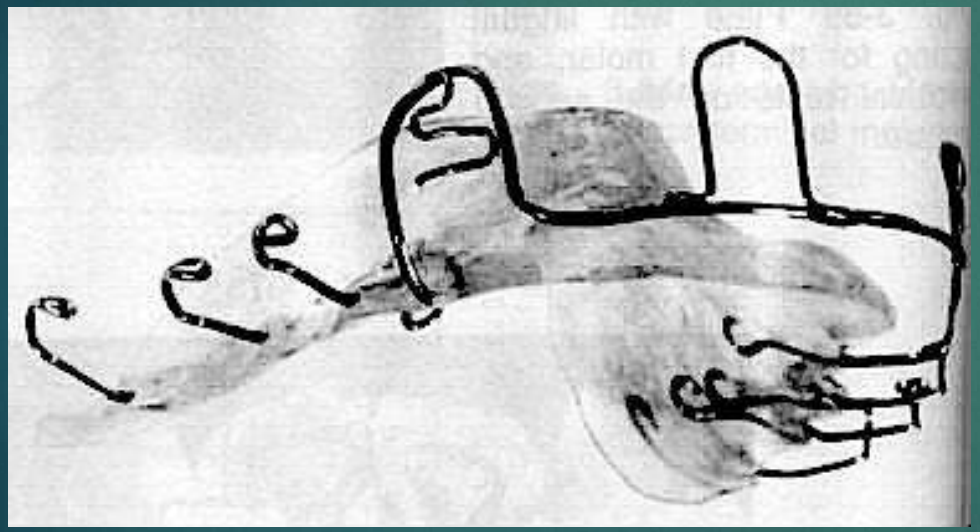


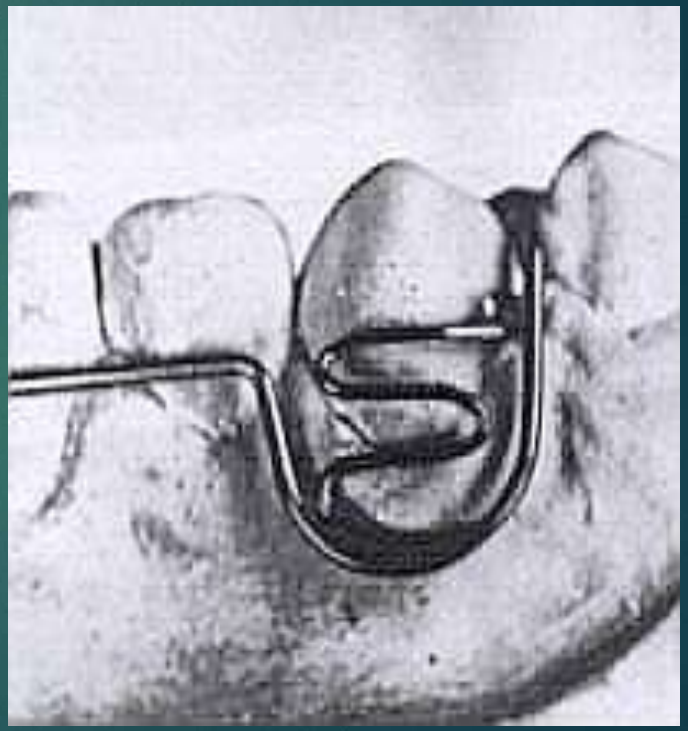
Labial wire with soldered hooks





Labial wire with springs





Springs

CLASSIFICATION

Based on presence or absence of helix

a. Simple – without helix
b. Compound – with helix

Based on nature of stability of the spring

a. Self supported -springs
b. Supported - springs

Based on presence of loops or helix

a. Helical springs
b. Looped springs

Based on direction of force

a.Protraction springs
b.Retraction springs
c.Palatal springs
d.Mesiodistal springs

Factors to be considered in designing of a spring

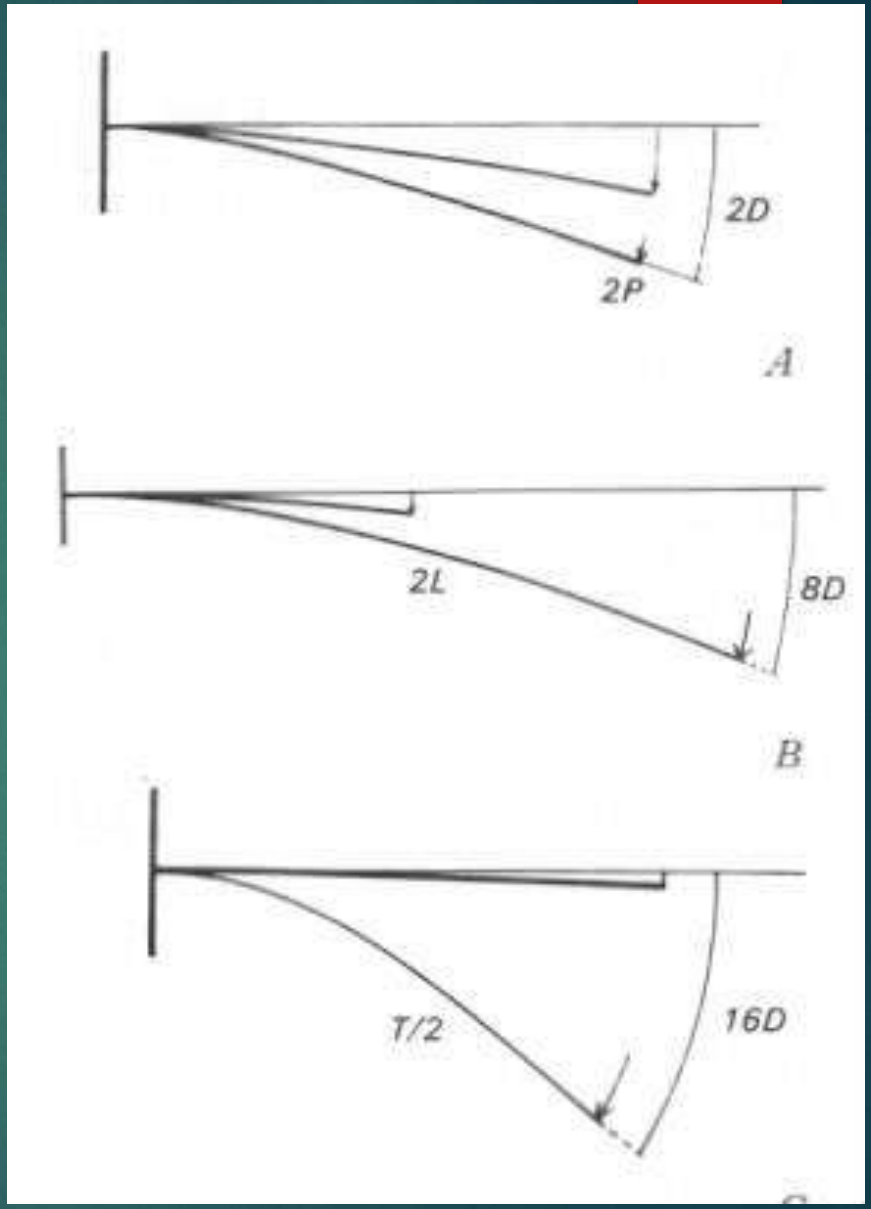
Within the elastic limit a spring may be deflected by ***pressure*** **P** at a free end if the ***length*** is **L** and ***thickness*** is **T** then ***deflection*** **D** is given by

$$D \propto \frac{PL^3}{T^4}$$

Double the pressure double the deflection

Doubling the the length the deflection becomes 8 times more for the same amount of pressure

If the thickness is reduced by half deflection becomes 16 times greater for the same amount of pressure



- Diameter of wire
- Length of the wire

$$\frac{F_1}{F_2} = \frac{L_2}{L_1}$$

- Force
- Deflection
- Direction
- Loops

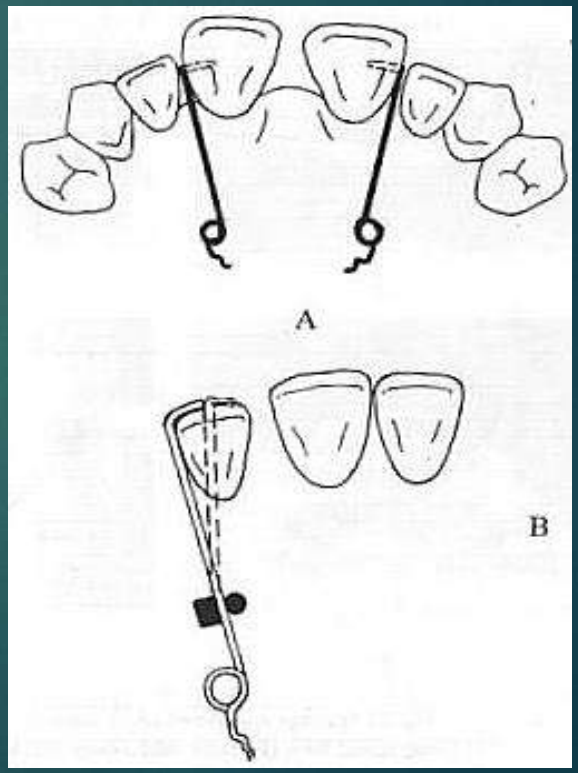
Wire diameter (mm)	Number of loops	Force
0.3	5	80
	3	115
0.4	4	145
	3	220
0.5	5	295
	4	390
	3	440
0.6	5	580
	4	680
	3	810

Single Cantilever Spring

- Also called as ***"finger spring"***.

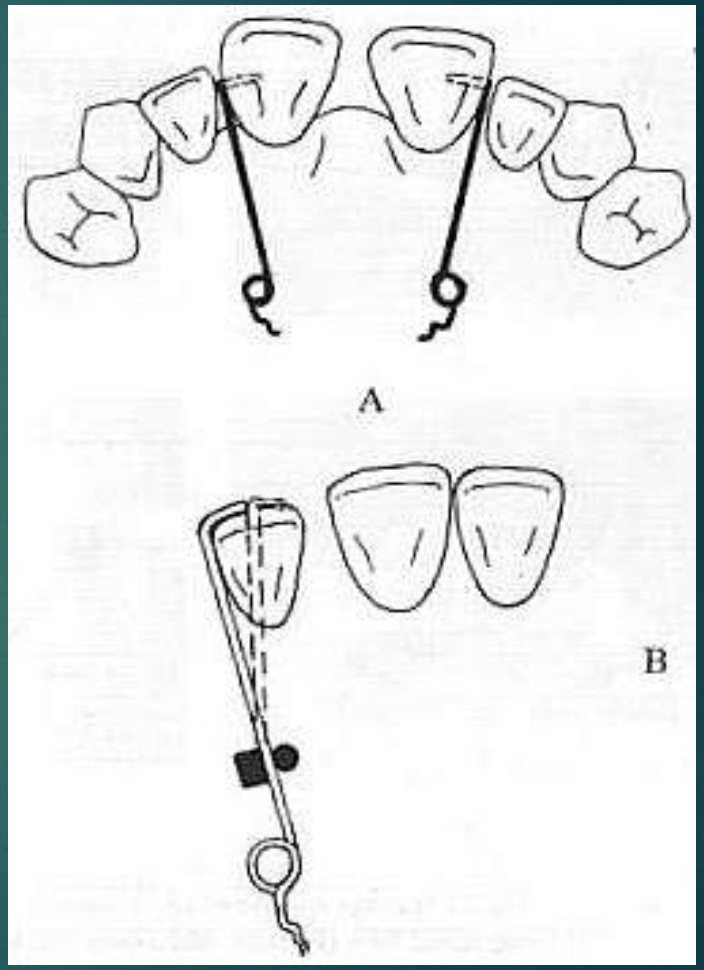
INDICATIONS:

used for the mesio-distal movement of the teeth.



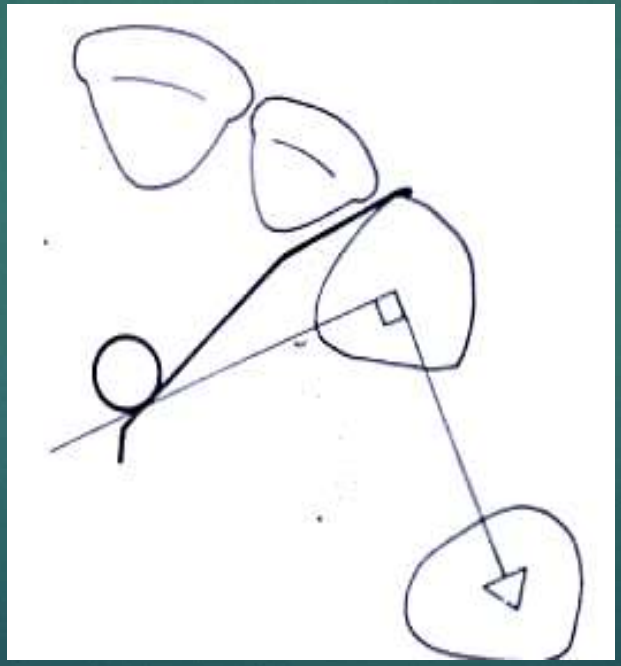
PARTS

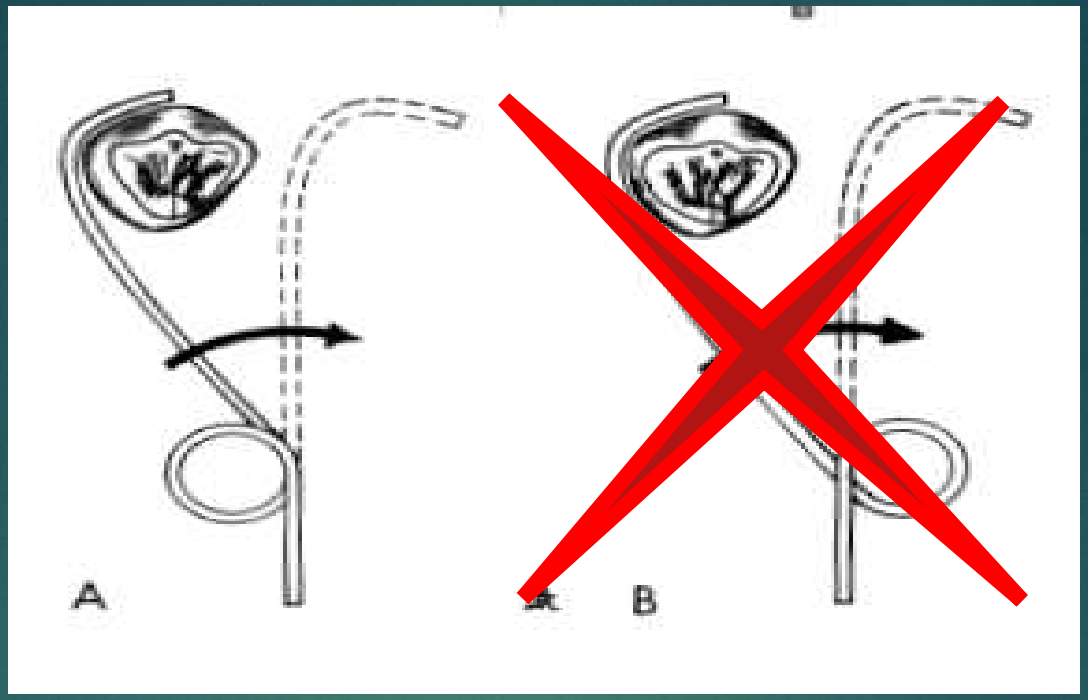
- Consists of an active arm 12 – 15 mm length towards the tissue.
- The helix of not more than 3 mm internal diameter.
- A retentive arm of 4 – 5 mm is kept away from the tissues and ends in a small retentive tag.



CONSTRUCTION

- Constructed from 0.5 mm wire
- Coil should lie along the long axis of the tooth to be moved and perpendicular to the direction of movement.



