

Treatment protocol for class III malocclusion in mixed dentition a review article.

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Abstract: "ONE OF THE MOST DIFFICULT PROBLEMS TO TREAT IN MIXED DENTITION IS CLASS III MALOCCLUSION" -Grabber, Vanarsdal¹. There is always a dilemma about the right age to start treatment, appliance chosen for treatment or whether it will be a one phase or two phase treatment module. This article will act as a guide to answer the above queries and also to choose between surgical or non-surgical procedure.

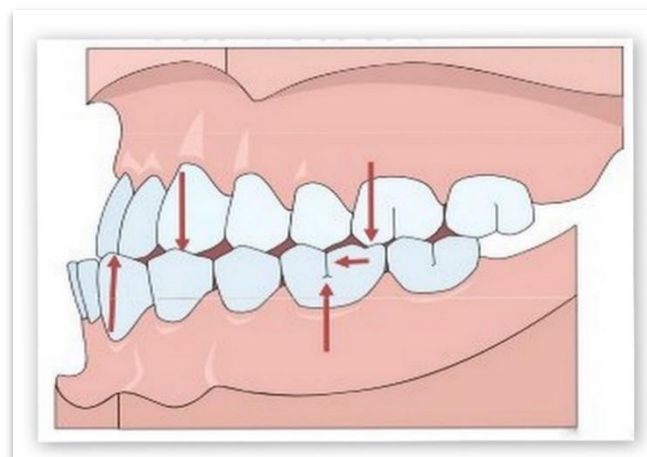
Key words: classIII, diagnosis, age, appliances used, mini screw, bone screw

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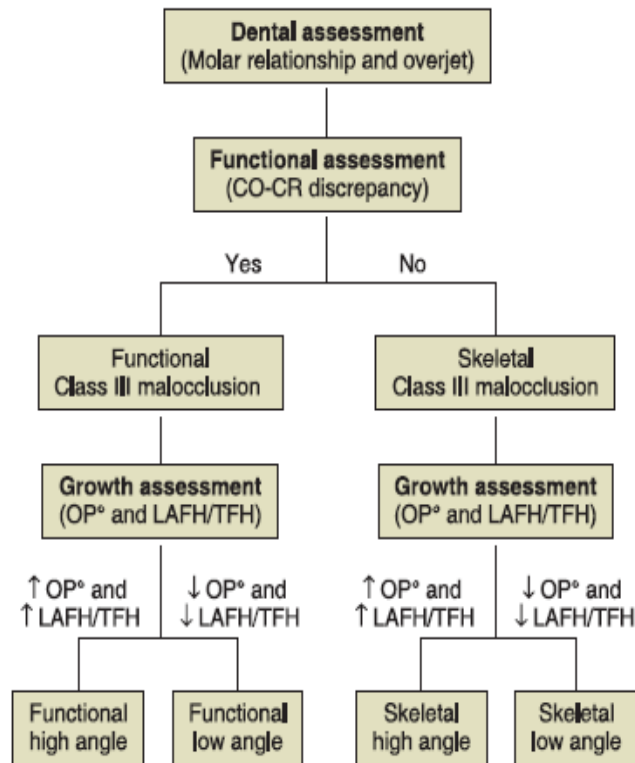
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I. Introduction:

ANGLE² in 1889 defined class III molar as relation with the mesio-buccal cusp of the maxillary first permanent molar occluding in the inter dental space between the mandibular first and second molars. Or lower permanent molar is ahead of the upper first molar by a distance of the width of a premolar or half the width of a molar.



Classification of developing Class III malocclusion for early treatment (ESTHETICS and BIOMECHANICS in ORTHODONTICS Second Edition Ravindra Nanda³)

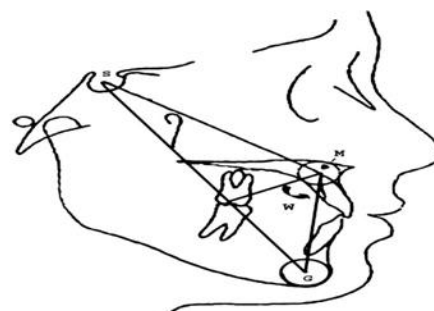
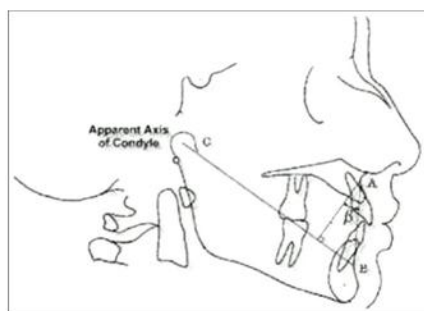


Diagnosis:

Based on Case history, Photographs, Study models, Radiographs Cephalometric analysis. Among these cephalometric analysis is most important.

