Extraoral appliances

- Extraoral appliances or orthopedic appliances are used to modify the growth of maxilla and mandible using extraoral forces. They are appliance's that provide a means of applying anterior, posterior or vertical directed forces to the dentition and skeletal complex from an extra-oral source

- There are essentially 3 alternatives for treating any skeletal malocclusion –

(i) growth modification

(ii) dental camouflage

(iii) orthognathic surgery

- Growth modification should be opted wherever applicable because this precludes the need for both tooth extraction and surgery.

- Goal of growth modification is to alter the unacceptable skeletal relationships by modifying the patients remaining facial growth to favorably change the size or position of the jaws. • There are 2 types of orthodontic appliances that can be used for modifying the growth of maxilla/mandible-

(i) orthopedic appliances

(ii) functional appliances

- There are 2 types of forces used in orthodontics- 1) orthodontic force – when applied brings about dental change. They are light forces (50-100 gm) bringing about tooth movement. 2) orthopedic force – when applied brings about the skeletal changes. They are heavy forces (300-500gm) that bring about changes in the magnitude & direction of bone growth.

- Basis of orthopedic appliance therapy resides in the use of intermittent forces of very high magnitude . Such heavy forces when directed to the basal bone via teeth tend to alter the magnitude & direction of the jaws by modifying the pattern of bone apposition at periosteal sutures & growth sites

- 1) Magnitude of force
- Extra oral forces of much greater magnitude, in excess of 400gms per side is required to bring about skeletal changes.
- Most orthopedic appliances employ forces in the range of 400-600 gm per side to maximize skeletal effect

2) Duration of force

- Orthopedic changes are best produced by employing intermittent heavy forces.
- Intermittent forces of 12-14 hours duration per day appear to be effective in producing orthopedic changes.
- An intermittent heavy force is less damaging to the teeth and periodontium than a continuous heavy force.

3) Direction of force

- Orthopedic force should be applied in the appropriate direction to have a maximum skeletal effect.
- The desired changes are best achieved when the line of force passes through the center of resistance of the skeletal structures to be moved.
- The force direction or force vector should be decided depending on the clinical needs

- 4) Age of the patient
- It is advisable to begin orthopedic appliance therapy while patient is still in the mixed dentition period, to make most of the active growth occurring prepubertal growth spurt. Treatment may have to be continued until the completion of adolescent growth, so as to prevent relapse caused by the re-expression of patients fundamental growth pattern after cessation of orthopedic therapy

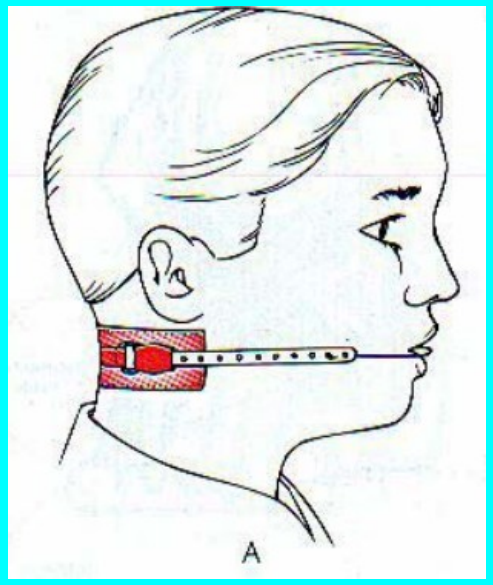
- The following are the commonly used orthopeadic appliances.

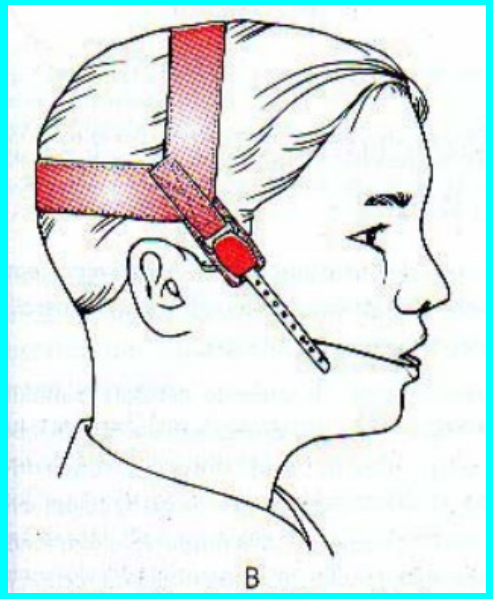
1. Head gear
2. Reverse pull facial mask
3. Chin cup