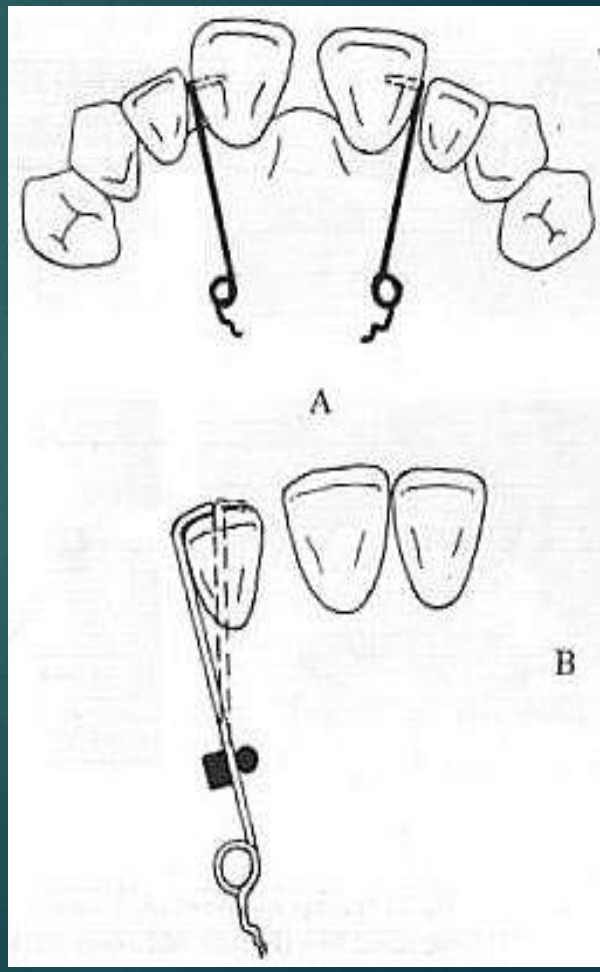


- For maximum resilience, the coil should lie on the ***opposite side*** of the spring from the the tooth. So that it is bound up as the appliance is inserted and unwinds as the tooth moves.

- In order to protect it from damage, the spring is boxed so that it lies in the recess between the base plate and mucosa.

ACTIVATION

- The finger spring is activated by moving the active arm towards the teeth to be moved.
- Should be done as close to the coil as possible.
- Activation of upto 3mm is considered ideal when 0.5mm wire is used and when 0.6mm wire is used half of that is used.



Double Cantilever Spring

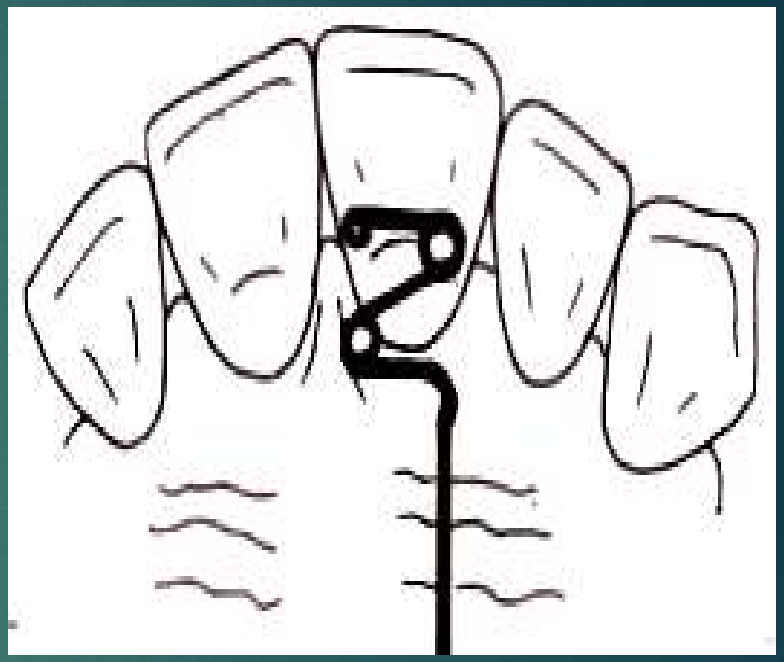
- Also known as "***Z – Spring***"

INDICATION

- Labial movement of single incisors or both
- To bring about minor rotations

CONSTRUCTION

1. From 0.5 mm hard round stainless steel wire
2. Spring consists of 2 coils very small in diameter
3. Spring should be perpendicular to palatal surface of the tooth otherwise ,it tends to slide down and intrude it.



4. Retentive arm of 10 – 12 mm length that gets embedded into acrylic
5. Should be boxed prior to acrylization.

ACTIVATION

By opening both the helixes by about 2 – 3 mm at a time .In case of minor rotation one of the helix is opened.

T Spring

Indication

When a premolar or a canine has to be moved buccally

Construction

- Made of 0.5 mm hard round stainless steel wire
- Spring consists of a T shaped arm whose ends are embedded in acrylic

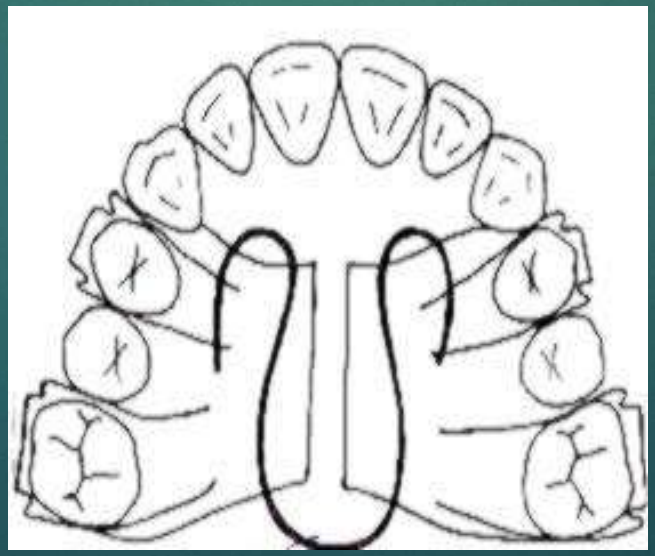
Coffin spring

Introduced by WALTER COFFIN

- Removable type of expansion spring

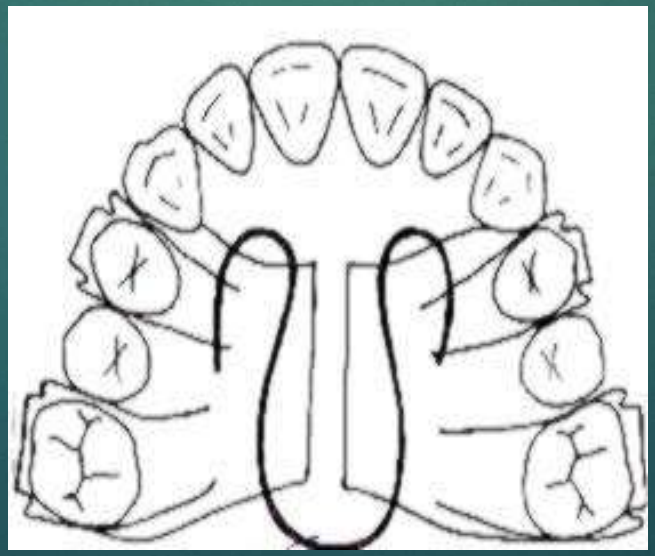
Indication

Used to bring about ***slow transverse dentoalveolar arch expansion*** in case of unilateral cross bite



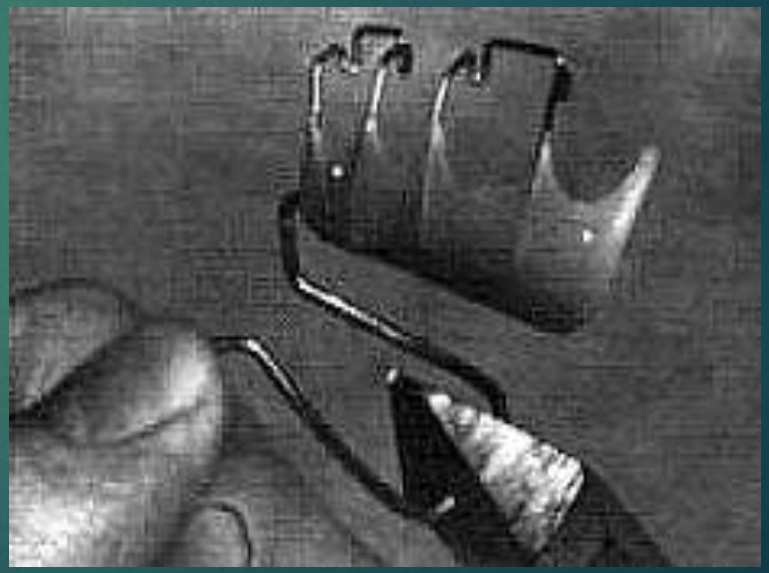
Construction

- Made of 1.25 mm hard stainless steel wire
- Consists of a **U** or a ***OMEGA*** shaped wire placed in the mid palatal region with retentive arms incorporated in the base plate
- Appliance gets retention from adams clasp on molars and premolars



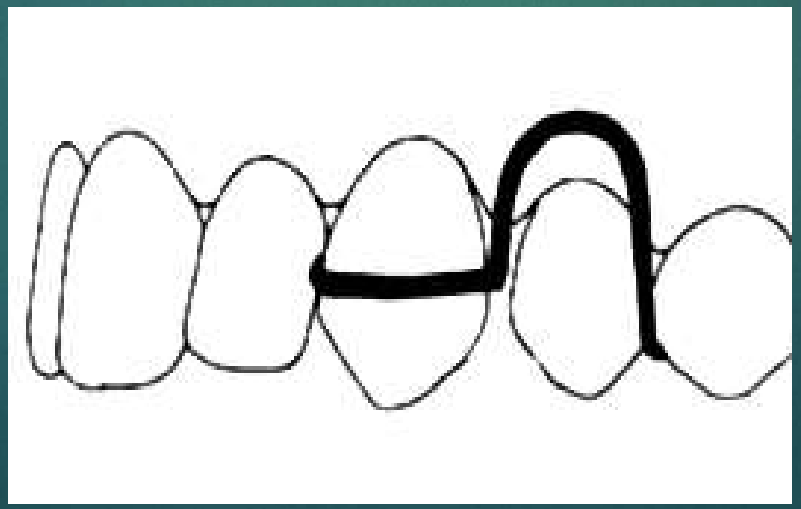
Activation

- By pulling the sides apart manually, first in the premolar region and then in the molar region
- Activation of 1-2 mm at a time appropriate



U loop canine retractors

- Made of 0.6 or 0.7 mm wire.
- Consists of U loop, active arm and a retentive arm.
- Mesial arm of the U loop is bent at right angles and adapted around canine below its contact point
- U loop should be 2-3 mm below the cervical margin



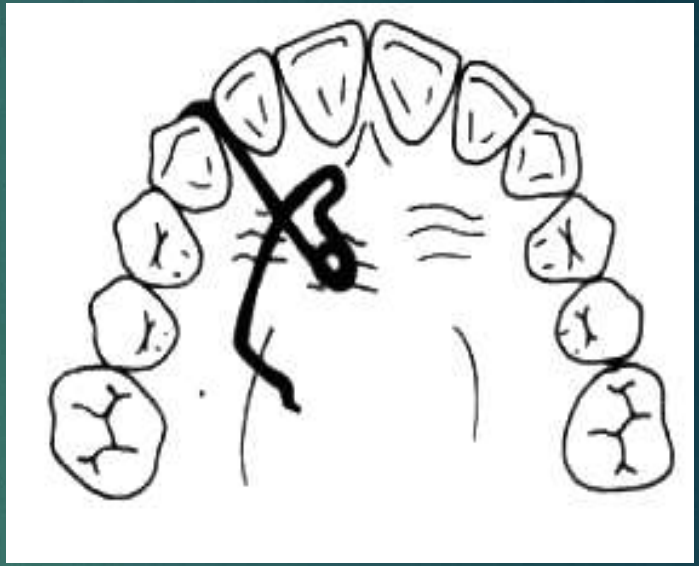
- Used when minimal retraction of 1-2 mm is required

Activation

By closing the loops by 1-2 mm or cutting the free end of active arm by 2 mm and readapting it

Palatal canine retractor

- Made of 0.6 mm wire
- Consists of a coil of 3 mm active arm, retentive arm



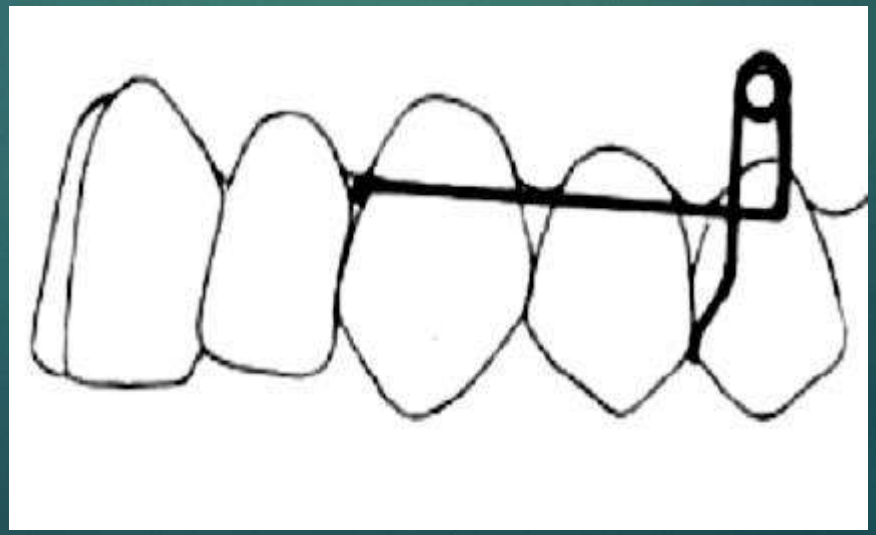
- Helix is placed along the long axis of the canine.

INDICATED in retraction of palatally placed canine

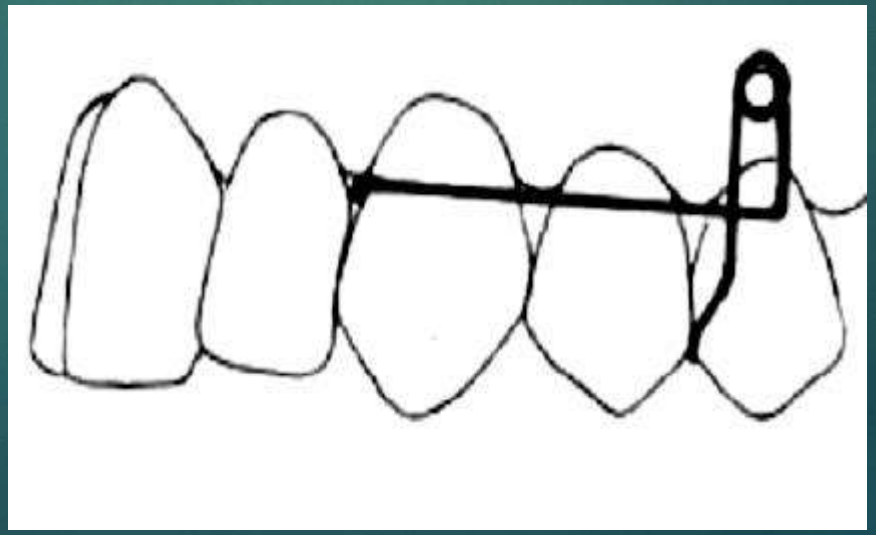
ACTIVATION by opening the helix 2 mm at a time

Reverse loop buccal retractor

- Also called as ***Helical canine retractor***
- Favored when the sulcus is shallow as in case of lower ach
- Made of 0.6 mm wire ,consists of 3 mm diameter coil ,an active arm (towards the tissue) and a retentive arm.



