Lecture 6 Treatment of Class III malocclusion (Part 1)

1. Class III malocclusion:

According to Angle classification (Fig. 1), Class III malocclusion can be defined as the advancement of the lower 1st permanent molar ½ a cusp or a cusp to the upper 1st molar with a reversal overjet. The British Standards definition of Class III incisor relationship includes those malocclusions where the lower incisor edge occludes anterior to the cingulum plateau of the upper incisors. Canine definition, the tip of the upper canine occlude posterior to the embrasure between lower canine and 1st premolar. Class III is very easy to identify but difficult to treat.

The majorities of Cl III malocclusions have an anterior cross bite with the lower incisors occluding labially to the upper incisors. Cl III malocclusion is the least common type of occlusal relationship in many countries which occurs in less than 5% and affects around 3% of Caucasians, and thus has been observed relatively less frequently in orthodontic practice.

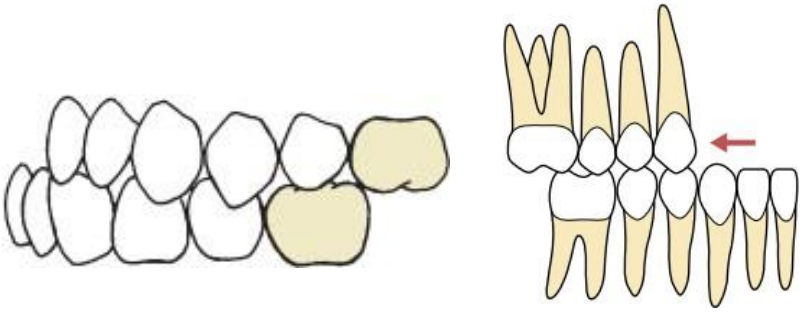

Figure 1 Class III malocclusion.

1.1 The main variations in class III maloccludion:

The main variations are:

1. The degree of Cl III anterio-posterior relationship of the dental arches.
2. The degree of lateral discrepancy in the upper and lower dental arch size.
3. The degree of incisal overbite or anterior overbite.
4. The degree of crowding of the teeth.

The source of these variations is found in the main aetiological features, skeletal, oral musculature and the size of the dentition.

1.2 Aetiology

1.2.1 Skeletal factor:

This factor plays a major role in most Cl III malocclusion and the majority of Class III incisor relationships are associated with an underlying Class III skeletal relationship. There are three important aspects of the skeletal relationships:

1. ***The antero-posterior skeletal relationship:***

Almost all Cl III is based on some degree of Cl III skeletal relationship. The antero-posterior skeletal discrepancy is largely responsible for the Cl III occlusal relationship, the reverse overjet and in many cases the buccal cross bite.

2. ***The relative widths of upper and lower jaws:***

Unilateral or bilateral crossbite may be caused by a discrepancy in the width of the jaws; similarly, since the buccal segments diverge backward, a discrepancy in antero-posterior relationship can lead to the development of crossbite.

3. ***Vertical dimension of the face:***

Class III malocclusions occur in association with a range of vertical skeletal proportions, ranging from increased to reduced. A backward opening rotation pattern of facial growth will tend to result in a reduction of overbite; however, a forward rotating pattern of facial growth will lead to an increase in the prominence of the chin. It is influenced by the gonial angle of the mandible. A high gonial angle tends to give a long face in the vertical dimension with a tendency to open bite, while a low gonial angle tends to give a short face in the vertical dimension with a tendency to a deep overbite.

- ***Cephalometric studies*** have shown that, compared with Class I occlusions, Class III malocclusions exhibit the following:
  - Increased mandibular length;
  - A more anteriorly placed glenoid fossa so that the condylar head is positioned more anteriorly leading to mandibular prognathism;
  - Reduced maxillary length;
  - A more retruded position of the maxilla leading to maxillary retrusion.

The first two of these factors are the most influential.

- **Note:**

Class III may be associated with open bite and/or crossbite and this gives greater difficulty in treatment and thus increases the need for surgery.

