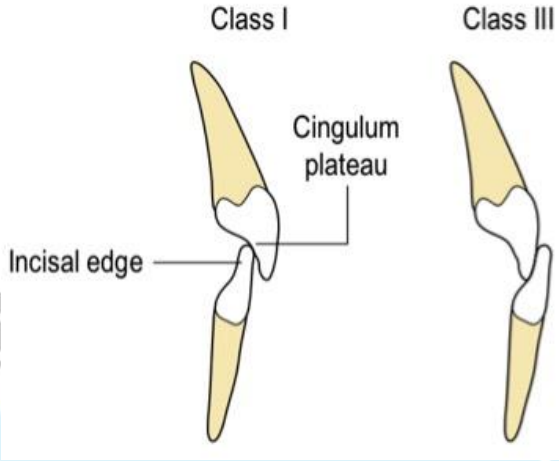
Treatment of Class III malocclusion

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. Class III malocclusions affect around 3% of Caucasians.



Aetiology

Class III malocclusion can have a strong genetic predisposition and hence may run in families.

Skeletal pattern: The skeletal relationship is often the most important aetiological factor, with the majority of Class III incisor relationships being associated with an underlying Class III skeletal relationship. 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 retrognathia.

The first two of these factors are the most influential. Class III malocclusions occur in association with a range of vertical skeletal proportions, ranging from increased to reduce. A backward, opening rotation pattern of facial growth will tend to result in a reduction of overbite with a longer lower face height but less mandibular forward projection; whereas, a forward rotating pattern of facial growth will lead to a more marked increase in the prominence of the chin.

Soft tissues: In the majority of Class III malocclusions, the soft tissues do not play a major aetiological role. 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.

However, 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, resulting in less dental camouflage being generated.

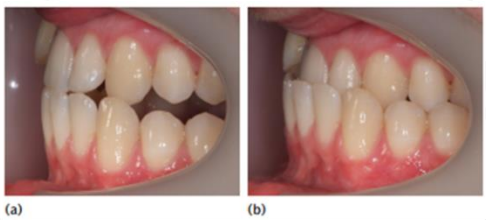
Dental factors: Class III malocclusions are often associated with a narrow upper arch and a broad lower arch, with the result that crowding is seen more commonly, and to a greater degree, in the upper arch compared with the lower. Frequently, the lower arch is well aligned or even spaced.

Also, class III incisor relationship could be due to excess in mandibular tooth material size which will be aligned more anteriorly. Or even may be due to reduced teeth size of maxillary arch (particularly lateral incisors), which will result in either a spacing or a retroclined maxillary central incisors.

Occlusal features

Class III malocclusions occur when the lower incisors are positioned more labially relative to the upper incisors. Therefore, an anterior crossbite of one or more of the incisors is a common feature of Class III malocclusions. Generally, the more anterior teeth that are in crossbite, the more severe the underlying skeletal Class III base.

As with any crossbite, it is essential to check for a displacement of the mandible on closure from a premature contact into maximal interdigitation. 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.



(a) Initial contact on the incisors in retruded contact position; (b) anterior displacement resulting in a full anterior crossbite in maximum intercuspation.

Another common feature of Class III malocclusions is buccal crossbite, which can occur for two main reasons.

1- Due to the relationship between the upper and lower jaws, there is a discrepancy in the relative width of the arches, with the lower arch being positioned relatively more anteriorly in Class III malocclusions.

2- In addition, the upper jaw can be intrinsically small both in the anteroposterior and transverse dimensions which will often result in severe crowding of the upper arch.



As mentioned previously, Class III malocclusions often exhibit dentoalveolar compensation with the upper incisors proclined and the lower incisors retroclined, which reduces the severity of the incisor relationship when compared to the underlying skeletal.

Treatment planning in Class III malocclusions

A number of factors should be considered when planning treatment:

The patient concern and motivation towards treatment: patient's opinion regarding their occlusion and facial appearance must be taken into account, as facial concerns will have a significant bearing on the appropriateness of an orthognathic surgical approach.

The severity of the skeletal pattern: in all three planes of space, anteroposteriorly, transversely, and vertically, should be assessed. This is the major determinant of the difficulty and prognosis of orthodontic treatment.