- Mesial arm is adapted between the premolars
- The distal arm is active bent at right angles to engage canine below the height of contour
- Coil is placed 3 mm below the gingival margin

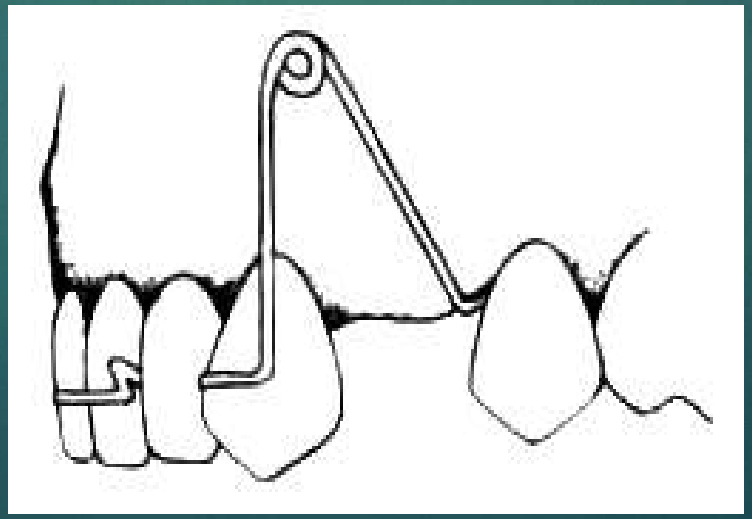


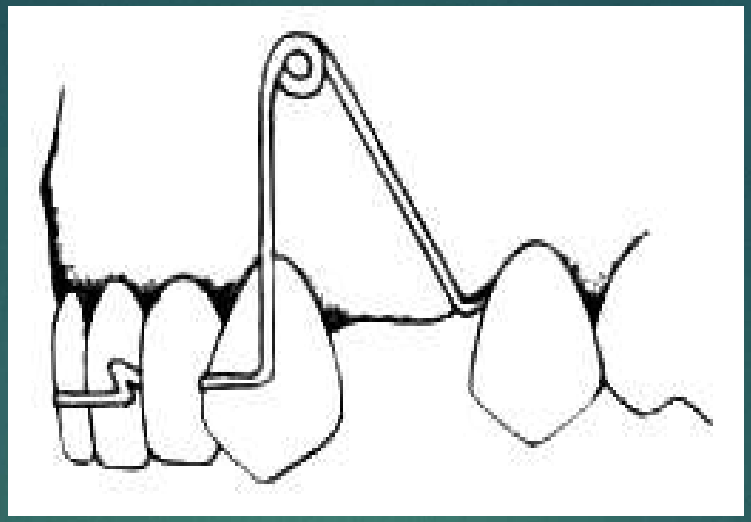
ACTIVATION

- Should not be activated more than 2 mm
- Done by cutting off 1 mm from free end and readpting
- Alternatively done by opening the helix by 1 mm.

Buccal self supported canine retractor

- Constructed of 0.7 mm wire
- Called **self supported** because it is made of thicker diameter wire that resists distortion
- Consists of helix of 3mm in diameter, an active arm and a retentive arm





- Coil lies just distal to the long axis of tooth.
- Anterior limb passes down from the coil to the middle of the crown and passes around the mesial contact area

Used in case of a buccaly placed canine or in case of a canine placed high in vestibule.

Features

- Only spring activated by closing the the coil
- The active arm is away from tissues to avoid impingement of soft tissues while the coil lies towards the tissues

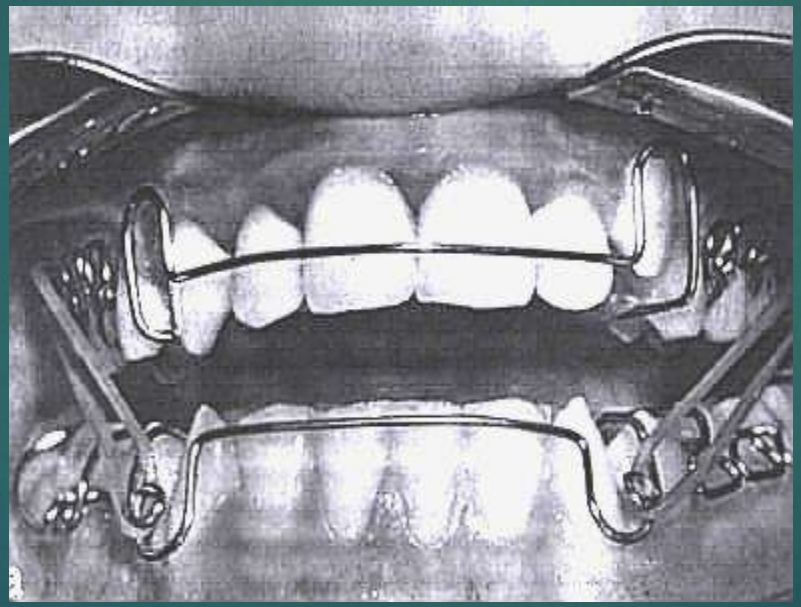
Activation

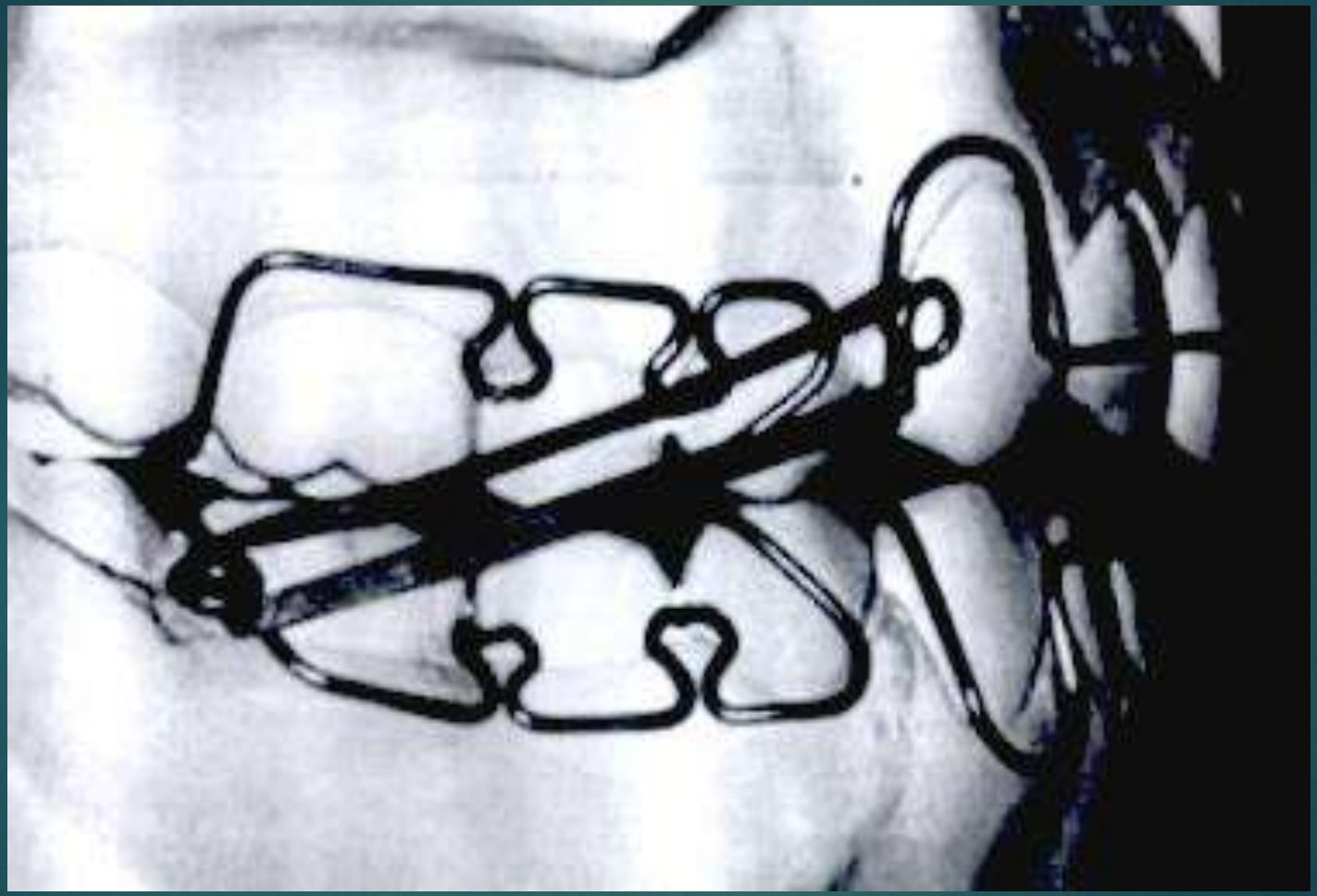
By closing the helix

Elastics

- Its use was first described by Jackson.
- May be used for movement of single teeth or group of teeth and for intermaxillary traction.
- Their application was greatly enhanced by introduction of arrow head clasps and modifications of adams clasp.

- Intermaxillary elastics with removable plates can be used for the treatment of Class II and Class III





Disadvantages

- Slip gingivally and cause trauma
- Risk of the arch form getting flattened
- Continuous immersion in saliva causes a rapid force decay of elastic

Orthodontic Screws

- Orthodontic screw is a active component of a removable appliance that together with acrylic plates can affect the teeth and alveolar process
- Screws were first introduced by Schwarz.

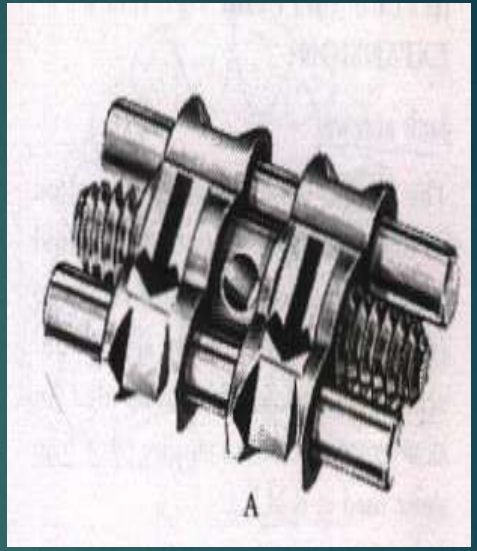
According to HAYNES and JACKSON (1962)

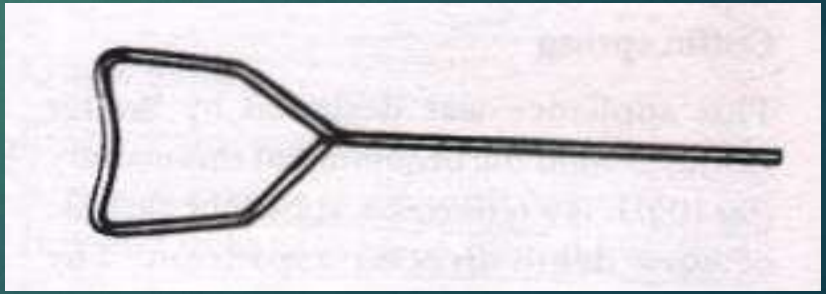
FEATURES of SCREW

- Adequate travel
- Stability
- Minimum bulk

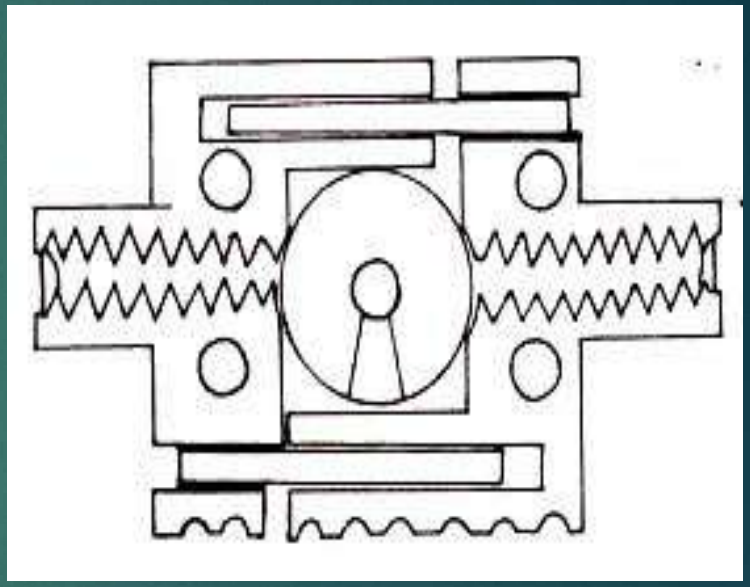
Parts

- Expansion screw consists of a central body which is generally divided into two parts
- The central base portion is drilled with 4 holes which are equidistant so that the screw can be opened with the help of a key by a quarter turn each time

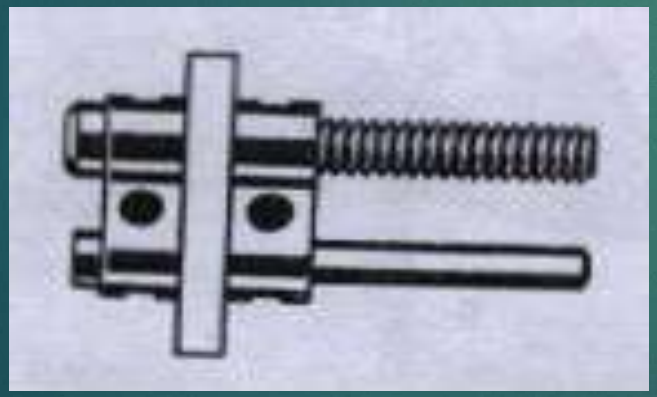


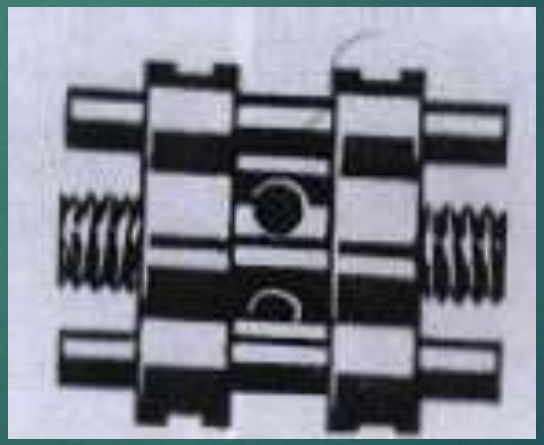


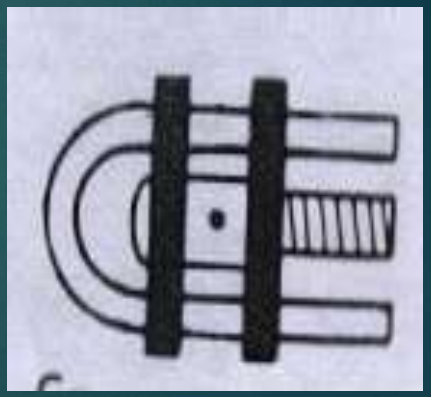
- The screw when turned 90 degrees will drive the parts of the plate 0.2 mm apart, which means narrowing of the periodontal membrane 0.1 mm on each side
- Each guide pin is received into the hole drilled into the opposing half of the expansion screw



- Guide pins helps in stabilizing the appliance precise parallel movement, prevents the end plate from rotating, accidental recoil





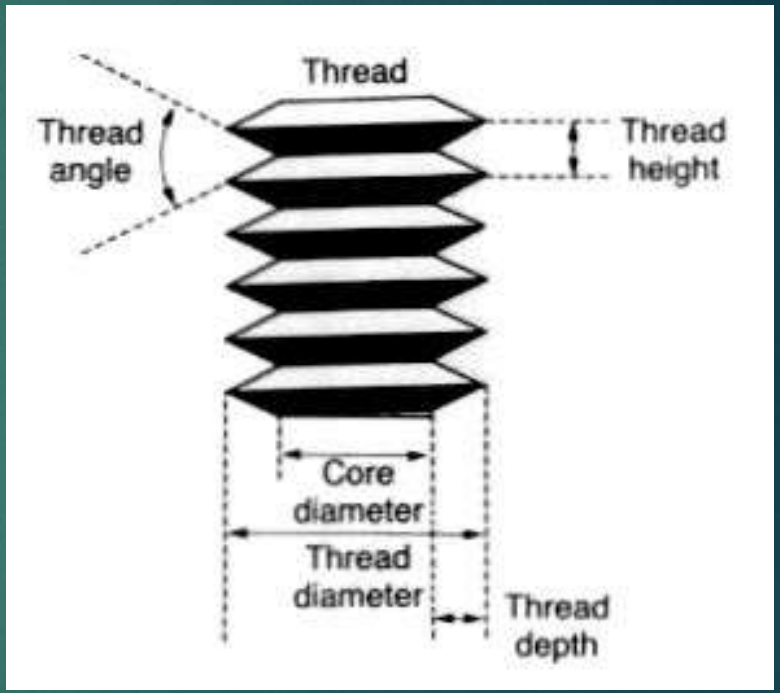


- The length of the screw determines the maximum opening
- The threaded cylinder and guide pins can be entirely encased by housing or partly
- The out side of the housing has grooves and undercuts for retention in acrylic