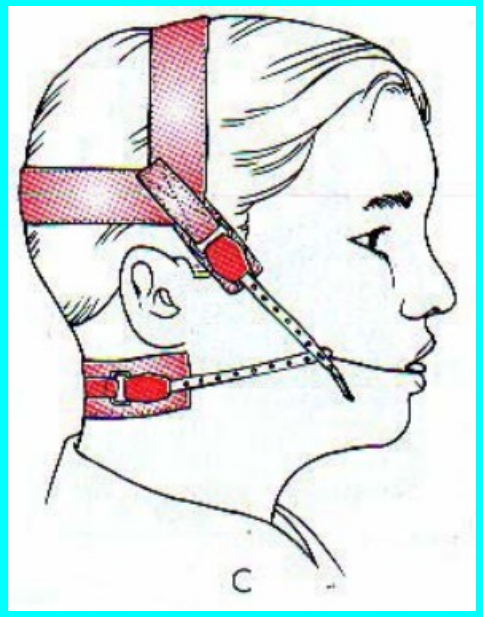
Headgear

Classification of Headgear

- Cervical headgear (Cervical pull)
- Occipital headgear (High pull)
- Combination



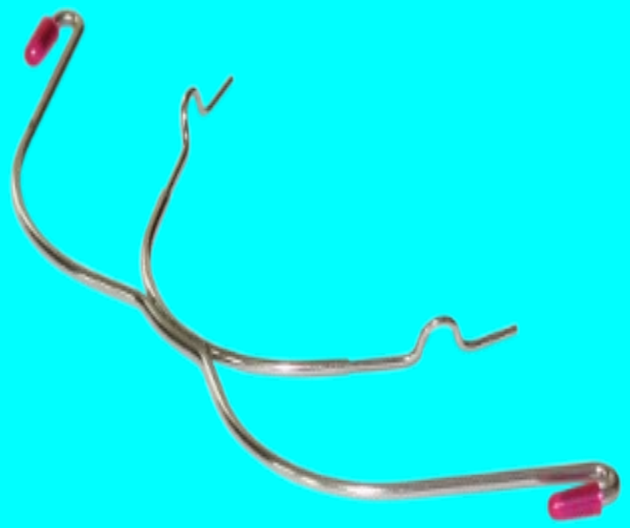




- Basic element

1. Force delivering unit
   i.e facebow , ‘j- hooks’
2. Force generating unit
   i.e. Elastic, springs
3. Anchor unit i.e. Head
   cap, neck pad

- Face bows: are Inner-outer bow type
- Commonly used with fixed or functional/removable appliance.
- Inner bow is available in either: 0.045 inch – 0.051 inch
- Outer bow diameter is : 0.072 inch



- J-hook type
- An alternative method of applying extra-oral forces to a fixed appliance.
- The hooks are termed ‘J’ hook on account of their shape and are attached directly to the arch wire usually in the incisor region

- Each J-hook consist of a 0.072 inch wire contoured so as to fit over a small soldered stop on the arch wire.

- Springs: calibrated tension springs are available. These have the advantage that the applied force can be varied. ᴥ Elastics: serve as force elements and are available in the following forms ᴥ neck bands with strong/medium pull ᴥ extra-oral plastic chains with length 119mm

- Cervical headgear: it obtained anchorage from the nape of neck. It cause extrusion for maxillary molars leading to an increase to lower facial height. It also move the maxillary dentition and maxilla distally. Its indicated in low mandibular angle cases. As an increase in lower facial height is beneficial in such patients.

- Occipital headgear: it derives anchorage from the back of head. It produces a distal and superiorly directed force on the maxillary teeth and maxilla.

- Treatment effects of the high-pull headgear include
- intrusion and distalization of maxillary molars
- Anti-clockwise mandibular rotation
- Decreased lower facial height

- Combination headgear: in this type of headgear, occipital and cervical anchorage are combined. when the forces exerted by both are equel, a distal and slight upward force is exerted on maxillary dentition and maxilla.

Other uses of headgear

1. Anchorage augmentation: anchorage reinforcement to prevent mesial movement of maxillary molars.
2. Distalization of molars : for the correction of molar relations or to gain space for correction of crowding or retraction of anteriors (300gm perside). Also Unilateral molar distalization in unilateral class II can be achieved by asymmetric cervical headgear.