Cephalometric analysis

- The SNA angle is significantly lower
- Negative ANB angle
- Greater mandibular protrusion
- Increased gonial angle (more obtuse)
- Steep mandibular plane angle
- Increased lower facial height Beta angle more than 35 degree
- W angle more than 35 degree
- Smaller Articular angle
- Greater saddle angle



GTRV (Growth Treatment Response Vector)⁴:

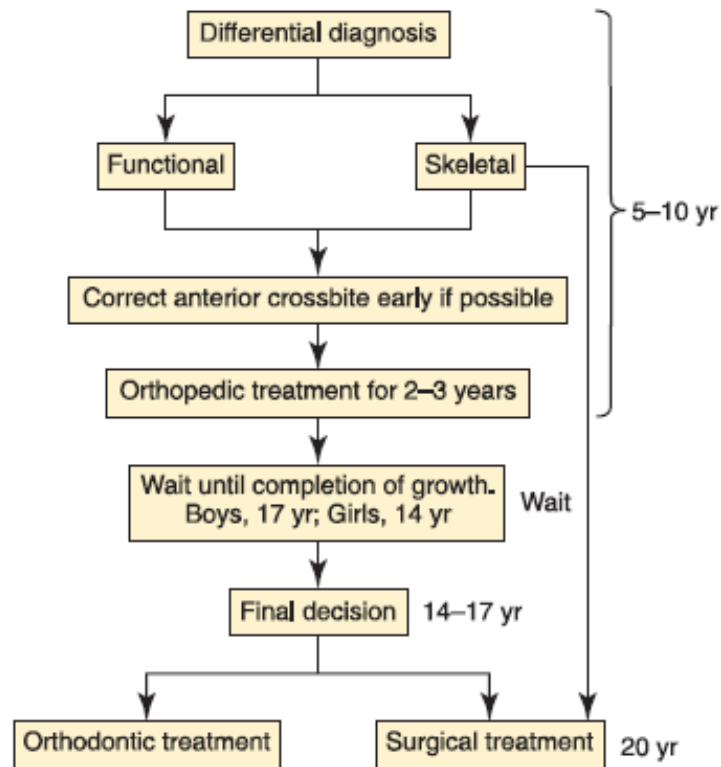
The GTRV ratio was calculated by using the following formula-

$$GTRV = \frac{\text{horizontal growth changes of the maxilla}}{\text{horizontal growth changes of the mandible}}$$

Normal value-0.77 for 6-16 yrs. of age
 If .33-.88-successfully camouflage
 If .38-surgery

Treatment Modalities:

(ESTHETICS and BIOMECHANICS in ORTHODONTICS Second Edition Ravindra Nanda³)



A. PSEUDO CLASS III MALOCCLUSION:

Correction of anterior cross bite

- ▶ Tongue blade
- ▶ Z-spring
- ▶ Anterior inclined plane

Correction of posterior cross bite

- ▶ Removable expansion plate
- ▶ Fixed expansion appliance.

Correction of occlusal prematurities

- ▶ Occlusal splint

B. TRUE CLASS III MALOCCLUSION:

The main dilemma lies between one phase or two phase treatment plan. Proffit⁵ contended that treatment should start as soon as possible after Class III malocclusion is diagnosed. He pointed to an ideal age of 8 years.

In 2004 Ochoa and Nanda⁶ examined the growth pattern of maxilla and mandible with ages ranging from 6 to 20 years and reported that maximum maxillary growth was observed between the ages of 6 and 8 years. The maxillary complex was still growing after the age of 8 years but at a decreasing pace until the age of 14 years. Moreover, in girls there was a significant decrease in maxillary growth after the age of 12.



Rationale for Early Timely Treatment of Class III Malocclusions:

The objective of early orthodontic treatment is to create an environment in which a more favorable dentofacial development can occur.