- The length of the screw determines the maximum opening
- The threaded cylinder and guide pins can be entirely encased by housing or partly
- The out side of the housing has grooves and undercuts for retention in acrylic

Principle of screw expansion

- Pitch of screw
- The two screw portion on either side of the central boss portion are threaded in opposite direction



- Expansion is brought about by displacement of teeth within the limits of the periodontal ligament
- The screw is designed in such a way that when opened by a quarter turn, it is less than the total with of the periodontal ligament (0.15 –0.35 mm)
- The intermittent forces allows remodeling changes to take place

Advantages

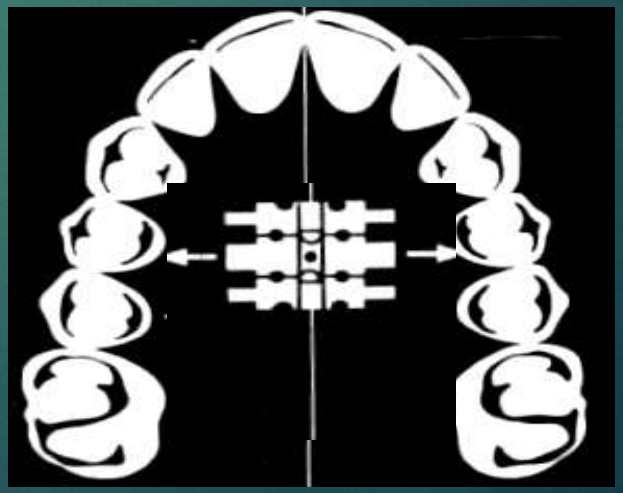
- Many types of tooth movement possible
- Activation within physiological limits ; less hyalinisation
- Activation precisely controlled ;simple
- Apply large intermittent force which decreases as the teeth moves

Disadvantages

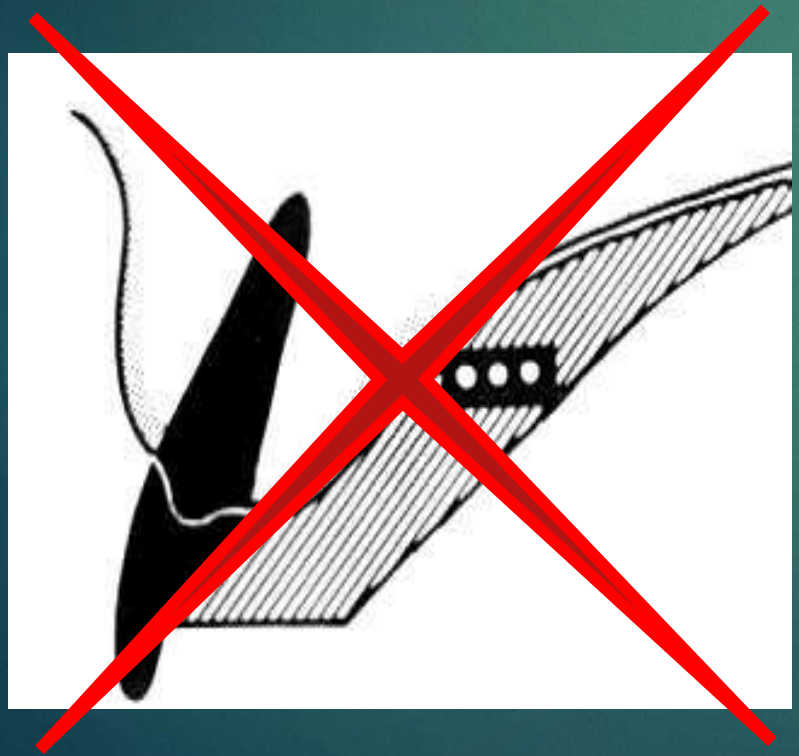
- Bulky
- Expensive
- Turns back (recoil) under load
- Patient cooperation

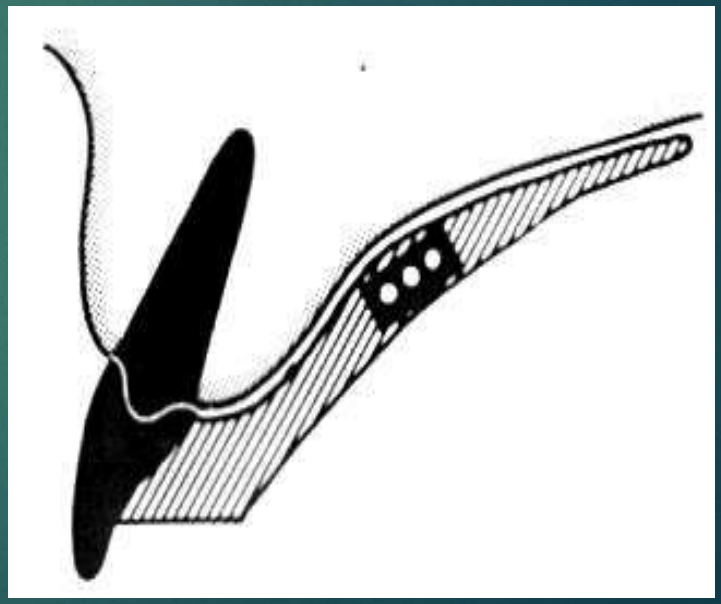
Placement of screw

- Transverse expansion screw should be positioned in the midline,oriented to median raphe
- It lies on an imaginary line passing between first and second premolar but in a narrow and long arch it is placed more posteriorly



- The horizontal plane of the screw is placed parallel to plane of the palate

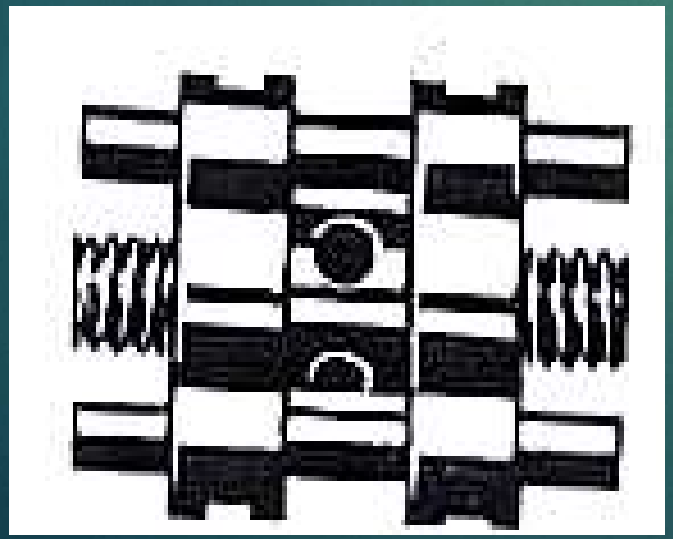


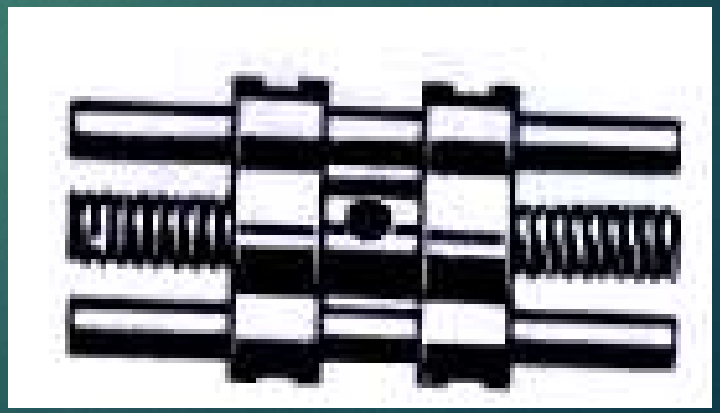


Special purpose screws

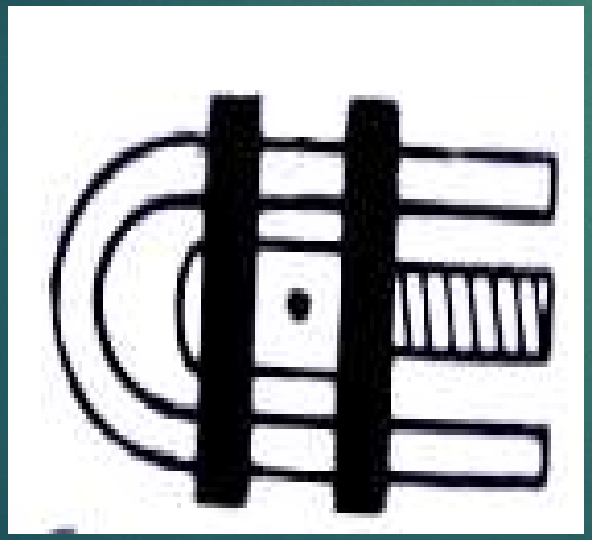
Skeleton type of screws

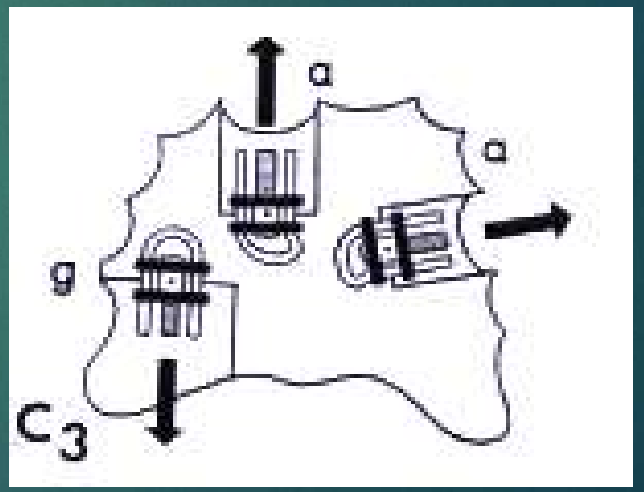
- Available in various sizes – broader for maxillary and narrower for mandibular



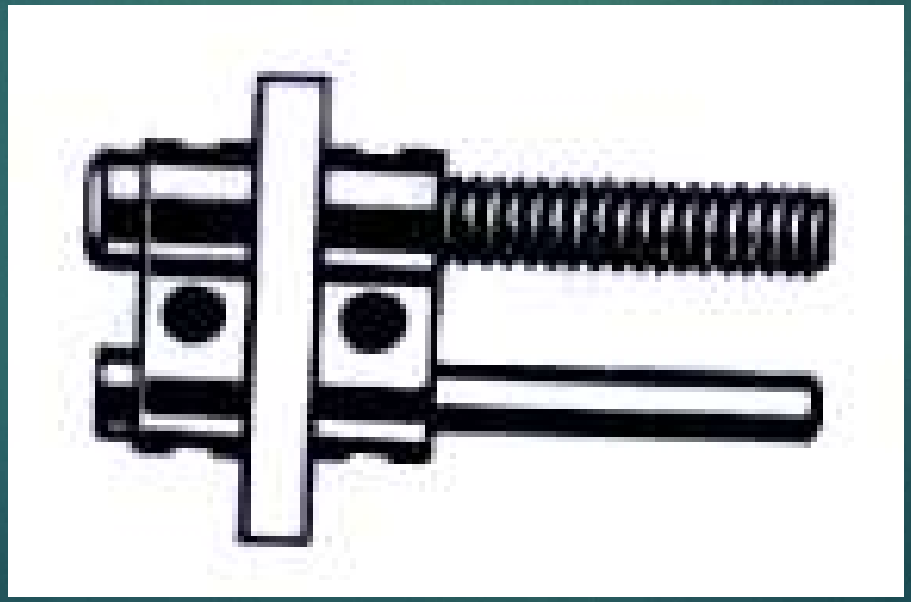


- For movement of a section of plate in case of limited space



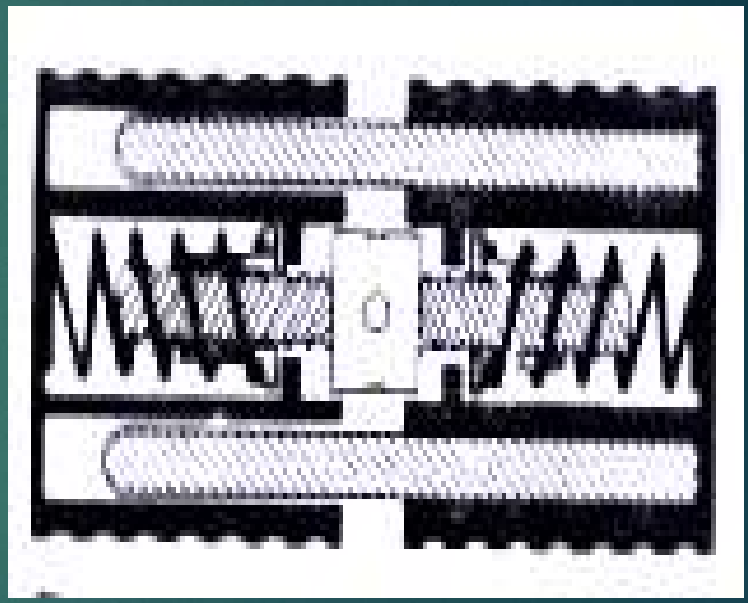


- For extensive distal movement upto 8 mm designed by Wise



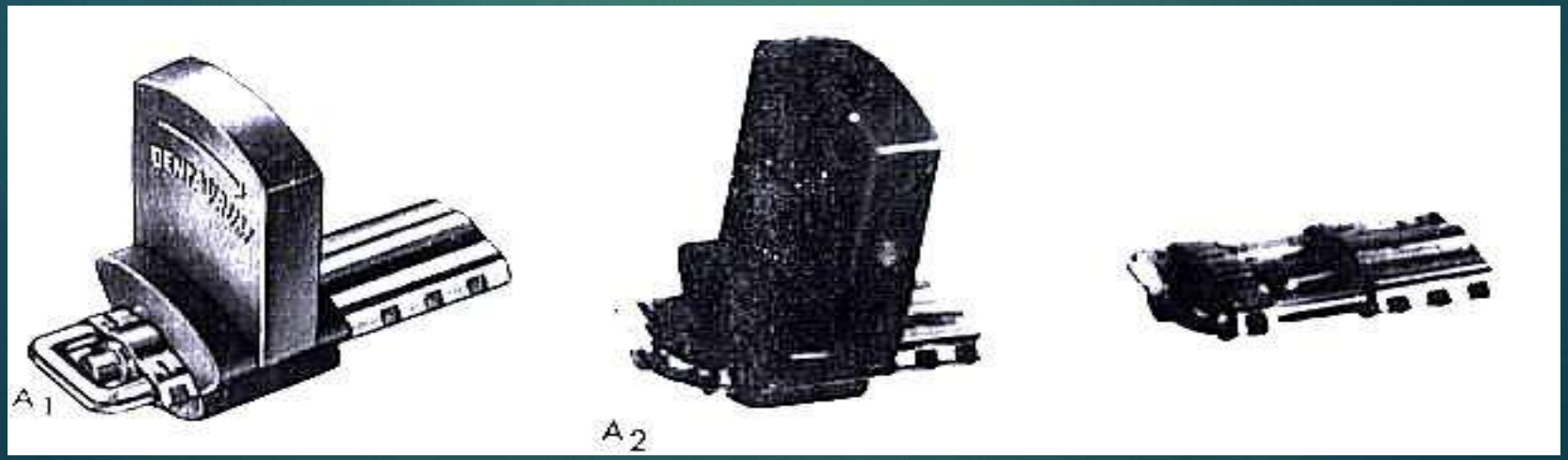
Encased screw with incorporated spring

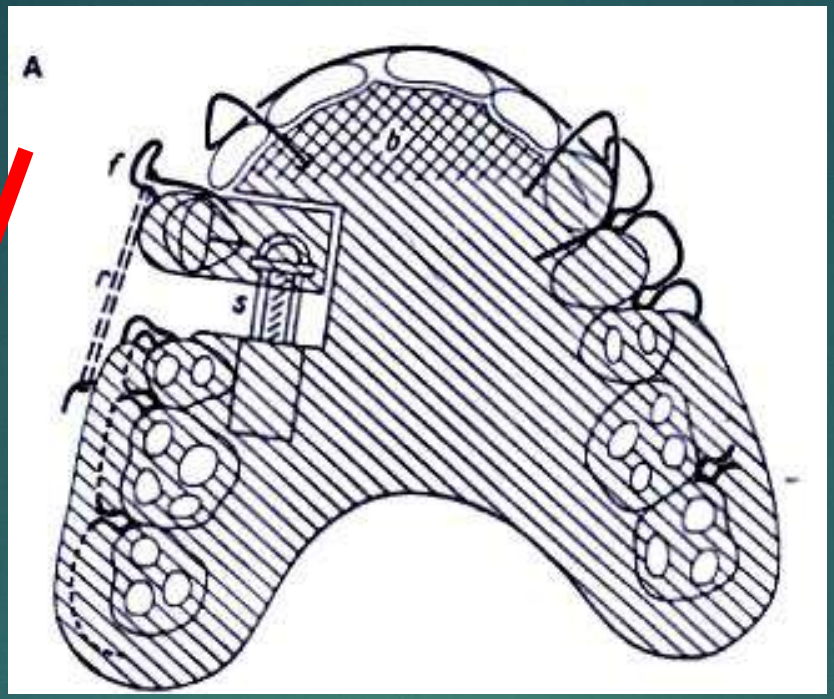
- Designed by Hausser
- A complete turn of the screw will expand it by 0.7 mm ;that means a quarter turn on each side is less than 0.1 mm
- By incorporating a spring this limited pressure can be kept constant