3. Molar rotation
4. Space maintenance: the mesial movement of molars is prevented to preserve the arch length

J hook headgear

- The forces produced by extraoral traction also can be attached anteriorly by means of j-hooks to the archwire or the hooks soldered to the archwire.

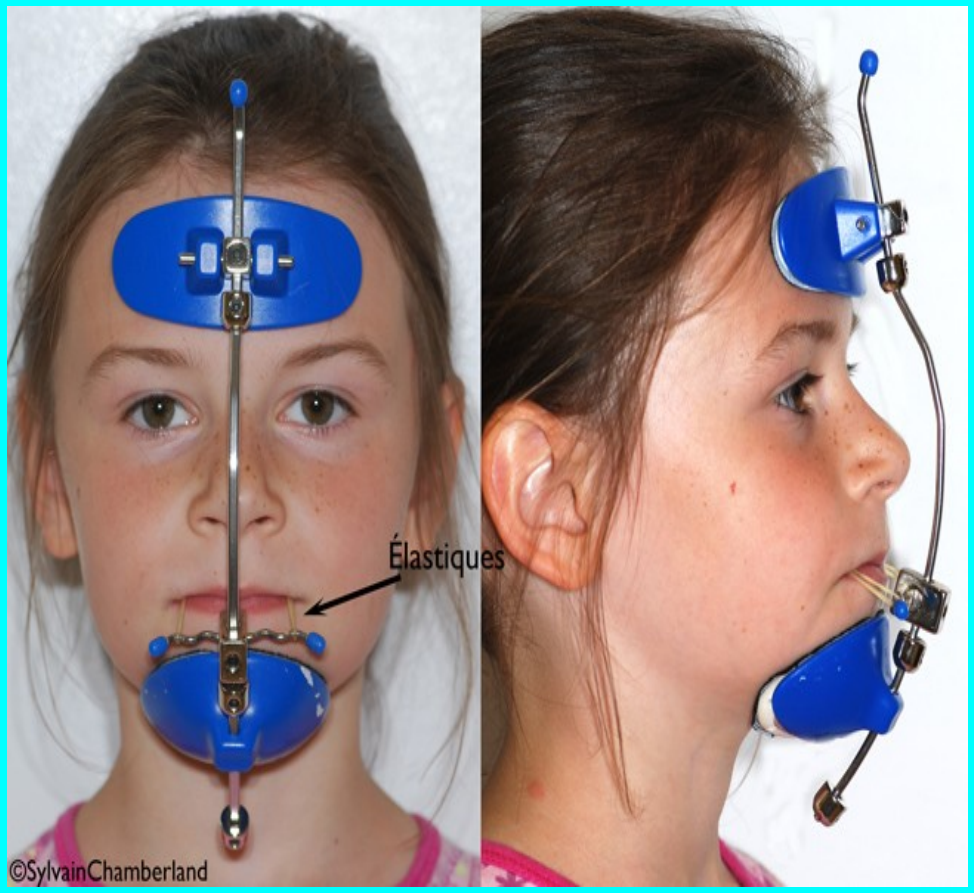
Flared maxillary incisors can be retracted using either a high pull or a straight-pull headgear combined with j-hooks that are attached to the arch wire anteriorly.

- J hooks can be applied to the maxillary teeth in a variety of force vectors to retract and intrude the maxillary incisor teeth.Usually done in edgewise mechanotherapy

Reverse pull facial mask

- Indications

1. Growing patients having a prognathic mandible and a retrusive maxilla (class III malocclusion)
2. For selective rearrangement of the palatal shelves in cleft patients.



- Anchorage from chin & forehead : no excessive force is exerted onto the condyler growth cartilage. Disadvantage is difficulty in speech& compromise in aesthetics & comfort.

- 1. Amount of force- the amount of force required to bring about skeletal changes is about 1 pound or 450 gms per side. 2. Direction of force- 15 – 20 degree downward pull to the occlusal plane to produce a pure forward translatory motion of the maxilla. If the line of force is parallel to the occlusal plane, a forward translation as well as an upward rotation takes place.