Indications for Early Class III Treatment:

- Good facial aesthetics
- Mild skeletal disharmony
- No familial prognathism
- Anteroposterior functional shift
- Convergent facial type
- Symmetric condylar growth
- Growing patients
- Expected good cooperation

Contraindication:

- Poor facial aesthetics
- Severe skeletal disharmony
- Familial pattern established
- No Anteroposterior shift
- Divergent facial type
- Asymmetric growth
- Non-growing patients
- Expected poor cooperation

The treatment objectives of the first phase are:

1. To maintain good oral hygiene with the help of dental caries risk tests
2. To correct functional deviation of the mandible and to stabilize the jaw position
3. To improve the three-dimensional jaw deformity as much as possible
4. To correct and control the deviation of the dental midline
5. To accomplish desirable anterior occlusion for establishing anterior guidance in the future
6. To establish bilateral posterior support
7. To gain enough space for the buccal teeth
8. To normalize and enhance orofacial functions.

Treatment objectives of the second phase are:

1. To achieve a balanced soft tissue profile
2. To establish final functional occlusion
3. To regulate temporomandibular joint (TMJ) and oral functions
4. To prevent periodontal disease and promote oral health.

Early Treatment of Skeletal Class III Malocclusions:

1. **Chin Cup Therapy:** The objective of early treatment with the use of a chin cup is to provide growth inhibition or redirection and posterior positioning of the mandible.

Two types:

- a. The occipital-pull chin cup that is used for patients with mandibular protrusion.
- b. The vertical-pull chin cup that is used in patients presenting with a steep mandibular plane angle and excessive anterior facial height. Recommended orthopedic force of 300 to 500 g per side. Patients are instructed to wear the appliance 14 hours per day.

Effect on Mandible:

- downward and backward rotation of the mandible,
- closure of the gonial angle,
- shortening of the mandibular length,
- bending of the condylar neck,
- remodeling of the glenoid fossa, and opening of the cranial base angle.

Limitations:



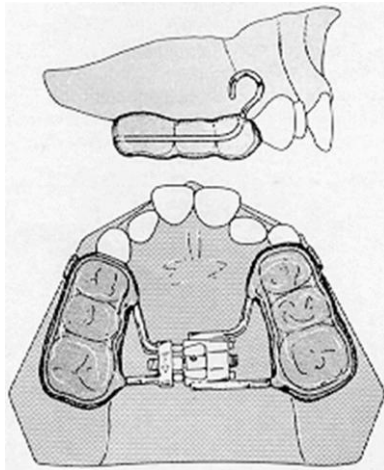
- ✓ Long treatment time
- ✓ Shows various response depending upon the facial type.
- ✓ Ulcerations at chin area.
- ✓ Need patient compliance.

Stability of Treatment:

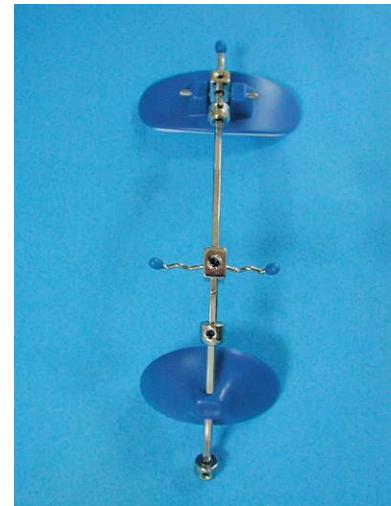
The stability of chin cup treatment remains unclear. Several investigators reported stability in horizontal maxillary and mandibular changes associated with chin cup treatment. However, a few studies reported a tendency to return to the original growth pattern after the chin cup is discontinued.

2. **Protraction face mask therapy:** used in mild to moderate skeletal class III with retrusive maxilla and hypodivergent growth pattern.

Appliance design:
Three parts
Facemask,
Maxillary splint, and
Elastic



Maxillary splint



Petit Mal face mask

Elastic sequence:

Initially	3/8"	8 oz.
After 2 weeks	1/2"	14 oz.
Increased to a max of	5/16"	14 oz.

Young patients (4-9) years should wear the mask on a full time basis except during meals. Duration is 4-6 months. They can be retained with only night time wear or with a maintenance plate, chin cup or FR III. In older patients, it is worn at all times except during school.

Treatment effect:

- ✓ Maxillary forward displacement: increase in SNA angle.
- ✓ Mandibular downward and backward rotation: decrease in SNB angle, increase in SN-MP angle
- ✓ Increase in anterior facial height.
- ✓ Labial inclination of upper incisors.
- ✓ Lingual inclination of lower incisors.