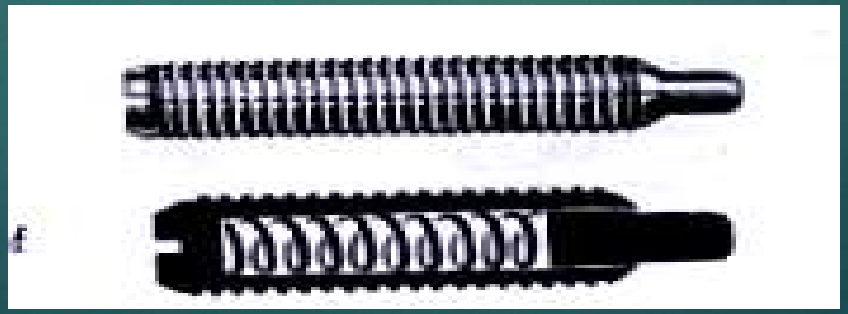
Encased pull screw

- This type of screw is inserted open and closed to effect tooth movement
- In case of closure of extraction spaces

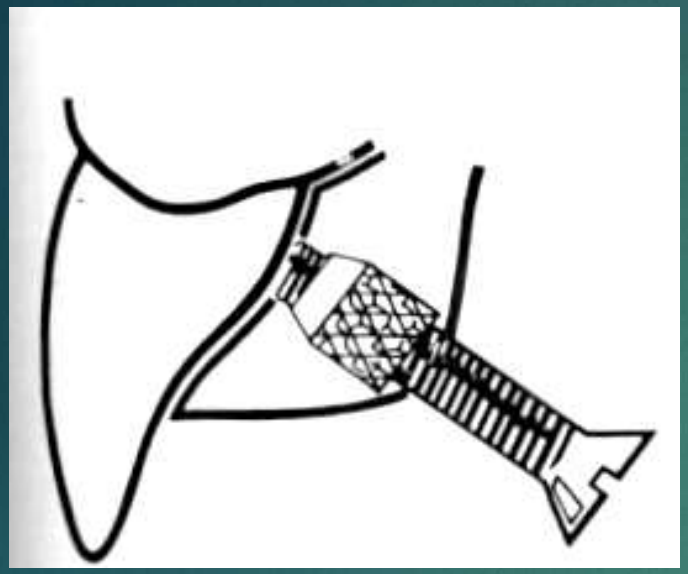


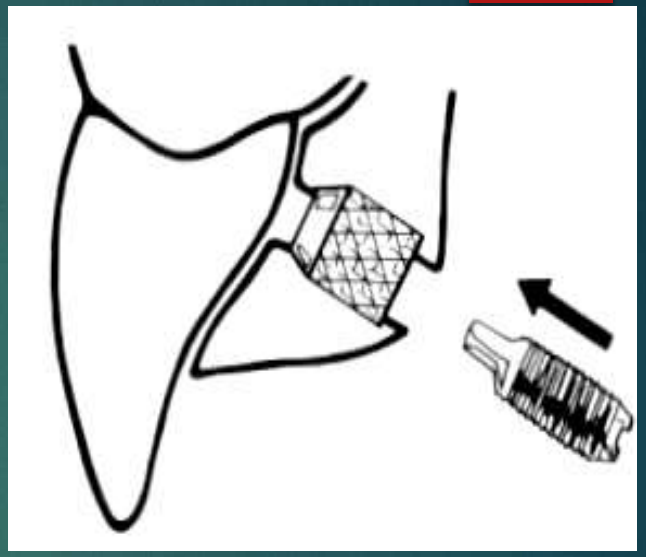


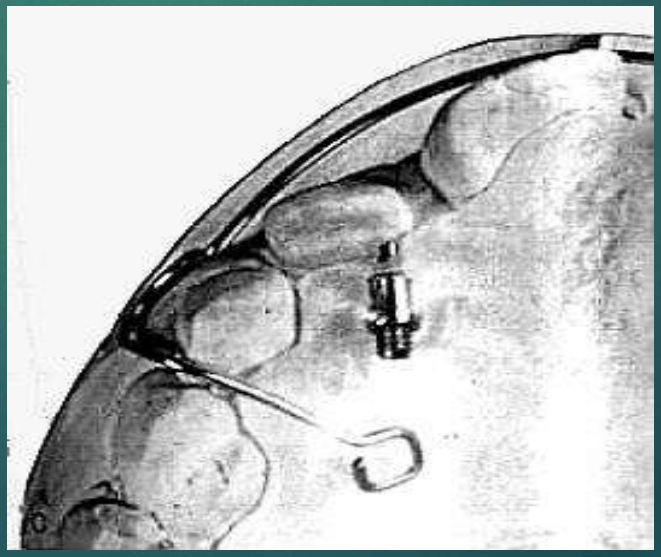
Screws incorporated with springs for movement of single teeth



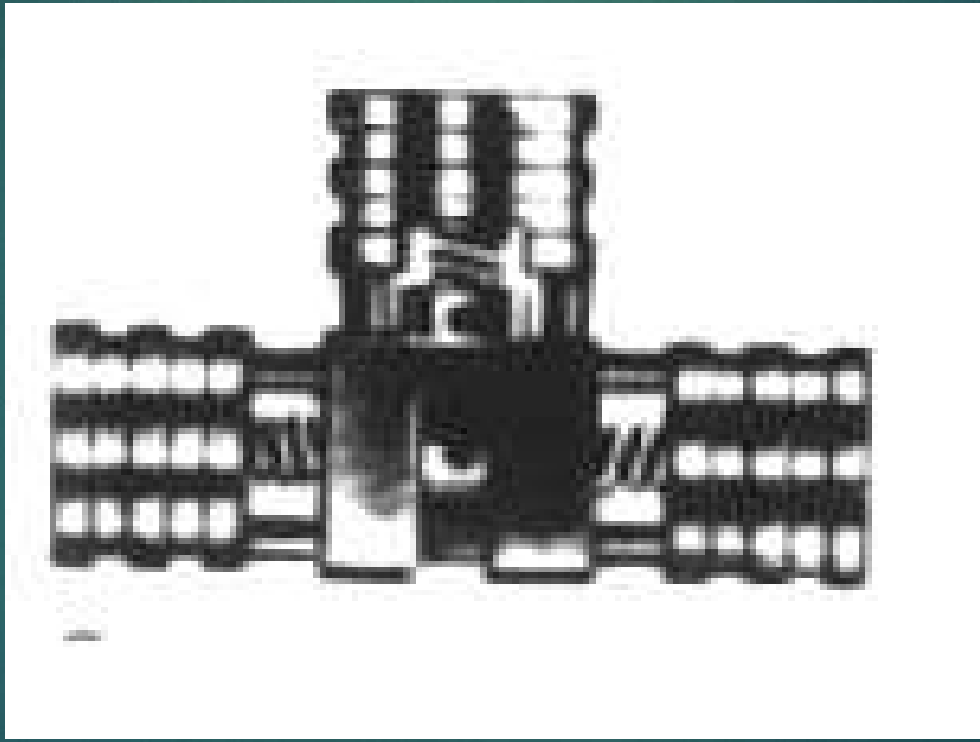
Spring loaded piston screw





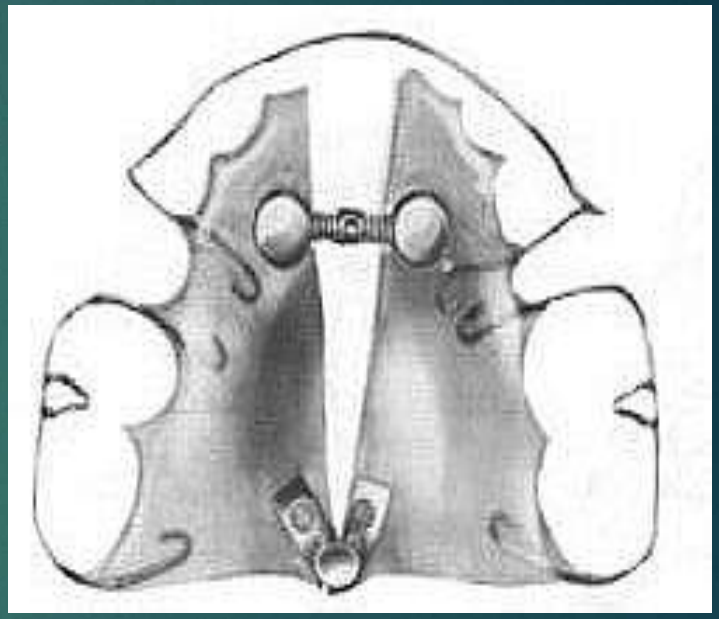


- *The Bertoni screw for expansion in three direction*

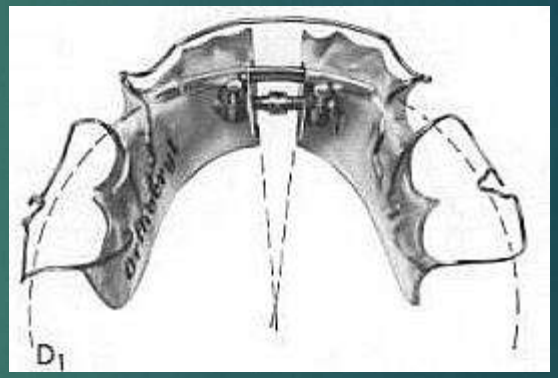


Fan type expansion screw or pivot screw

- Used when anterior segment of the maxillary arch requires more expansion than posterior segment
- Screw is made of two parts,a hinge and a special screw permitting a slight rotation inside the disk

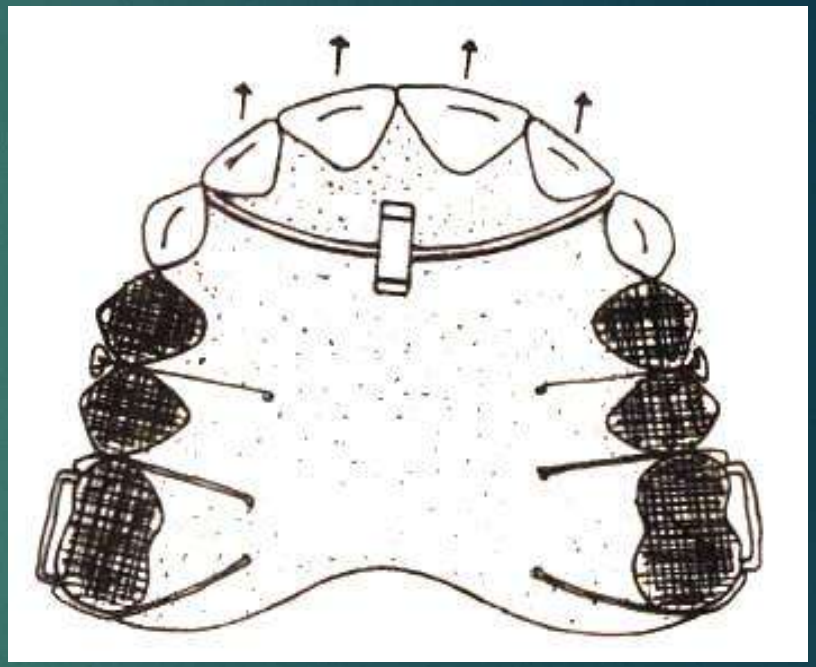


Eccentric mandibular expansion screw by G. Muller (1962)

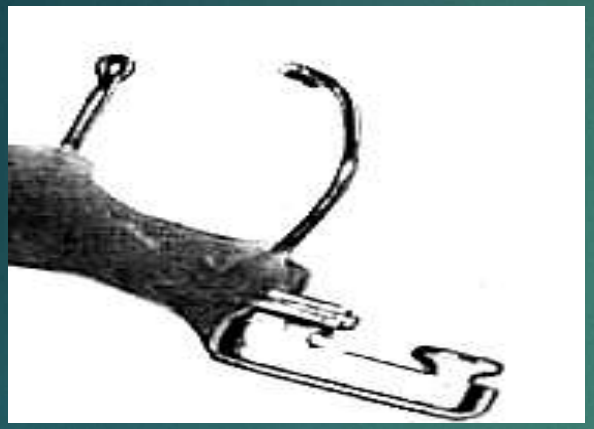


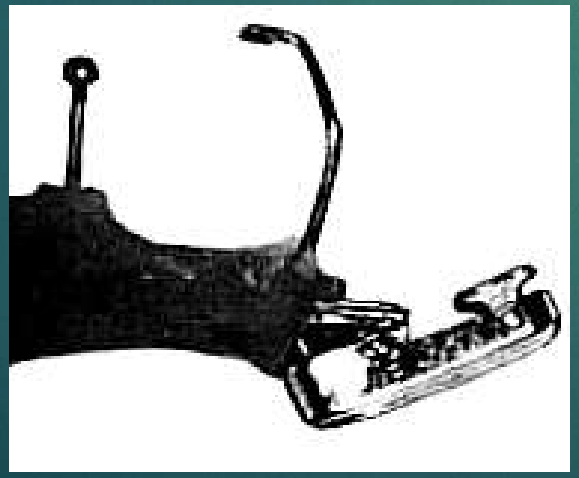
Anterior expansion of arches

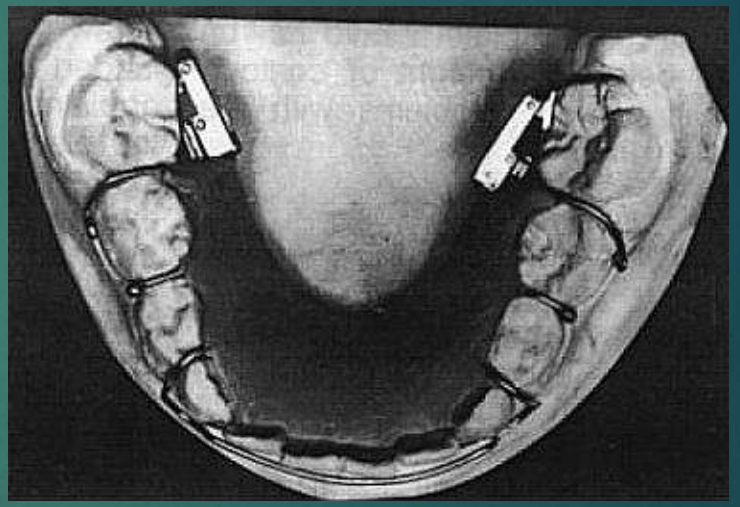
- To correct maxillary anterior cross bite
- Bring the base plate material up the occlusal surface of the posterior teeth, to separate the teeth vertically and allow clearance for upper incisors to move out of crossbite