1.2.2 The oral musculature:

In contrast to Class II, the soft tissues do not play a major aetiological role in the majority of Class III malocclusions. In fact the reverse is often the case, with the soft tissues tending to

tilt the upper and lower incisors towards each other so that the incisor relationship is often less severe than the underlying skeletal pattern.

This dento-alveolar compensation occurs in Class III malocclusions because an anterior oral seal can frequently be achieved by upper to lower lip contact. This has the effect of moulding the upper and lower labial segments towards each other.

The main exception occurs in patients with increased vertical skeletal proportions where the lips are more likely to be incompetent and an anterior oral seal is often accomplished by tongue to lower lip contact.

- **Other soft tissue factors may lead to the development of Class III malocclusion:**
  - A flat anterior positioned tongue that lie low in mouth is said to cause Class III malocclusion.
  - Lack of eruption of posterior teeth due to lateral tongue thrust results in overclosure of mandible. This causes autorotation which leads to Class III formation.

1.2.3 Dental factors:

Class III malocclusions are often associated with a narrow upper arch and a broad lower arch, with the result that crowding is seen more commonly, and to a greater degree, in the upper arch than in the lower. Frequently, the lower arch is well aligned or even spaced.

1.3 Growth

1- Facial growth is unfavourable in most of the Class III cases.
2- Vertical facial growth increases the tendency to open bite.
3- Excessive horizontal growth causes the reverse overjet to become worse.

1.4 Morphological classification of Class III (Table 1):

A. Dental (Anterior crossbite).

It is characterized by incorrect inclination or position of maxillary or mandibular incisors. Anterior crossbite, particularly crossbite of all of the incisors, is rarely found in children who do not have a skeletal Class III jaw relationship. In the dentoalveolar Class III malocclusion, there is no apparent sagittal skeletal discrepancy. The problem is primarily caused by lingual tipping of the maxillary incisors and labial tipping of the mandibular incisors.

As causal factors, primary tooth persistence or an abnormal tooth bud position, especially in the maxilla. Tongue dysfunction may also be the reason for the tipped position of the mandibular incisors. Therapy involves orthodontic treatment elements.

B. Pseudo-class III (Progenic forced bite).

It is characterized by an anterior positioning of the mandible as a result of premature dental contacts deflecting the mandible anteriorly to allow the patient to achieve full intercuspation. It is due to a postural position of the lower arch in a case of inadequate nasal breathing in which

the patient tries to push the mandible forward to break the posterior oral seal and facilitate the oral breathing in case of for example in adenoid patient or chronic tonsillitis. As with any crossbite, it is essential to check for a displacement of the mandible on closure from a premature contact into maximal interdigitation. In Class III malocclusions this can be ascertained by asking the patient to try to achieve an edge-to-edge incisor position. If such a displacement is present, the prognosis for correction of the incisor relationship is more favourable.

C. Skeletal Class III:

It refers to true skeletal discrepancies in the maxilla and/or mandible. These molar and incisors are Class III and usually associated with Class III apical base relationship. Class III is likely to get worse around the time when a child shifts from the deciduous to permanent dentition.

1. Maxillary retrognathism.

In maxillary micrognathia, the upper jaw is underdeveloped or too small sagittally. As a rule, the mandible has developed normally or is orthognathic. Etiologically, there is a hereditary component. In terms of differential diagnosis, the lateral cephalogram shows a retrognathic maxilla with an orthognathic mandible. The SNA angle is reduced, the SNB angle is normal, and the ANB angle is negative. *This can happen, for example, in some cleft patients who may exhibit cleft-related micrognathia of the maxilla.*

2. Mandibular prognathism.

In true progenia, reverse anterior overbite arises as a result of skeletal overdevelopment of the mandible. The etiology is hereditary. In terms of differential diagnosis, the cephalometric findings show a normal SNA angle, an enlarged SNB angle and a negative ANB angle.

3. Combination of different morphological Class III variant.

In the worst-case scenario, the maxilla is retrognathic and the mandible prognathic. In these cases, combined orthodontic and surgical treatment is always necessary.

