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Introduction

• The term orthopedics derived from Greek – means “Proper Education”

• Fundamental principle of orofacial orthopedics is to aim at optimizing the development of the structures i.e., to remove restrictions or retardation’s in the accomplishment of growth pattern
'Orthopedic Therapy' is aimed at the correction of skeletal imbalance with the correction of any dentoalveolar malocclusion being of less importance, in which little or no tooth movement is desired.
Philosophy of Extraoral force

A disproportion in the size or position of the jaws result in a skeletal discrepancy in either the sagittal, coronal/vertical or transverse plane.

The three approaches to manage skeletal problems are:

a. Growth modification

b. Camouflage treatment

c. Surgical correction

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- Best option: Growth modification.

- It helps in altering the expression, direction and magnitude of growth.

Orthopedic forces are heavier (≈ 400 gm) when compared to orthodontic forces (50-100 gm).

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BASIS FOR ORTHOPEDIC APPLIANCES

• Orthopedic appliances make use of the teeth as a "handle" to transmit forces to the underlying skeletal structures, to bring about favourable skeletal change.

Amount of Force

• The force magnitude should be high i.e, at least greater than 400 gm (400-600 gm) per side.
Duration of Force

- **Intermittent forces** produce skeletal change whereas **continuous forces** produce dental movement.

- Worn for about 12-14 hours/day to bring about the desired effect.

- An intermittent heavy force is less harmful to the teeth and periodontium than a continuous heavy force.
Age of the Patient

Most effective: mixed dentition period as it takes advantage of the prepubertal growth spurt.

- Treatment should be maintained till growth is complete as these appliances change only the expression of growth and not the underlying growth pattern.
Timing of Force Application

• There is evidence that there is an increase in the release of growth hormones more during the evening and night and is associated with the sleep onset.

• Therefore, it is advisable to wear the headgear in the evening and throughout the night.
ORTHOPEDIC APPLIANCES

1. Headgear
2. Facemask
3. Chin cup

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Headgear

• Most commonly used extra-oral orthopedic appliances.
• Used: growth period / prepubertal period to intercept or correct certain skeletal malocclusions
• To distalize the maxillary dentition or maxilla.
• An important adjuncts to control or gain anchorage.

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Components

• Force delivering unit-face bow, J hook.
• Force generating unit.
• Anchor unit-head cap, neck strap.
Face Bow

• One of the most important components, helps in delivering extraoral force to the posterior teeth.

1. Outer Bow/Whisker Bow

• Round stainless steel wire 0.051" or 0.062" in dimension
2. Inner Bow

- **0.045" or 0.052"** round stainless steel wire
- Inserts into the round buccal tube on the maxillary first molars.

3. Junction

- Point of attachment of the inner and outer bow, which may be soldered or welded.
- Usually positioned at the midline of the two bows, however, it may be shifted to one side in case of asymmetric face bows.
According to origin of force facebow divided into as follows

- Cervical-pull facebow
- High-pull facebow
- Combi facebow
- Asymmetric facebow
Force Generating Unit

- Connects the face bow to the anchor unit and delivers the force to the teeth and the underlying skeletal structures.
- Force element: *springs or elastics*

**Anchor Unit**

Head cap or a neck strap, which makes use of anchorage from the skull or back of the neck respectively
- combination of the two may also be used.
Classification

According to direction of force:
• Distal force
• Mesial force

According to location of anchor unit:
• Cervical pull
• Occipital pull
• High pull (Parietal)
• Combination pull
Cervical pull (Low pull)

- Anchor unit: nape of the Neck
- Causes: extrusion and distalization of the molars along with distal movement of the maxilla.
**Indications**

1. Short face, Class II maxillary protrusive cases with a low mandibular plane angle and deep bite (true).
2. Anchorage conservation.
3. Early treatment of Class II malocclusion to distalize the maxilla and correct Class II molar relationship.

**Contraindications**

1. Open bite cases
2. High mandibular plane angle
3. Long face cases with an increase in lower anterior face height.
Occipital Headgears

- Anchorage: occipital region, i.e. back of the head
- Causes: distal translation of the molar

High Pull Headgear

- Anchorage: parietal region, i.e. front of the head
- Causes: intrusion and distalization of teeth.
Combination Pull headgear (Medium pull)

- Anchorage from at least two regions, i.e. the neck and occiput.
- Causes: distal and slightly superior force on the maxilla and dentition.
Principles of Force Application in Headgear Therapy

**Force**
- Changes or tends to change the position of rest of a body or its uniform motion in a straight line
- By means of springs or elastics

**Point of Origin of Force**
- Anchor site of the headgear: neck (cervical) or occipital region (occipital) or both.

**Point of Attachment of Force**
- Point of the outer bow to which the force element is attached.
- By altering the length or angulation of the outer bow, it is possible to alter the line of action of force.
Center of Resistance

- The point through which the resultant of the forces acting upon a body would produce a translatory movement

- To bring about movement translation force should be directed through the center of resistance of molar
Center of Rotation

- It is the point around which the tooth rotates/tips when force is applied away from the center of resistance of the tooth.
Uses of Headgears

• To restrain the forward and downward growth of the maxilla and re-directioning maxillary growth.