The magnitude of force:

- ✓ The force value used for maxillary protraction ranges from 200-800 gm. per side.
- ✓ Preadolescent patient (4-8 years): 200-250 gm. per side.
- ✓ Early adolescent patient (8-11 years): 300-450 gm. per side.
- ✓ Late adolescent patient (>11 years): 450-600 gm. per side.

Direction of force: the protraction elastics are attached near the maxillary canines with a downward and forward pull of 30 degrees from the occlusal plane.

Patients are instructed to wear the appliance for 12 hours per day.

3. PROTRACTION WITH AND WITHOUT RME:

In patients whom no increase in transverse dimension is desired, the appliance should be still activated for 8 - 10 days to disrupt the maxillary sutural system and to promote maxillary protraction (Hass⁷,1965)

Clinically, it has been shown that maxillary expansion can disarticulate the maxilla to allow a more favorable forward movement of the maxilla.

The sutures were loosened by alternating weekly expansion and constriction for 8 weeks, a facemask was used at night to "pull" the maxilla forward, and Class III elastics were used during daytime to "hold" the result of the protraction.

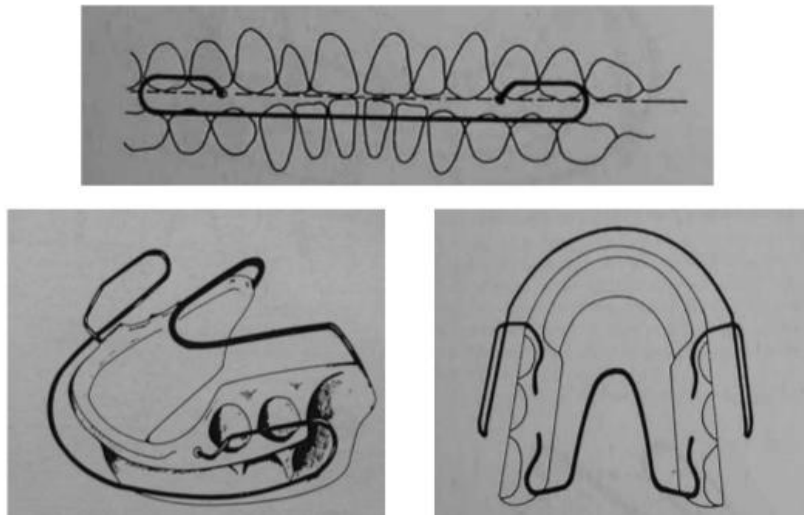
4. MYOFUNCTIONAL APPLIANCES:

Indications:

- ✓ Mild to moderate skeletal discrepancies
- ✓ Growing patients
- ✓ Preliminary treatment before major fixed appliance therapy
- ✓ Decreased lower facial height
- ✓ Post treatment retention

Functional Regulator of Frankel – 3: can also be used as a retainer after class III correction by protraction face mask (Petit) or orthognathic surgery (Eirew)

Class III or Reversed Bionator:



Reverse Twin Block:

Functional correction of Class III malocclusion is achieved in Twin Block technique by reversing the angulations of the inclined planes cut at 70° angle, drive the upper teeth forwards by the forces of occlusion and restrict forward mandibular development.



5. The Modified Tandem Appliance:

Used in class III malocclusion with open bite and hyperdivergent growth pattern. Appliance design (JCO 2011 VOLUME XLV NUMBER 6)⁸:



Wearing time -Patients should be encouraged to wear the Tandem Appliance as much as possible outside of school.

Average about eight hours a day, usually while sleeping

Elastics-At the beginning of treatment, patients are instructed to wear the appliance with light, 8oz training elastics from the outer facebow.

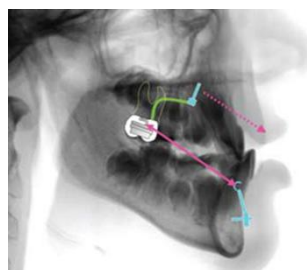
Subsequently, heavy orthopedic traction with 14oz elastics effectively delivers the protraction force to the maxilla.

Advantages:

- ✓ Forces are applied directly (by the Mentoplate) or transferred indirectly (Hybrid Hyrax) to skeletal structures.
- ✓ The appliances are nearly invisible; no extraoral devices are required.
- ✓ Rapid expansion opens the midpalatal sutures for better maxillary protraction.
- ✓ Anchorage is stable and reliable.
- ✓ Insertion is possible before complete eruption of the lower canines.
- ✓ The placement procedure is less invasive than when multiple miniplates are used.
- ✓ The upper and lower arches remain fully accessible for orthodontic tooth movements.