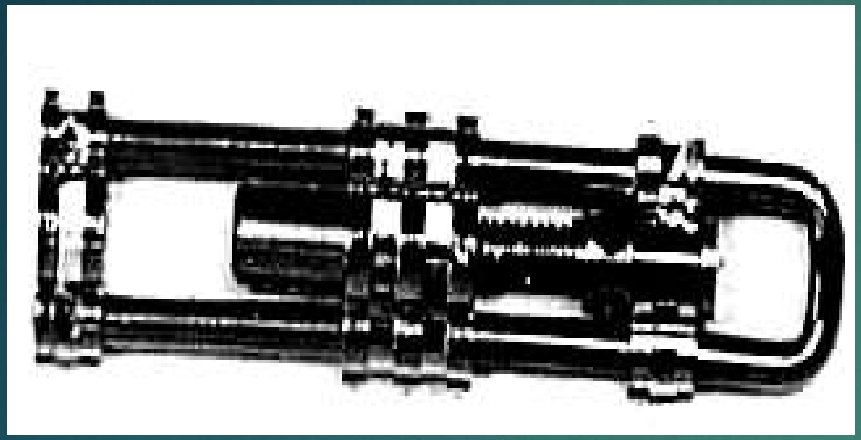
Molar tipping screw

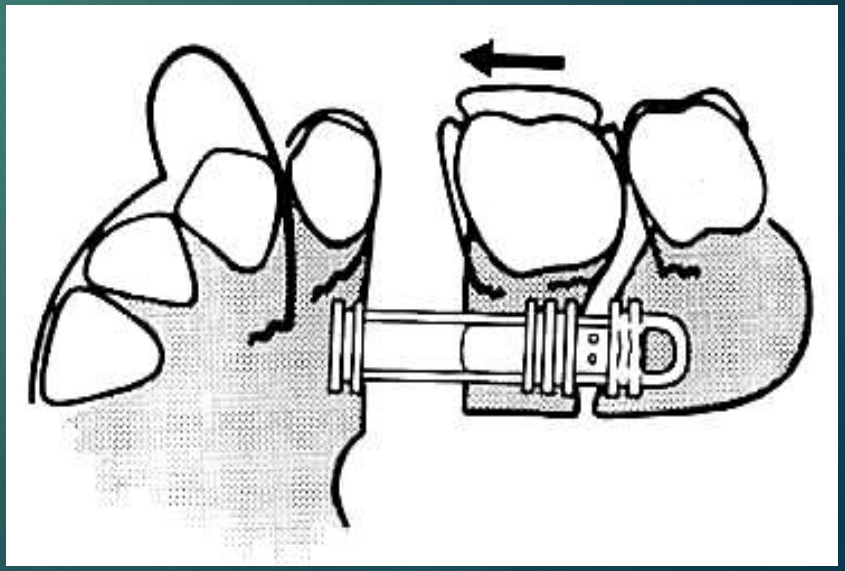






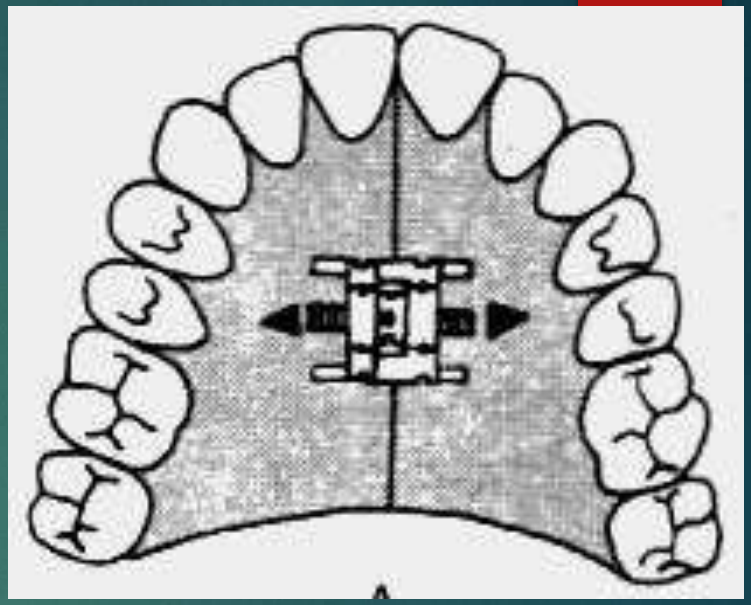
Hellar screw





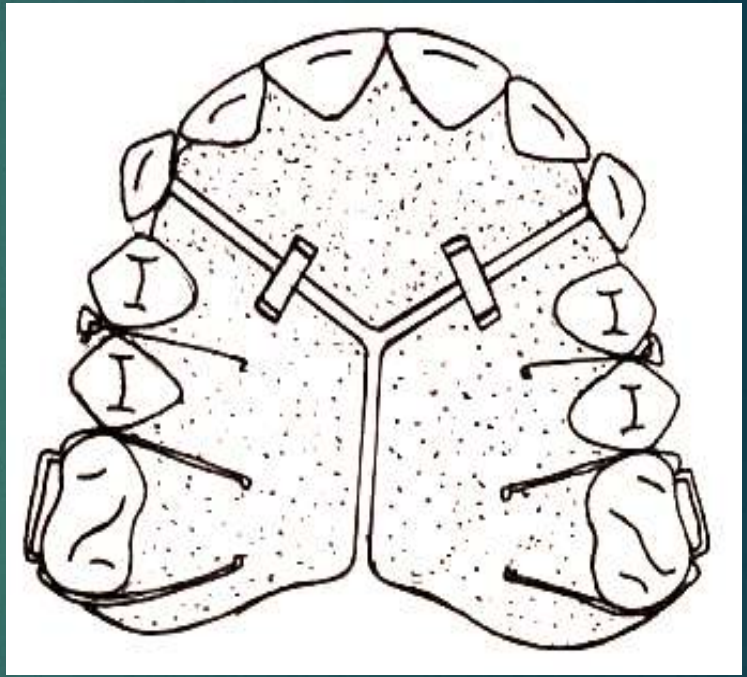
Transverse expansion of arches

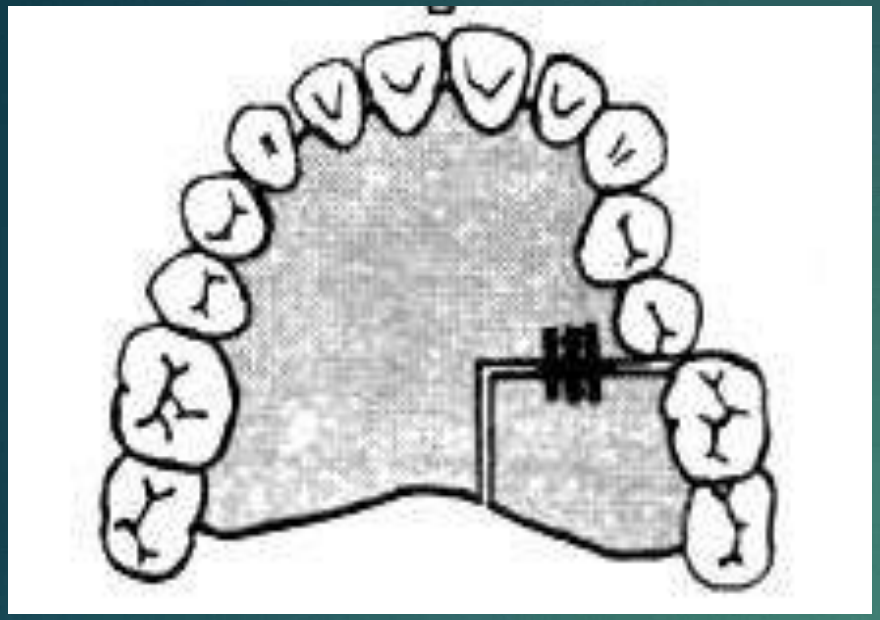
- In case of constricted maxillary arch
- Active plate is split in the midline will expand the arch almost totally by tipping the posterior teeth buccally and not by opening mid palatal suture

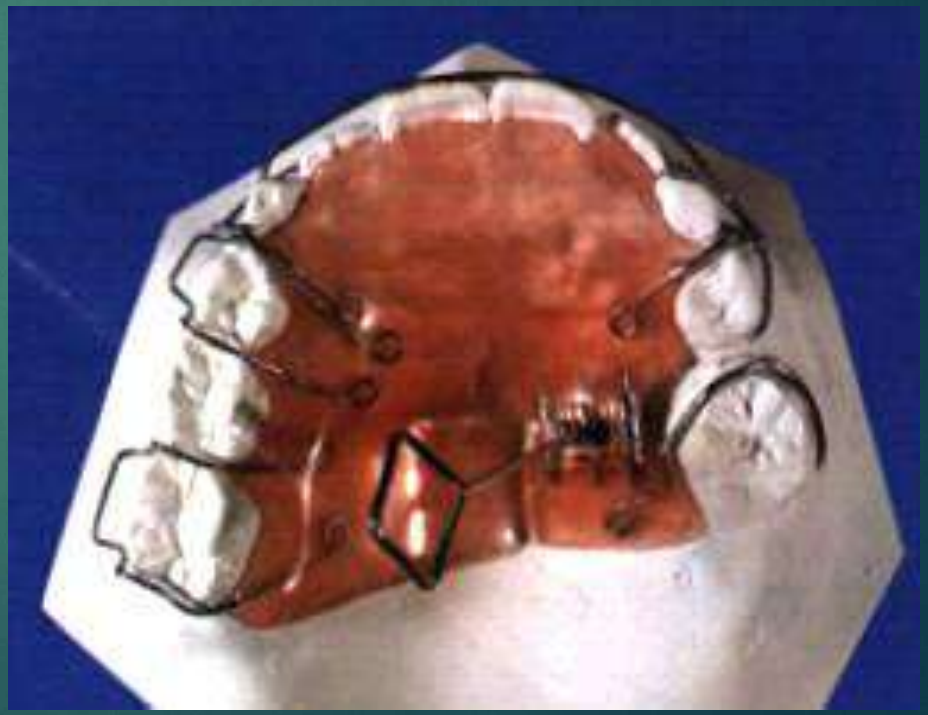


Simultaneous Anterior and Posterior arch expansion

- It is possible to expand particularly in the maxillary arch by dividing the base plate into 3 rather than 2 segments.
- This is based on Schwarz's original Y plate used simultaneously to expand the maxillary posterior teeth laterally and incisors anteriorly.







Clasps

- These are retentive components that resists the displacement orthodontic appliance by contacting the surface of the tooth or by engaging the undercuts
- Clasps can be broadly classified into

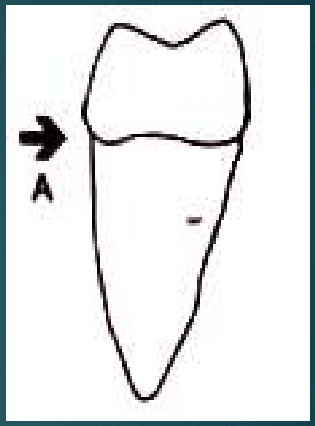
Single arm clasps – C , triangular clasps

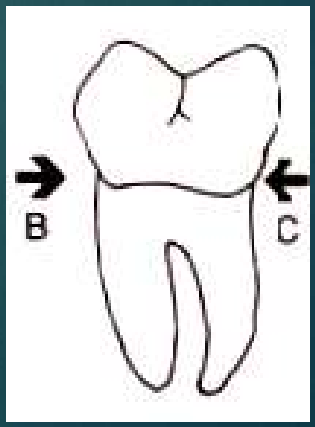
Double arm clasps –U , Adams clasps

Mode of action

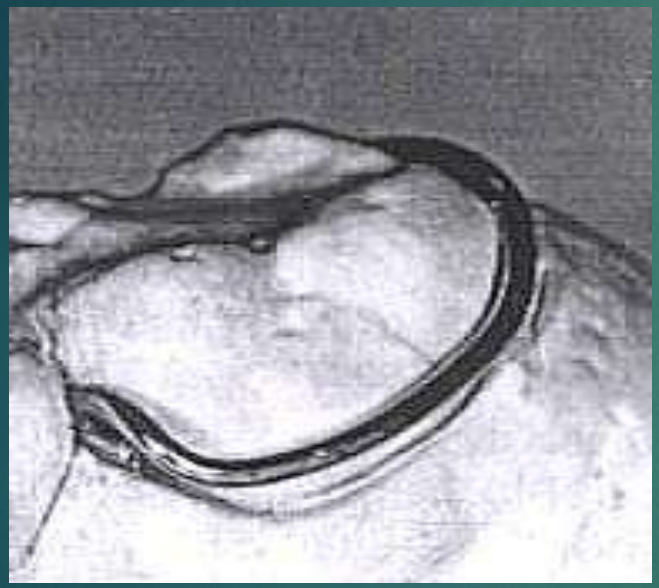
- They act by engaging the constricted areas of teeth called undercuts
- Two types

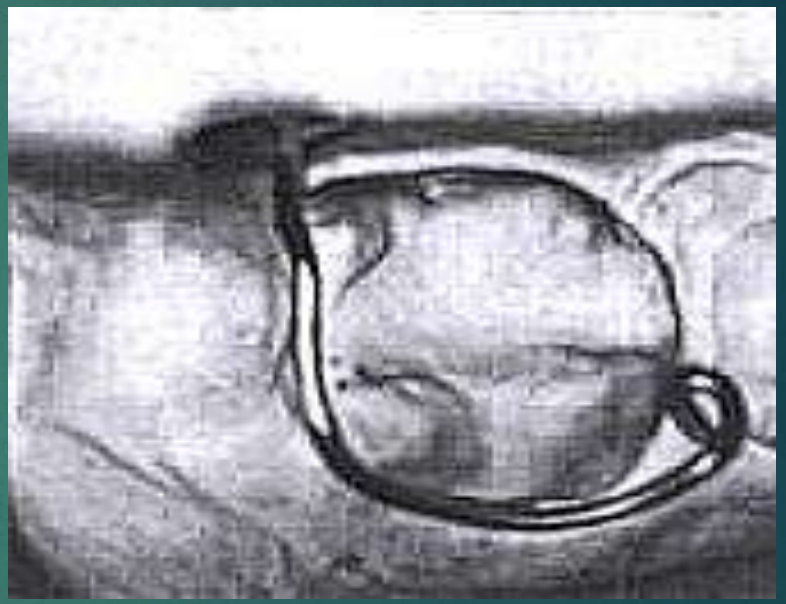
1. ***Buccal and lingual cervical undercuts***
   - C and U clasps
2. ***Mesial and distal proximal undercuts***
   - Adams and Crozat clasps





- Also called as **C clasp** or **Three quarter clasp**
- It engages the bucco cervical undercut
- Wire is engaged from one proximal undercut along the cervical margin then carried over the occlusal margin to end as a single retentive tag on the lingual side





Advantages

- Simplicity in design and fabrication

Disadvantages

- Cannot be used in partially erupted teeth
- Its made of thicker wire hence very rigid

Jackson's clasp

- Introduced by Jackson in 1906
- Also called as **Full clasp** or **U clasp**
- Engages bucco cervical undercut and mesio distal undercuts

Advantages

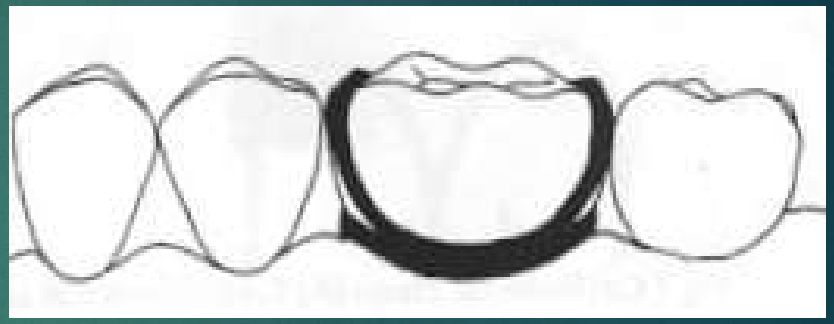
- Easy to construct and adequate retention

Disadvantages

- Inadequate retention in partially erupted teeth

Crozat clasp

- It resembles a full clasp but has a additional piece of wire soldered which engages into the mesial and distal proximal undercut
- Offers better retention than full clasp