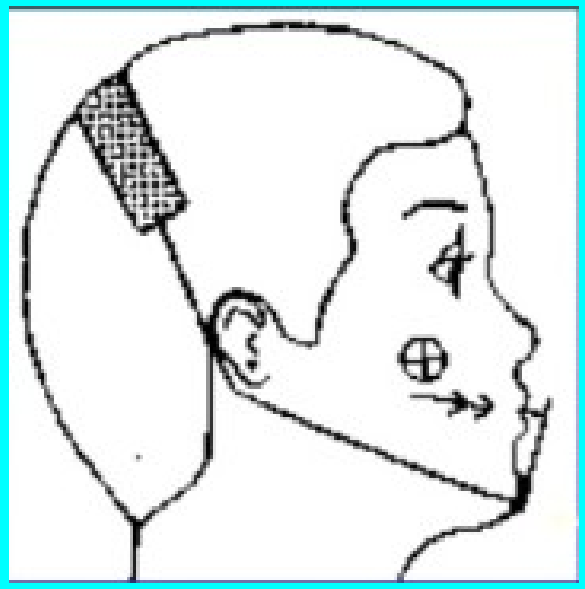
- 3. Duration of force- time taken to achieve desired results is proportional to the amount of force utilized. 4. Frequency of use- 12 to 14 hours of wear a day

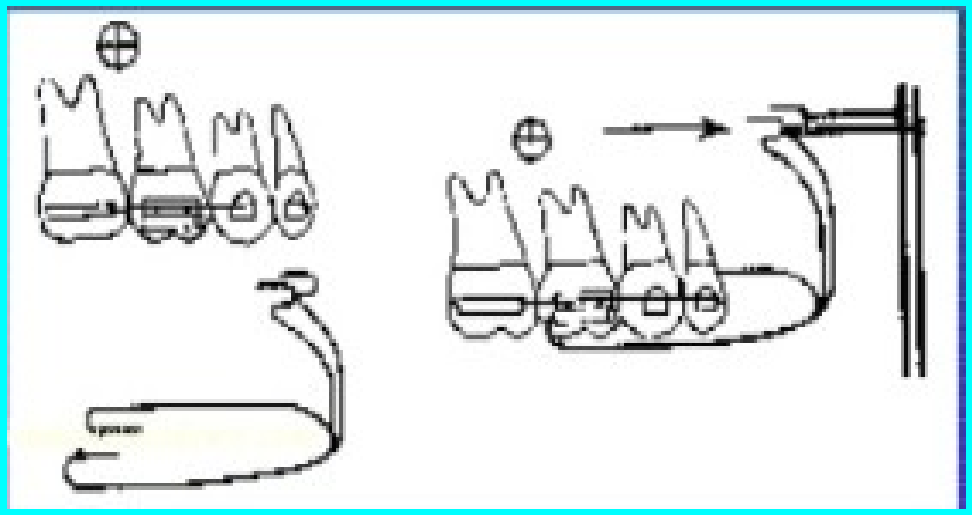
Parts of a reverse pull headgear

- 1.Chin cup : is used to take anchorage from the chin area. It can be ready made or can be fabricated from an impression of the patients gonial region. It is connected to the rest of the face mask assembly by means of metal rods. 2. Forehead cap : use to derive anchorage from the forehead. 3. Elastics : used to apply a forward traction on the upper arch. Vertical posts of the chin cup are used to attach the elastics onto the molar tubes or hook soldered on the arch wire. It is purely for tooth movement. 4. Intraoral appliance : traction hooks are placed either in the molar or premolar region. 5. Metal frame : It connects the various components such as the chin cup and forehead cap. It also has provision to receive elastics from intraoral appliance.

- Also called as “protraction headgear”
- When an anterior protractory force is required, a protraction headgear is used.
- Principle – pulling force on the maxillary structures with reciprocal pushing force on the forehead or mandible through facial anchorage.
- A reverse pull headgear basically consists of a rigid framework, which takes anchorage from chin or forehead or both for anterior traction of maxilla using extra oral elastics that generate large amounts of force up to 1 kg or more.

- 1. Protraction headgear by Hickham : Uses the chin and top of the head for anchorage. Force distribution is – 15% head, 85% chin. Consists of 2 short arms in front of the mouth to engage maxillary protraction elastics. 2 long arms run parallel to the lower border of the mandible & go vertically up from the angle of the mandible and end behind the ears. An elastic strap is attached to the end of the long arms to encircle the head. Advantages – 1) better aesthetics 2) comfort 3) option of unilateral force applicability.