The amount and expected pattern of future growth: both anteroposteriorly and vertically, should be considered. It is important to remember that average growth will tend to result in a worsening of the relationship between the arches as the maxilla completes its growth before the mandible, and a significant deterioration can be anticipated if growth is unfavourable. When evaluating the likely direction and extent of facial growth, the patient's age, sex, facial pattern, and family history of Class III malocclusions should be taken into consideration.

Overbite: In Class III malocclusions, a normal or increased overbite is an advantage, as sufficient vertical overlap of the upper and lower incisors after treatment is vital for stability.

Patient ability to achieve edge to edge incisors relation: If the patient can achieve an edge-to-edge incisor contact and then displaces forwards into a reverse overjet, this increases the prognosis for correction of the incisor relationship with orthodontic camouflage.

Amount of dento-alveolar compensation present: In general, orthodontic management of Class III malocclusion will aim to increase dento-alveolar

compensation. Therefore, if considerable dento-alveolar compensation is already present, trying to increase it further may not be an aesthetic or stable treatment option.

Cephalometrically, it has been suggested that, for the majority of patients, an upper incisor angle of 120° to the maxillary plane and a lower incisor angle of 80° to the mandibular plane, are the limits of an acceptable compromise.

Degree of crowding: in each arch should be considered. In Class III malocclusions, crowding occurs more frequently, and to a greater degree, in the upper arch than in the lower. Extractions only in the upper arch should be resisted as this will often lead to a worsening of the incisor relationship. Where upper arch extractions are necessary, it is advisable to extract at least as far forwards in the lower arch, to allow maximum opportunity to establish a positive overjet at the end of treatment. Using headgear for distal movement of the upper buccal segments to gain space for alignment is inadvisable in Class III malocclusions as this may have the effect of restraining growth of the maxilla which could worsen the underlying skeletal relationship.

Functional appliances are less widely used in Class III malocclusions because it is difficult for patients to posture posteriorly to achieve an active working bite. However, they can be useful in mild cases in the mixed dentition where a combination of proclination of the upper incisors together with retroclination of the lower incisors is required.

Treatment options

Accepting the incisor relationship: In mild Class III malocclusions, particularly those cases where the overbite is minimal, it may be preferable to accept the incisor relationship and direct treatment towards achieving arch alignment.

For younger patients, who present with a more severe Class III incisor relationship with upper arch crowding, an initial course of orthodontic treatment may be undertaken to align the upper teeth. This provides the psycho-social benefits of an improved dental appearance during the early teenage years, while awaiting the completion of facial growth.

At this stage, the options may be to accept the residual malocclusion, undergo orthodontic camouflage, or proceed with full comprehensive treatment involving further orthodontic treatment and orthognathic surgery.

The most appropriate option would be dependent on the degree of adverse growth and the concerns of the patient.

Early orthopaedic treatment (Growth modification): Orthopaedic correction of Class III malocclusions aims to enhance or encourage maxillary growth and/or restrain or redirect mandibular growth.

There is good evidence that orthopaedic correction treatment is more likely to be successful if it is carried out prior to the pubertal growth spurt. The techniques in most common usage are as follows:

• Protraction face-mask used to advance the maxilla: The forces applied in this technique are in the region of 400 g per side and a cooperative patient is necessary to achieve the 14 hours per day wear required.

• Bone-anchored maxillary protraction (known as BAMP): Screws or mini-plates are used in the posterior maxilla and anterior mandible for Class III elastics. There is some evidence to show that a greater degree of maxillary advancement is achieved than with face-mask therapy alone.

• A combination of two techniques: Elastics are run between skeletal anchorage in the maxilla and a face mask.

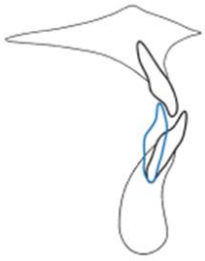
• Chin-cup: This has the effect of rotating the mandible downwards and backwards, reducing the overbite but with no reported orthopaedic change, so is a largely historic technique.

Orthodontic camouflage:

Orthodontic correction of a Class III incisor relationship can be achieved by proclination of the upper incisors, retroclination of the lower incisors, or a combination of both. Proclination of the upper incisors reduces the overbite whereas retroclination of the lower incisors helps to increase overbite.



Proclination of the upper incisors results in a reduction of overbite.



Retroclination of the lower incisors results in an increase of overbite.

