Class III malocclusion

Aetiology

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**.**

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.

Soft tissues:

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.

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.

Occlusal features:

- Anterior crossbite of one or more of the incisors is a common feature of Class III
- 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.
- Buccal crossbite, which is usually due to a discrepancy in the relative width of the arches. This occurs because the lower arch is positioned relatively more anteriorly

Treatment:

Factors to be considered when planning treatment:

• **Patient's concerns and motivation towards treatment**

• **Severity of skeletal pattern:**

The severity of the skeletal pattern, both anteroposteriorly and vertically, should be assessed. This is the major determinant of the difficulty and prognosis of orthodontic treatment.

• **Amount and direction of any future growth:**

It is important to remember that average growth will tend to result in a worsening of the relationship between the arches, 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

• **Can patient achieve edge-to-edge incisor contact?**

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.

• **Overbite:**

In Class III malocclusions a normal or increased overbite is an advantage, as sufficient vertical overlap of the upper incisors with the lower incisors post-treatment is vital for stability.

•Amount of dento-alveolar compensation present:

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 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 acceptable compromise

• Degree of crowding:

Malocclusions crowding occurs more frequently, and to a greater degree, in the upper arch than in the lower. Extractions in the upper arch only 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. Using headgear for distal movement of the upper buccal segments to gain space for alignment is inadvisable in Class III malocclusions as this will have the effect of restraining growth of the maxilla.

Treatment options:

1 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.

2 Early orthopaedic treatment

This is an area of orthodontics that is attracting considerable attention. Orthopaedic correction of Class III malocclusions aims to enhance or encourage maxillary growth and/or restrain or re-direct mandibular growth.

• 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 co-operative patient is necessary to achieve the 14 hours per day wear required. patients under the age of 10 years showed a success rate of 70 per cent in terms of achieving a positive overjet over a followup period of 15 months.

• 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 these 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 with a reduction of overbite so is largely historic.

3 Orthodontic camouflage

Extraction of the lower deciduous canines may allow the lower labial segment to move lingually slightly. Early correction of a Class III incisor relationship has the advantage that further forward mandibular growth may be counter-balanced by dento-alveolar compensation.

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.

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.

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.

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.

4 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. It is impossible to produce hard and fast guidelines as to when to choose surgery rather than orthodontic camouflage, but it has been suggested that 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 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 treatment will be challenging owing 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 for 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. For example, if lower premolars are extracted in an attempt to retract the lower labial segment but this fails and a surgical approach is subsequently necessary, the pre-surgical orthodontic phase will probably involve proclination of the incisors to a more average inclination with re-opening of the extraction spaces. This is a frustrating experience for both patient and operator. 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 age 15 years in girls and age 16 years in boys. 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.