



Borderline class III patient and treatment options: A comprehensive review

*¹ Dr. Abdul Baais Akhooon, ² Dr. Mohammad Mushtaq, ³ Dr. Assiya Ishaq

¹ PG, Department of Orthodontics and Dentofacial Orthopaedics, Govt. Dental College and Hospital, Shereen Bagh, Srinagar, Jammu and Kashmir, India

² Professor and Head of the Department, Department of Orthodontics and Dentofacial Orthopaedics, Govt. Dental College and Hospital, Shereen Bagh, Jammu and Kashmir, India

³ Junior Resident, Department of Orthodontics and Dentofacial Orthopaedics, Govt. Dental College and Hospital, Shereen Bagh, Jammu and Kashmir, India

Abstract

Treatment planning in orthodontics plays a key role in determining the successful treatment of any kind of malocclusion. Skeletal class III malocclusions are generally difficult to treat because of the complex nature of the skeletal and dental manifestations they produce. Mild to moderate skeletal class III malocclusions sometimes have an acceptable facial profile where orthodontic camouflage is possible. This article describes the characteristic features of borderline skeletal class III malocclusion and discusses the various treatment options.

Keywords: class III malocclusion, facial profile, camouflage, orthognathic surgery

1. Introduction

Soft tissue limitations not reflected in the envelope of discrepancy often are a major factor in the decision for orthodontic or surgical-orthodontic treatment. Envelope of discrepancy outlines the limits of hard tissue change towards ideal occlusion.

The decision for camouflage or surgery must be made before treatment begins because the orthodontic treatment to prepare for surgery often is just the opposite of orthodontic treatment for camouflage. In camouflage extraction spaces are used to produce dental compensations for the jaw discrepancy and the extractions are planned accordingly. In surgical orthodontics, orthodontics before surgery aims at removing dental compensations present in the malocclusion i.e. decompensation or 'Reverse orthodontics' and makes the malocclusion even more worse so that maximum correction is achieved at surgery.

Class III problems are less amenable to camouflage than Class II because retracting lower incisors may make the chin appear even more prominent, just the opposite of effective camouflage. If space is needed in the lower arch, second rather than first premolar extraction would be a logical choice so that the lower incisors are not retracted too much.¹

2. Camouflage treatment results

Orthodontic camouflage of skeletal malocclusion can have both acceptable and poor results^[1].

Acceptable results likely

1. Average/short facial pattern
2. Mild anteroposterior jaw discrepancy
3. Crowding < 4-6 mm
4. Normal soft tissue features (nose, lips, chin)

5. No transverse skeletal problem

Poor results likely

1. Long vertical facial pattern
2. Moderate or severe anteroposterior jaw discrepancy
3. Crowding > 4-6 mm
4. Exaggerated features
5. Transverse skeletal component of problem.

Class III malocclusion is described as supernormal Class I or Frank mesial-molar relationship accompanied by an incisor edge-to-edge bite or a negative over jet. The abnormal sagittal relationship is only a minor phenotype of maxillary and mandibular deviations in sagittal, vertical and transverse dimensions, their disturbed proportions and altered locations in cranium. There is often some underdevelopment of frontal sinus and front maxillary articulation may be more posterior^[2]

3. Clinical features of Class III face

Class III patient presents with the following features^[2].

Extra-oral features

1. A concave face, deficient maxilla and/or prominent chin.
2. Malar deficiency resulting into flat mid-face.
3. Increased lower anterior face height.
4. Anatomically large lower lip length.
5. Poor development of soft tissues around face.

Intra-oral features

1. Zero/negative over jet
2. Narrow maxillary arch with crowding
3. Unilateral/Bilateral posterior crossbite
4. Proclined maxillary incisors

5. Retroclined mandibular incisors
6. A wide lower arch with buccal segment showing compensations to accommodate narrow maxillary arch.
7. Low tongue posture
8. A flat curve of spee.