• Molar distalization: Headgear may be used to distalize the maxillary molar to correct the Class II molar relationship

• To reinforce molar anchorage in high anchorage cases

• Effective means of maintaining arch length by preventing mesial migration of molars.

• Molar rotation can also be brought about with the inner bow of the headgear.

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FACEMASK
(Reverse Pull Headgear)

For Class II problems

• i.e. treatment involves restriction of mandibular growth along with downward and forward maxillary growth.
• When headgear applies a distal force to the maxilla, compression of the maxillary sutures can inhibit forward maxillary growth.
• Likewise, pulling the maxilla forward and separating the sutures should stimulate forward growth of the maxilla.

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• Popularized by Delaire in 1970s is one of the most common reverse pull headgears in use today.
• Works Principle: pulling the maxillary structures forward with the help of anchorage from the chin or forehead or usually both.
Parts of a Facemask

1. Forehead cap
2. Metal framework
3. Chin cup/pad
4. Intra oral appliance
5. Heavy elastics
Indications

- Mild to moderate Class III skeletal malocclusion due to maxillary retrusion.
- Ideal patients for facemask should have:
  - Normal or retrusive but not protrusive maxillary teeth as facemask causes forward movement of the maxillary teeth relative to the maxilla.
  - Short or normal, but not long, anterior vertical facial dimensions, i.e. a hypodivergent growth pattern.
  - Correction of postsurgical relapse after osteotomies.
  - Selective rearrangement of palatal shelves in cleft patients.
Biomechanical Considerations

• **Amount of force**: Successful maxillary protraction can be brought about by 300-500 gm of force per side in the primary or mixed dentition.

• **Direction of force**: 15-20° downward pull to the occlusal plane is required to produce forward maxillary movement.

In most cases of maxillary deficiency, maxilla is deficient in the vertical plane as well, therefore, a slight downward, direction of force is usually desirable.
• **Duration of force:** to vary between 3 and 16 months. On an average at least 8-12 months of wear is required.

• **Frequency of use:** 12-14 hrs/day

• **Age of patient:** Optimal results are seen when facemask is used in the primary or early mixed dentition period.

• **Anchorage systems:** Palatal arches or palatal expansion appliances may be used as anchorage
Types of Reverse Pull Headgear

- Protraction headgear
- Delaire facemask
- Tubinger model of facemask
- Petit type of facemask

Hickham 1960s
CHIN CUP

• 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.

• Useful in the treatment of Class III malocclusion that occurs due to a protrusive mandible but a relatively normal maxilla.

• Chin cup therapy attempt to retard or redirect the growth of the mandible.

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Philosophy of Chin Cup Therapy

• Mandible grows by apposition of bone at the condyle and along its free posterior border.

• Condyle is not a growth center and condylar growth is largely a response to translation of surrounding tissues.

• This contemporary view offers a more optimistic view of the possibilities for growth restraint of the mandible, as with chin cup therapy.
Basic Chin Cup Appliance Design

- Head cap, which is firmly fitted/seated on the posterosuperior aspects of the cranium as anchorage
- Has attachments for the placement and activation of the chin cup.

- **Force module Elastic/metal spring** that provides the desired tension levels on the chin cup.
• **Chin cup**: Custom made or preformed, hard or soft.
• A hard chin cup can be custom made from plastic using a chin impression.
• A soft cup can be made from a football helmet chins trap.
• A commercial metal or plastic cup can be used if it fits well enough.
• Soft cups produce more tooth movement than hard ones.

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There are two ways to use the chin cup:

- Line of force acting directly through the condyle with the intent of impeding mandibular growth. This method causes no opening of the mandibular plane angle.
• Line of force acting below the condyle:
  • Chin is rotated downward and backward
  • Less force is required
  • Increase in facial height is achieved for a decrease in the prominence of the chin.
• Vertical force on the chin:
  • Decrease in mandibular plane angle
  • Decrease in gonial angle
  • Increase in posterior facial height.
Magnitude of Force

- Force of 300-600 gm/side.
- Initially a lower force level (about 150 gm) may be advised for the patient to get used to the appliance.

Duration of Wear

- Maximum of 12-14 hr/day of chin cup wear is recommended.
Types of Chin Cup

• **Occipital pull chin cup:** derives anchorage from the occiput region.

• Used in Class III cases with mild to moderate mandibular prognathism.
• Vertical pull chin cup: derives anchorage from the parietal region.

• Indicated in high angle cases or long face patients as it helps to close the angle of the mandible and increase the posterior facial height.
Effects of Chin cup

- Redirection of mandibular growth in a downward and backward direction.
- Remodeling of the mandible and a decrease in mandibular plane angle
- Lingual tipping of lower incisors.
- Improvement in skeletal and soft tissue profile.

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Thank you ...