In the correction of Class III malocclusions, if the positions of the upper and lower incisors are adjusted within the zone of soft tissue balance then, provided that there is an adequate overbite and further growth is not unfavourable, the corrected incisor relationship has a good chance of stability.

Note: Although functional appliances can be used to advance the upper incisors and retrocline the lower incisors, in practice these tooth movements are accomplished more efficiently with fixed appliances.

Crowding: Space for relief of crowding in the upper arch can often be gained by expansion of the arch anteriorly to correct the incisor relationship and/ or buccolingually to correct buccal segment crossbites. Therefore, it may be prudent to delay permanent extractions until after the crossbite is corrected and the degree of crowding is reassessed.

Expansion of the upper arch to correct a crossbite will have the effect of reducing overbite, which is a disadvantage in Class III cases. This reduction in overbite occurs because expansion of the upper arch is achieved primarily by tilting the upper premolars and molars buccally, which results in the palatal cusps of these teeth swinging down and 'propping open' the occlusion. Therefore, if upper arch expansion is indicated and the overbite is reduced, expansion should be achieved using rectangular archwires with buccal root torque added to try and minimize this sequela.

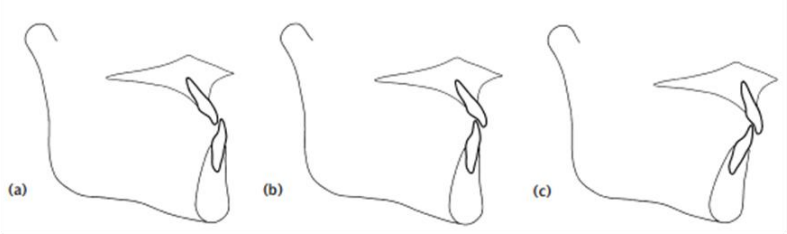
Space is required in the lower arch for retroclination of the lower labial segment, and therefore extractions may be required unless the arch is naturally spaced.

Surgery: In a proportion of cases, the severity of the skeletal pattern and/or the presence of a reduced overbite or an anterior open bite preclude orthodontics alone, and surgery is necessary to correct the underlying skeletal discrepancy.

Surgery is almost always required if the value for the ANB angle is below –4° and the inclination of the lower incisors to the mandibular plane is less than 80°.

However, the cephalometric and clinical findings, in all three planes of space, should be considered in conjunction with the patient's concerns and facial appearance. For those patients where orthodontic camouflage treatment will be challenging due to the severity of the skeletal pattern and/or a lack of overbite, a surgical approach should be considered before any permanent extractions are carried out, and preferably before any appliance treatment.

The reason for this is that management of Class III malocclusions by orthodontics alone involves dento-alveolar compensation of the underlying skeletal pattern. However, in order to achieve a satisfactory occlusal and facial result with a surgical approach, any dento-alveolar compensation must first be removed or reduced.



(a) Severe Class III malocclusion with dento-alveolar compensation. (b) Without reduction of the dento-alveolar compensation, surgery to produce a Class I incisor relationship will only achieve a limited correction of the underlying skeletal pattern, thus constraining the overall aesthetic result. (c) Decompensation of the incisors to bring them nearer to their correct axial inclination allows a complete correction of the underlying skeletal pattern.

Because the actual surgery needs to be delayed until the growth rate has diminished to adult levels, planning and commencement of a combined orthodontic and orthognathic approach is best delayed until around the age of 16 years. This has the advantage that the patient is of an age when they can make up their own mind as to whether they wish to proceed with a combined approach. As the pre-surgical phase of orthodontic treatment is likely to take 18–24 months, this will allow for any further adverse facial growth to occur prior to surgery at around 18 years old. The patient will then undergo finishing orthodontic treatment for about 6–12 months postoperatively to optimize the occlusal result.

Adult treatment

A pseudo - Class III malocclusion may result from loss of posterior tooth support and mandibular overclosure. The primary treatment objective in these patients is prosthodontic rehabilitation to prevent the overclosure.

Stability

The stability of anterior crossbite correction is greatly facilitated by achieving a positive overbite at the completion of orthodontic treatment. Continuing mandibular growth in adolescence may also be a significant factor contributing to relapse.

Key points

• Growth is often unfavourable in Class III malocclusions.

• If orthopaedic treatment might be an option then it is important to refer the patient to a specialist before 10 years of age.

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2. Phulari BS. (2017): Orthodontics: principles and practice: 2nd edition. Jaypee. 2017.