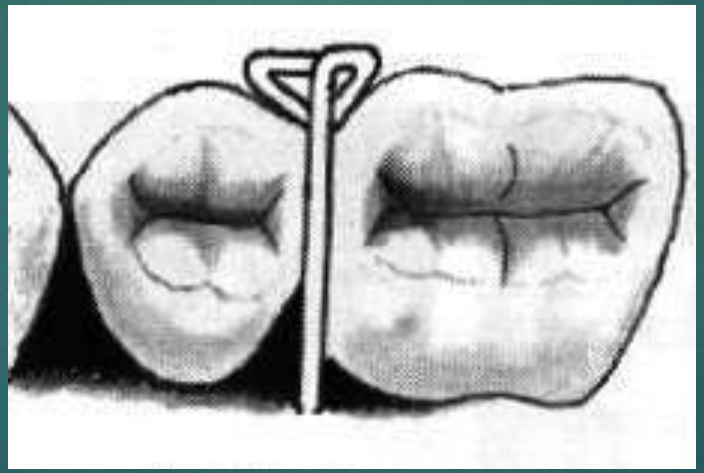


Triangular clasp

- Introduced by Zimmer in 1949
- Used between two adjacent posterior teeth
- Engage the proximal undercuts
- Indicated when additional retention is needed

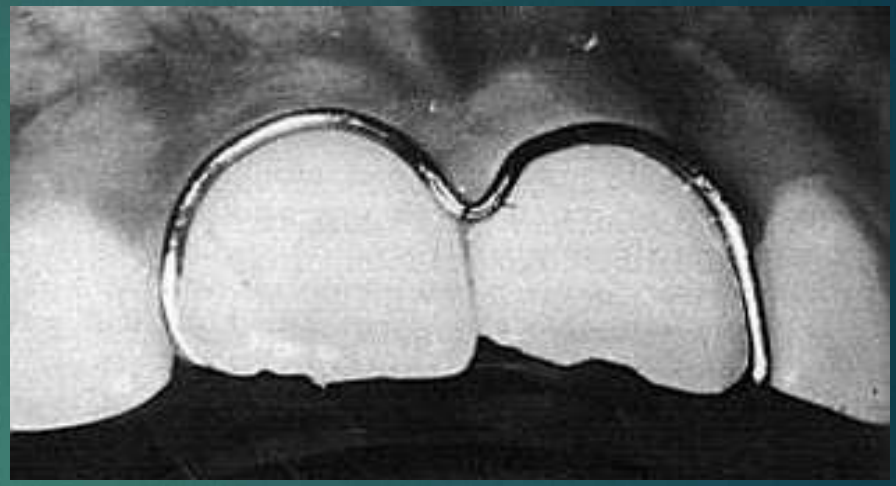
- The triangle as a rule fits horizontally into the interdental space

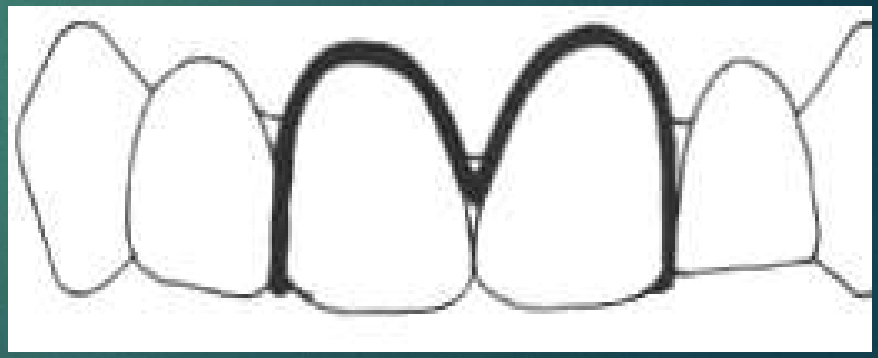
- The open end is towards the teeth



Southend clasp

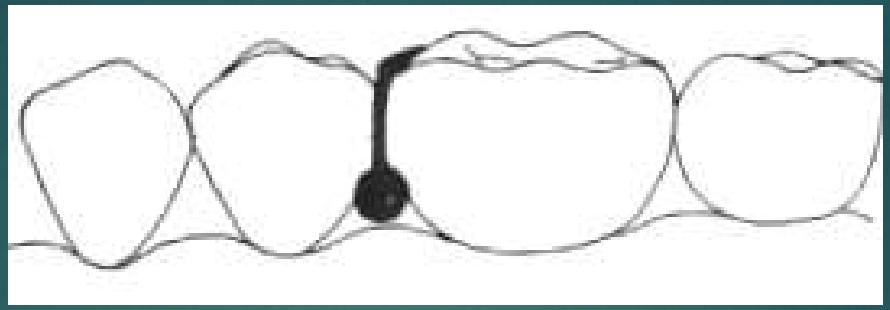
- Used when retention is needed in anterior region
- Wire adapted along the cervical margins of both the central incisors
- Distal ends are carried over the occlusal embrasures on the palatal side as retentive arms



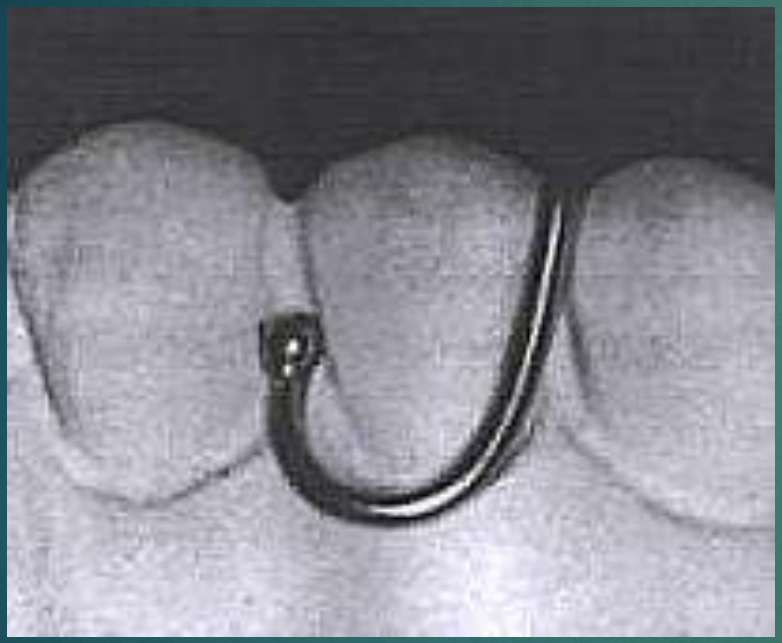


Ball End clasp

- Fabricated using wires having ball like structure at one end
- The ball can be made at the end of the wire using a silver solder
- Preformed wires having ball at one end is also available



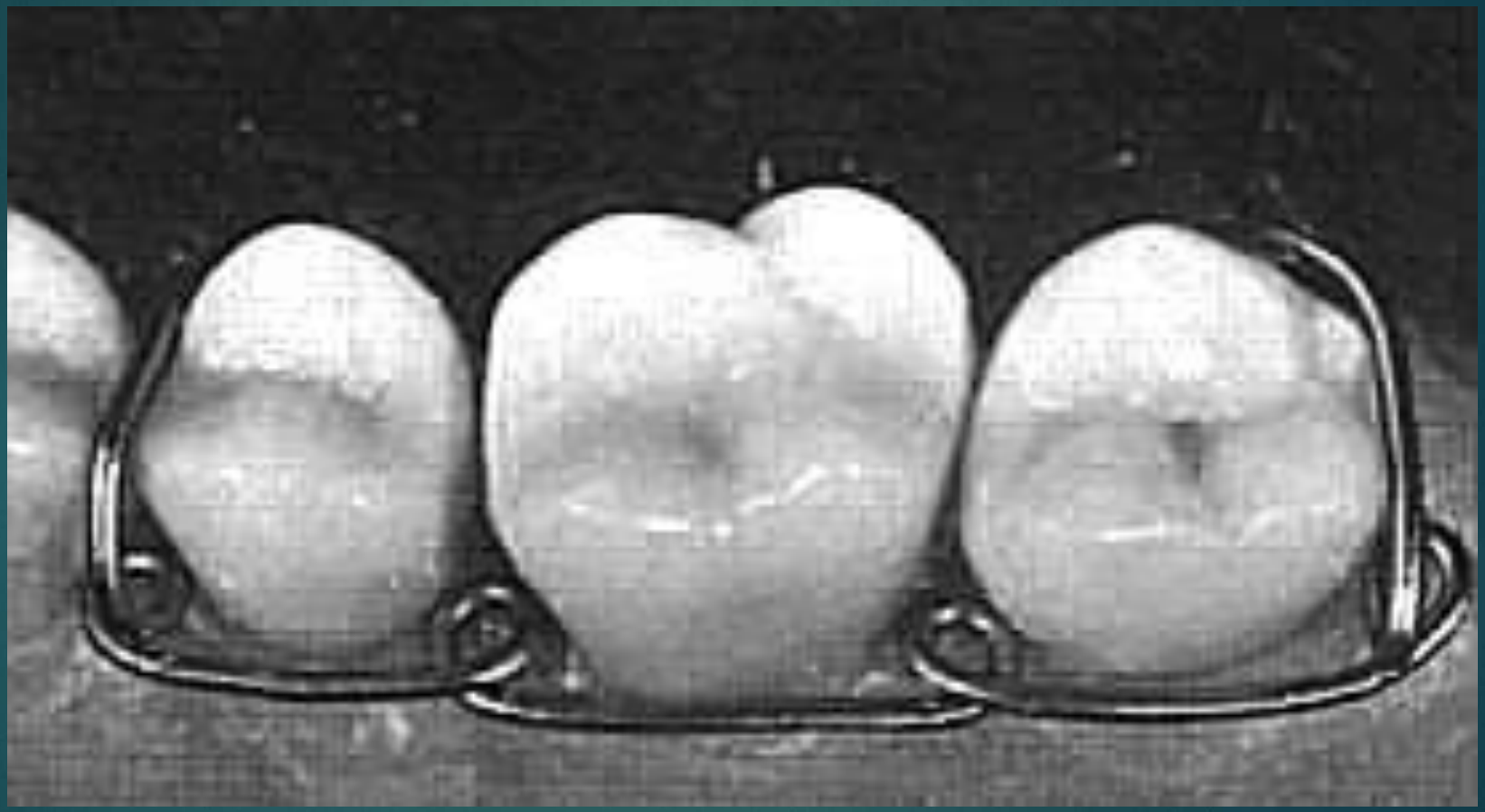
- The ball engages the proximal undercut between two posterior teeth
- Indicated when additional retention is required



Arrow pin clasp

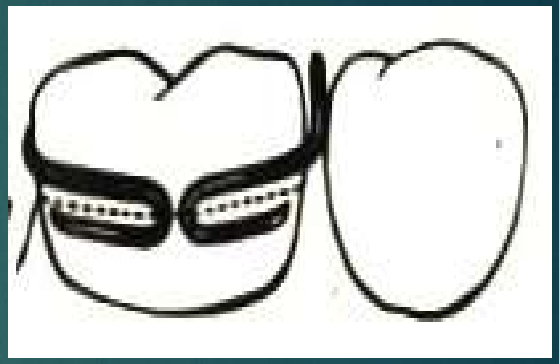
- A solid arrow is bent to engage interdental space

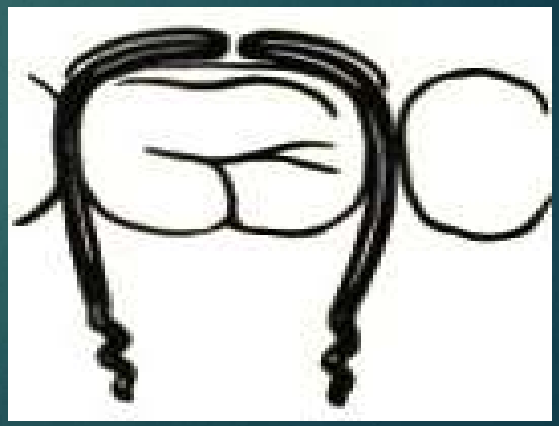
Eyelet clasp



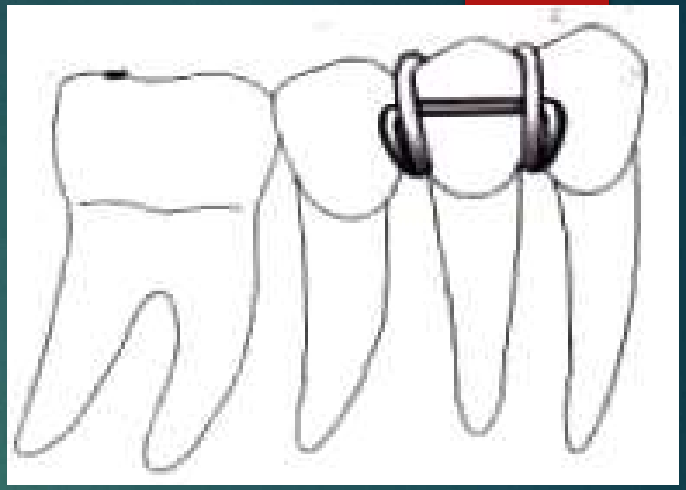
Duyzing's clasp

- Made by two wires emerging from the plate to cross the occlusion over the anterior and posterior contact point of the tooth clasped
- Then each wire goes above the greatest circumference of the tooth to the middle of the tooth and back again below using the undercut





Delta clasp



- W. J Clark (1985)
- Retention of twin block appliance
- Modification of Adams clasp
- Retentive loops are in shape of closed triangle

ADVANTAGE

- Does not open with repeated insertion and removal

Arrow head clasp

- By A. M. Schwarz

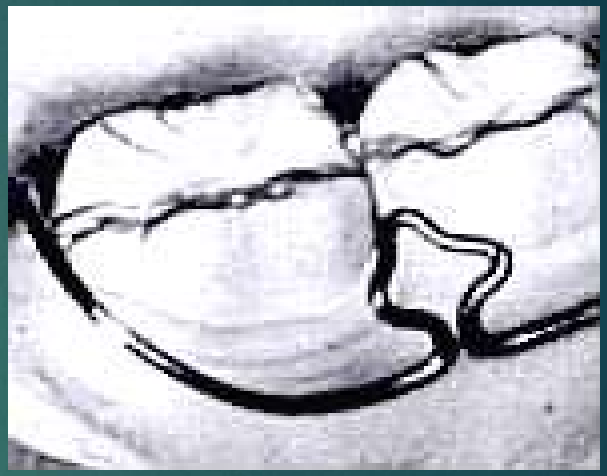
Parts

1. The arrow head portion
2. Vestibular portion
3. Retentive arms

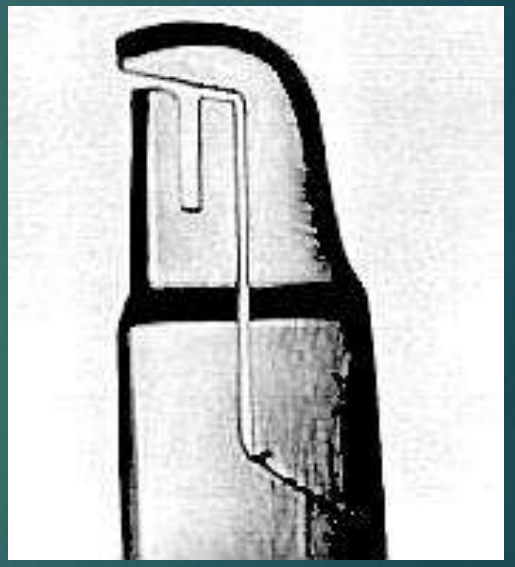
- The arrow heads bent in horizontal plane perpendicular to long axis engage the interproximal undercuts

- The vestibular portion stands 1 mm away from the tissues

- Stahl (1958) – arm should make a sweeping curve from the base of arrowhead to its insertion