Table 1 Causes of a reversed overjet

Cause	Aetiology
Skeletal pattern (skeletal Class III)	• Long mandible. • Forward placement of glenoid fossa positioning the mandible more anteriorly. • Short and /or retrognathic maxilla. • Short anterior cranial base.
Anterior mandibular displacement on closure	• Premature contact.
Retained primary upper incisors	• These may deflect the eruption path of their successors palatally into crossbite.
Restrained of maxillary growth	• Found in repaired cleft lip and palate and attributed to the effect of postsurgical scar tissue.

1.5 Occlusal Features (Fig. 2):

- Class III molar relation: The lower dental arch is in anterior relation to the maxillary arch. Mesiobuccal cusp of the upper first permanent molar occludes with the interdental space between the lower 1st and 2nd permanent molars.
- Class III canine relation: Upper canine occludes with the interdental space between lower first and second premolars.
- Severity of the incisor malrelationship varies greatly.
- It could be edge-to-edge or reverse overjet.
- Frequently, the lower incisors are retroclined.
- The overbite also varies between cases.
- Deep bite or open bite will be seen.
- Crowding will be present in some cases.
- Upper arch is narrow and lower arch broad. This could lead to crossbite.

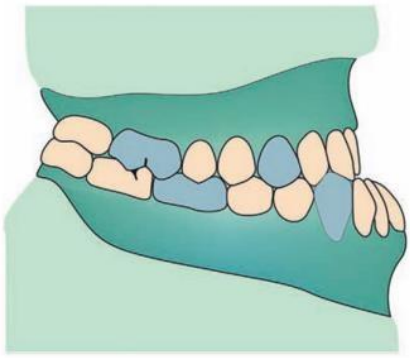

Figure 2 Dental features of Class III malocclusion.

1.6 Diagnosis:

The diagnostic procedure should help in the determination the type of Class III malocclusion i.e., dental or skeletal, true or pseudo.

1) Clinical examination should include ***observation of path of closure***.
2) Study models and radiographs (orthopantomogram/ OPG)) should also be taken.
3) A lateral cephalogram offers valuable information on the skeletal nature of the malocclusion.
4) The patients with Cl III often have a family history of other people having an anterior crossbite or Class III malocclusion.
5) Dental Class III malocclusion is characterized by lack of sagittal skeletal discrepancy.
6) The dental problem is caused by ***labial tipping of the mandibular incisors and a lingual tipping of maxillary incisors***.
7) Skeletal Class III malocclusion patients may exhibit:

    - A smaller than normal SNA angle and a larger SNB angle.
    - A negative ANB angle.
    - ***Upper incisors proclination and retroclination of the lower incisors.***

8) Functional shift is usually detected in patients with Pseudo Class III malocclusion. They exhibit a forward shift of the mandible upon closure as a result of abnormal tooth contacts.

9) The relationship between two lines, one dropped from the bridge of the nose to the base of the upper lip, and a second one extending from that point downward to the chin (Fig. 3). These line segments ideally should form a nearly straight line, with only a slight inclination in either direction. A large angle between them (>10 degrees or so) indicates either profile convexity (upper jaw prominent relative to chin) or profile concavity (upper jaw behind chin). Therefore, a concave profile indicates a skeletal Class III jaw relationship.

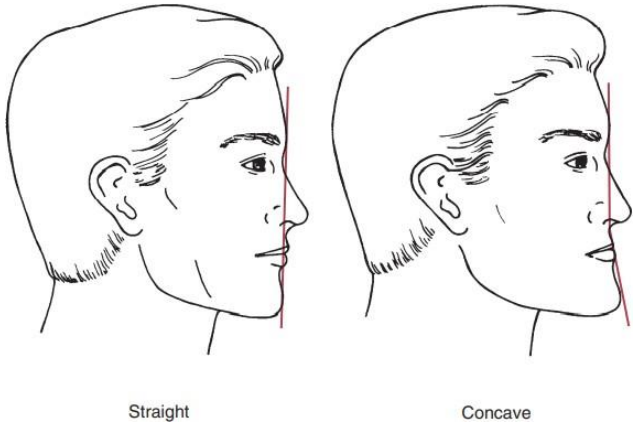

Figure 3

- **Note:** The long-term success of Class III treatment cannot be guaranteed due to the unpredictability of future growth.