6. Early Class III Treatment with a Hybrid Hyrax :-

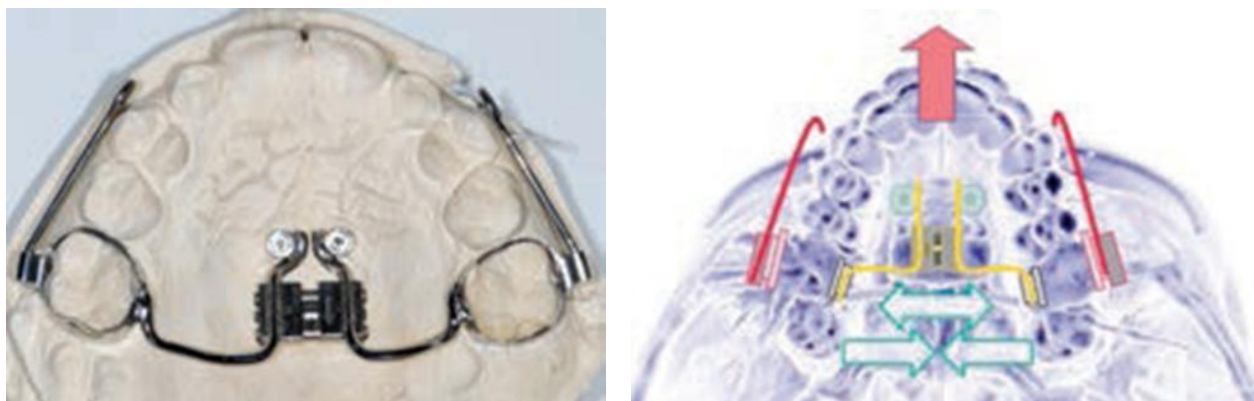
Mentoplate Combination JCO/JANUARY 2011⁹:



Two mini-implants with interchangeable abutments (2mm × 9mm) are inserted next to the midpalatal suture, near the second and third palatal rugae. An implant diameter of 2mm is recommended for better stability. The Hybrid Hyrax is inserted one week later by pressing it gently over the mini-implants and alternately screwing the two abutments onto the mini-implants. The expansion screw should be activated immediately after insertion of the Hybrid Hyrax; turning the screw 180° twice a day results in a daily expansion of .8mm.

7. **Early Class III Facemask Treatment with the Hybrid Hyrax and Alt-RAMEC Protocol**
JCO/FEBRUARY 2014¹⁰:

Liou's¹¹ Alt-RAMEC (alternating rapid maxillary expansion and constriction) protocol was designed to maintain this sutural stimulation over a longer period, thus achieving greater maxillary protraction. The expander is activated about 1mm (four turns) per day, alternating one week of expansion with one week of constriction. In the original protocol, this procedure was repeated for seven to nine weeks, using intraoral springs for the Class III correction.



The sagittal split screw was activated twice a day with 180° turns, for a daily activation of .8mm. A protraction force of 400g was applied on each side from elastics connected to the facemask. After one week of expansion, the split screw was reactivated for a week of compression.

Advantages:

- ✓ Because the sagittal forces are transferred to the maxillary bone, there are no dental side effects in terms of mesial migration.
- ✓ The transverse forces are applied anteriorly to mini-implants, with no risk of periodontal damage to the premolars or deciduous molars.
- ✓ Due to the opening of the midpalatal sutures, Alt-RAMEC provides a longer-lasting “RPE effect” for increased maxillary protraction.
- ✓ The treatment is minimally invasive.
- ✓ The upper and lower arches remain fully accessible for orthodontic corrections.

8. **Bone anchored maxillary protraction:**



II. Conclusion:

Understanding the causative factors such as maxillary skeletal, mandibular skeletal, dental, neuromuscular, or a combination of these will help in determining whether early orthopedic treatment will be beneficial for these patients and in the selection of suitable appliances for treatment. Correction of anterior cross bite must be done as soon as possible. After correction of anterior crossbite, treatment with an orthopedic appliance can continue if anteroposterior skeletal problems persist. However, orthopedic appliances should not be used for more than 2 to 3 years. It is better to wait until diminution of growth at around 14 years of age for girls and 17 years of age for boys than to start the treatment immediately after phase I treatment. At that time, a final decision can be made on whether to treat the patient orthodontically or by surgical treatment.

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