Pliers



Advantages

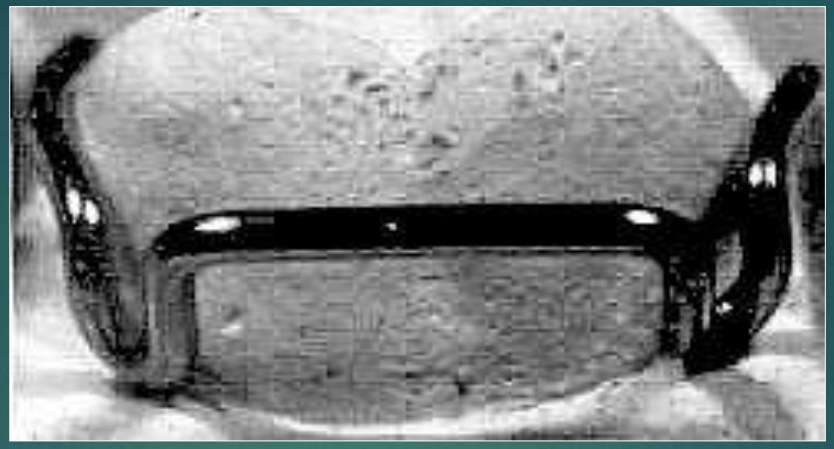
- The expanse of wire between the arrow head makes it more elastic
- The possibility of adjusting the arrows slightly mesially or distally
- Used both on deciduous or permanent teeth
- Facilitates teeth to erupt in position

Disadvantages

- Needs a special type of pliers
- Occupies a large amount of space
- Arrow heads can injure the interdental soft tissues
- Difficult and time consuming to fabricate

Adams clasp

- Described by Philip Adam
- Also known as Liverpool clasp,universal clasp and modified arrow head clasp
- Constructed using 0.7 mm hard stainless steel wire
- Parts
  - Two arrow heads
  - The bridge
  - Two retentive arms

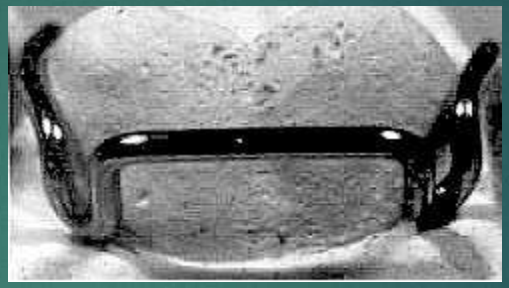


- The two arrowheads engage the mesial and the distal proximal undercuts.
- The arrowheads are connected to each other by a bridge which is at a 45° to the long axis of the tooth.
- Corrected constructed Adams clasp should be passive but in contact with tooth surface when the appliance is fully inserted

Advantages

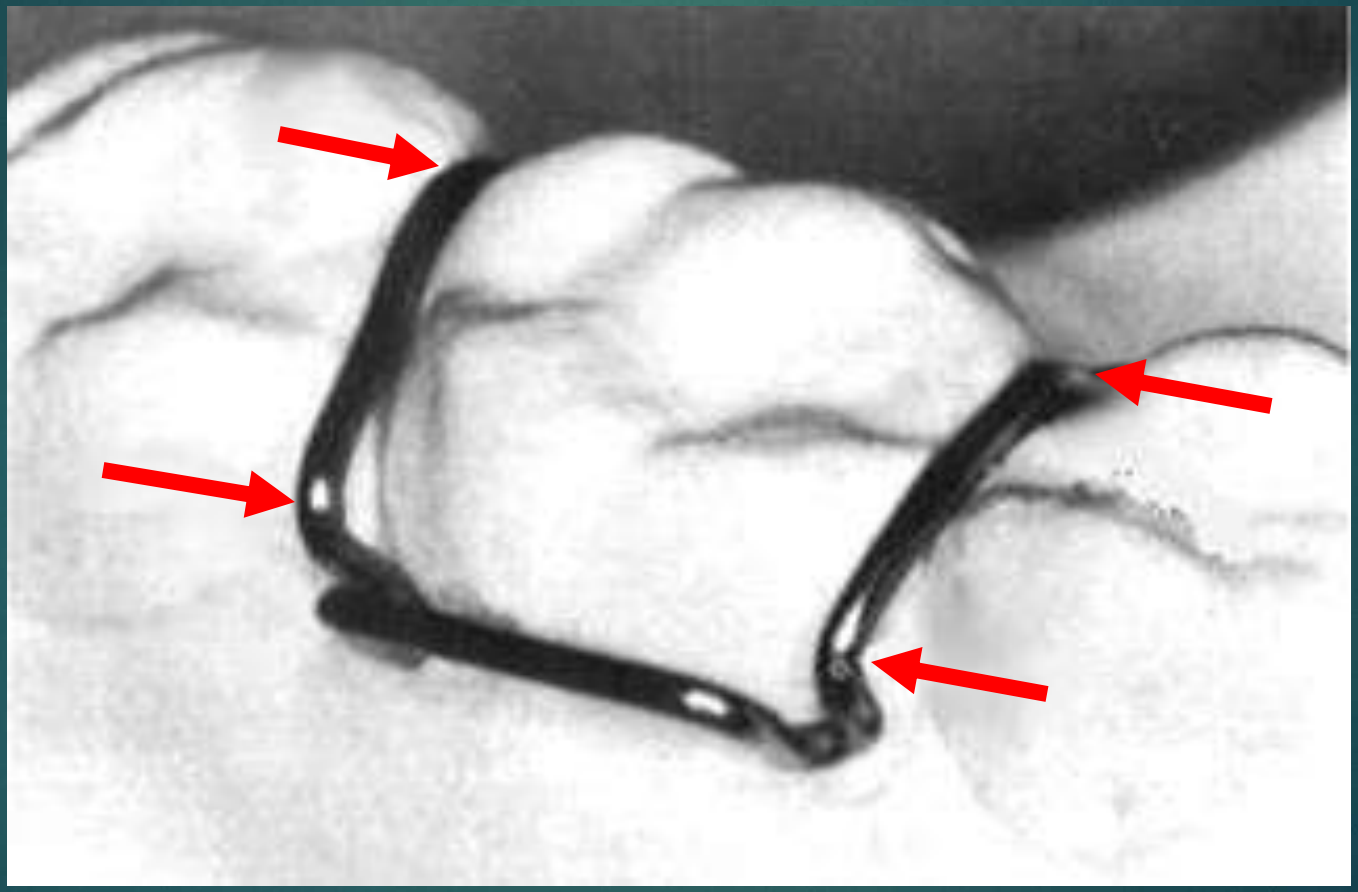
- It is rigid and offers excellent retention.
- Can be fabricated on both deciduous and permanent dentition.
- Can be used on partially or fully erupted teeth.
- Can be used on molars, premolars and incisors.
- No specialized instruments needed to fabricate.
- It is small and occupies minimum space.
- Clasp can be modified in a number of ways

Essential features of Adam's clasp



- Bridge is straight.
- Arrowheads are parallel and must not contact adjacent tooth.
- Bridge stands away from tooth at an angle of 45.

- Tags are formed by turning down at right angles.
- The clasp should be passive but in contact with the teeth when fully inverted.
- Should not exert any force as it can tip the tooth.



Modifications

Adam with single arrow head

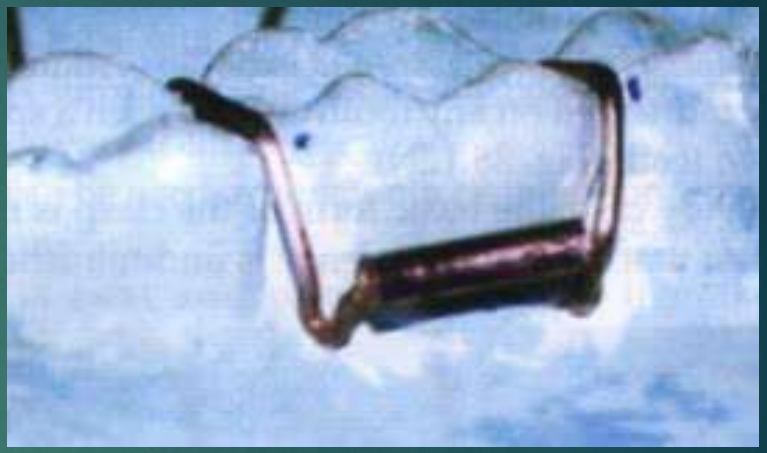
- Indicated in a partially erupted tooth usually the last erupted molar
- Arrow head is made to engage the mesio proximal undercut of the last erupted molar
- Bridge is modified to encircle the tooth distally and ends on the palatal aspect as a retentive arm

Adam with J hook

Adam with incorporated helix

Adam with soldered buccal tube

- This permits the use of extraoral anchorage using face bow - head gear assembly



- *Adam with distal extension*

- *Adam on incisors and premolars*

Adam with additional arrowhead

- The additional arrowhead engages the proximal undercut of the adjacent tooth and is soldered on to the bridge
- This offers additional retention

Adam's clasp on rotated teeth

- Made in the usual way, the bridge of the clasp should be in line with the buccal segment and not with the buccal surface of the tooth.

Base plate

- The frame work of the removable appliance

Functions

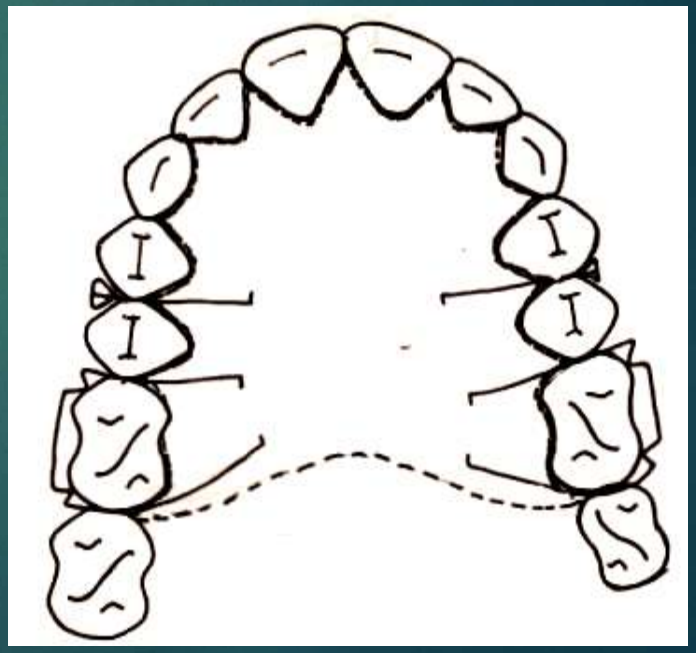
- Unites all components of the appliance into one unit
- Helps in anchoring
- Provides support for wire components
- Helps in distributing the forces over a large area
- Bite planes can be incorporated

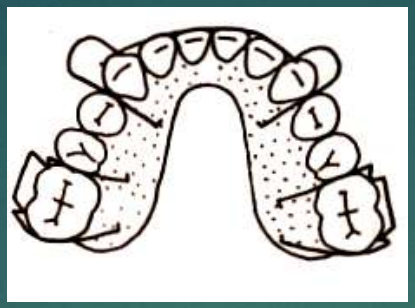
THICKNESS

- Base plates of 1.5 –2 mm thickness offer adequate strength and at the same time well tolerated.

Extension

- The maxillary base plate usually covers the entire palate till the distal of the first molar.





- The mandibular base plate is U shaped
- It is usually shallow to avoid irritation to lingual sulcus thereby a reduction in strength
- To compensate for this it should be reinforced with a stainless wire

Materials used

Heat cure

- More color stability
- Less porosity
- Strength

Self cure

- Convenience
- Speed
- Cost
- Possible for repair

Heat cure

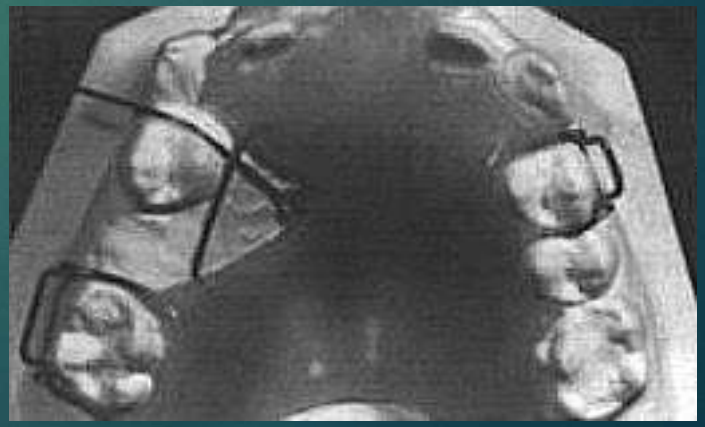
Steps

- Wire parts of the appliance secured to the cast by pink wax.
- Cast dipped in water for 10 – 15 minutes and the surface wetness allowed to dry.

- Single sheet of wax is warmed and pressed over cast.

- Wax is trimmed to shape with a double flat ended instrument.

- Any wax inside or about the coil of the spring is removed with a probe.



- While flasking care should be taken to put plaster around the springs and in the coil.
- When processed the appliance is deflasked, plaster removed and the plate is trimmed and polished.

Self cure

Steps

- The cast is coated with separating medium.
- All the components are secured in position using pink wax.
- Parts of the springs which must not be bound up in the base plate material are covered with pink wax.

- Self cure acrylic is applied –
  - single mix technique
  - salt and pepper/sprinkle on technique
- Appliance trimmed and polished.

Clear acrylic resins

Advantage

- Blanching of the tissues can be seen.
- Any entrapment of food can be observed.

Base plate can also be fabricated using thermoplastic acrylic sheets which are warmed on a ***Biostar*** machine (220° C), the advantage being uniform thickness.

Delivery of the appliance

- Check that the previously described design has been made correctly.
- Check for any roughness
- Trimming acrylic base for proper fit
- Adjust springs
- Test the functioning of screws.
- Examination of clasps
- No soft tissue impingement

Instructions

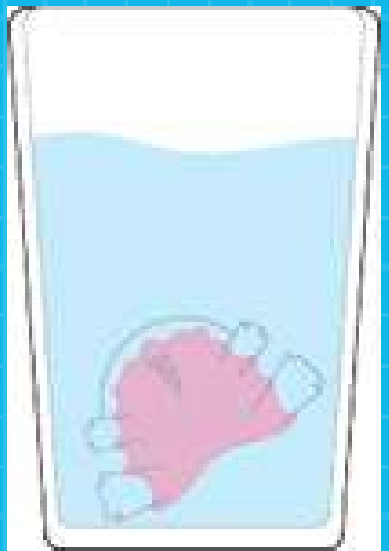
- Insertion & removal.
- Duration
- Cleaning
- Activation of screws
- **Report to clinic in case of any damage**

Cleaning of a removable orthodontic appliance

The advantage of removable orthodontic appliance is that it can be taken out. The user must ***take it out*** and clean it thoroughly to remove the ***dental plaque*** ***in the morning and before bed at night***.

Technique:

Take out the removable orthodontic appliance, use a toothbrush and some liquid soap to clean every surface of the appliance. After cleaning, the appliance can be worn again.



When the orthodontic appliance is not worn, it should be cleaned and immersed in a cup of water.

Examination at each return visit

- Enquire if the appliance has been comfortable.
- Patient asked to remove & insert the appliance
- Check for any facets ,wear upon acrylic & even breakage.

- Amount of tooth movement
- Soft tissue
- Reschedule the next appointment - 4 weeks interval.

Decline

- Since 1970 decline in U K
- Series of technical advances

ORTHODONTIC BANDS

Prewelded

Preformed

DIRECT BONDED ATTACHMENTS

PREADJUSTED EDGEWISE

According to BDJ sept 22 2001 vol 191

- Quality not so high
- Higher discontinuation of treatment
- Few general practioners willing to undertake orthodontic treatment
- Malocclusion requiring tipping are few
- Only in certain limited cases they provide simple , effective, efficient treatment

Conclusion

It is emphasized that if good results are to be obtained meticulous attention must be paid to case history, treatment planning, appliance design and adjustment.

Although removable appliances are adequate to produce majority of tooth movements, it is difficult to attain the precision of fixed appliance.

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- Orthodontic treatment with Removable appliances : Houston and Isaacson
- The Design Construction Use Of Removable Orthodontic Appliances :C.Philip Adams
- Contemporary Orthodontics : Profitt


THANK YOU...

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Dated …**13/06/2022..**

UG TEACHING PROGRAMME

S.NO.	TOPICS
1.	Adult Orthodontics
2.	Anchorage
3.	Fixed appliances
4.	Management of Class II
5.	Management of Class III
6.	Management of Cross bite
7.	Management of Open bite
8.	Management of some common malocclusions
9.	Management of Deep bite
10.	Removable Orthodontic Appliances

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Prof.& Head