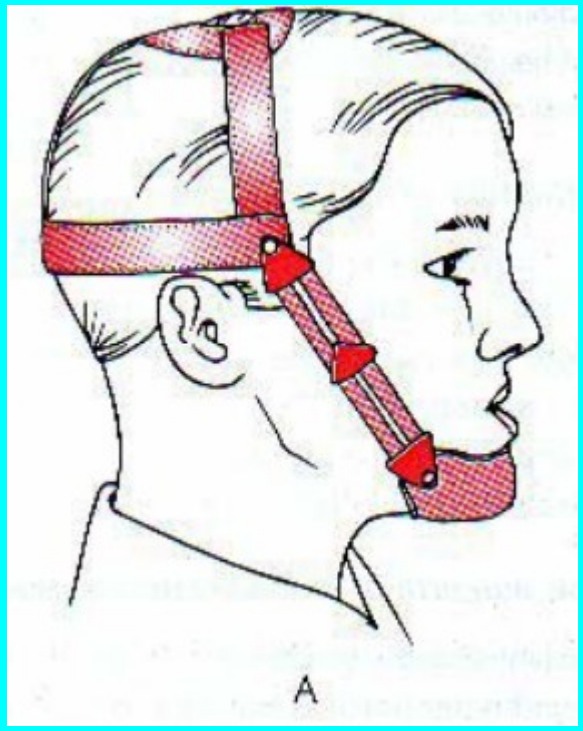


2. Face mask of Delaire:
   Uses the chin and forehead for support. Appliance is made up of a rigid wire framework, which is squarish& kept away from the face. It has a forehead cap and a chin cup with a wire running in front of the mouth used for elastic attachment.

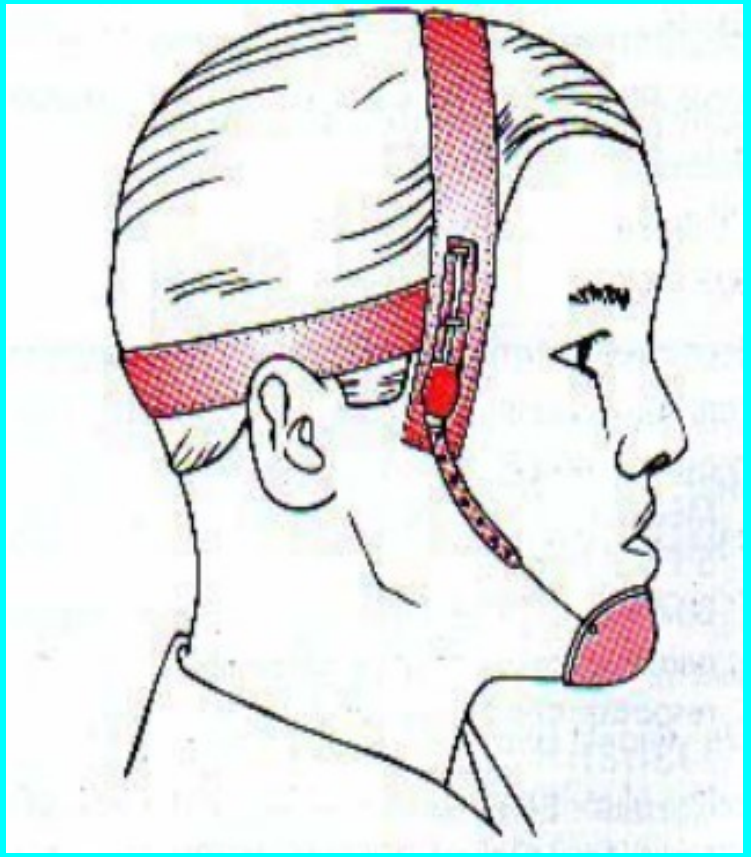
chin cap

- It is an extra oral orthopedic device that covers the chin and is connected to a head gear. Used to restrict the forward and downward growth of the mandible.

- 1) Occipital pull chin cup
- Derives anchorage from the occipital and parietal region.
- Used in class III malocclusions associated with mild to moderate mandibular prognathism.
- Also indicated in patients with slightly protrusive lower incisors as they invariably produce lingual tipping of the lower incisors.



- 2) Vertical pull chin cup
- Indicated in patients with steep mandibular plane angle and excessive anterior facial height.
- These patients usually exhibit an anterior open bite.



- At the time of appliance delivery a force of 150-300 grams per side is used. Over the next 2 months the force is gradually increased to 450-700 grams per side. The patient is asked to wear the appliance for 12-14 hours a day to achieve the desired results

Indication

- 1) Patients with mild skeletal prognathism of the mandible.
- 2) In case of increased facial height.
- 3) Patients who has well aligned or protrusive, but not retroclined mandibular incisors.