4. Maxillo-mandibular Relationship

Based on the sagittal discrepancy, Class III malocclusion has been grouped into four basic combinations^[2]:

1. Prognathic mandible: Orthognathic maxilla
2. Retrognathic maxilla: Orthognathic mandible
3. Orthognathic maxilla & mandible
4. Retrognathic maxilla, prognathic mandible.

5. Pseudo Class III malocclusion

It results from prematurities in occlusion leading to an anterior shift of mandible causing Pseudo or functional Class III. If left untreated would lead to skeletal Class III malocclusion. It exhibits discrepancy in centric relation and centric occlusion. Path of closure of mandible will be upward and forward because of anterior shift of mandible^[2].

6. Borderline Class III patient

Rabie *et al.* described borderline patients as 'those patients who were similar with respect to the characteristics on which orthodontic/surgical decision appeared to have been based'.

For such patients it becomes difficult to straightaway take a treatment decision for orthognathic surgery or there is a difference of opinion among a peer group to choose a therapy based on mild nature of severity of the problem^[2].

7. Cephalometric findings in borderline Class III malocclusion

They vary greatly according to the type, nature and severity of the problem and age of the patient. A lateral cephalogram is helpful in the evaluation of the severity of relationship and existing dental compensations both in maxilla and mandible. Postero-anterior view is particularly useful when there is a facial asymmetry and to evaluate the extent of maxillary arch constriction and width of the large mandible^[2].

8. Camouflage treatment

Treatment approach where the underlying skeletal deformity is left untreated but teeth are moved to such positions to create an acceptable occlusion without violating the norms of aesthetics and stability^[2].

Good cases for camouflage treatment

1. A Class III case with mild to moderate severity.
2. Subjects who have passed the active growth period for orthopaedic treatment of maxillary protraction and chin cup therapy.
3. Absence of skeletal facial asymmetry.
4. Hypodivergent Class III pattern
5. Lack of posterior crossbite or mild posterior crossbite
6. Presence of good alveolar bone support in mandibular anterior symphysis and in the maxilla to accommodate mandibular anterior retroclination and maxillary anterior proclination.
7. Good oral hygiene and periodontal health with no

fenestrations in the anterior region.

8. Patients with limited expectations in the improvement of profile
9. Patients having Average or Horizontal growth pattern
10. Patients who accept camouflage treatment modality with an understanding of possible future surgery.

Cases not good for camouflage treatment

1. Acute nasolabial angle which indicates that further proclination of maxillary anteriors could worsen the profile.
2. Limited possibilities of further retroclination of mandibular incisors due to pre-existing dental compensations and further limitations posed by limited availability of bone at symphysis.
3. Large negative overjet
4. Large tongue
5. Class III malocclusion of familial/ genetic etiology
6. Those with significant skeletal facial asymmetry and jaw deviations
7. Open Gonial angle, openbite and vertical growers
8. Patients with high expectations in terms of improvement of chin and profile.

9. Treatment Approaches for Class III malocclusion

There are three treatment approaches for treating Class III malocclusion^[3]:

1. Non-extraction treatment
2. Extraction treatment
3. Surgical treatment

9.1 Non-extraction approach: It is used when skeletal dentoalveolar arches in each jaw are sufficient to accommodate total tooth substance (minor crowding). It uses the following techniques:

- A) Multiloop edgewise archwire technique
- B) Use of distalization of lower arch using anchorage derived from mini-implants.

9.2 Extraction approach

Extraction pattern varies considerably from case to case. The space resolution should be primarily based on incisor position, then consideration should be given for crowding resolution. Limits for upper/lower incisor movements to compensate in camouflage treatment in Class III malocclusion can be- 120° to the SN plane and 80° to the mandibular plane, respectively.

Extraction choices can be

- Mandibular incisor
- Upper second premolars and lower first premolars
- Only lower premolars
- Mandibular second molars.

Mandibular incisor extraction: Where crowding is not large or situations of mild Bolton discrepancy^[4].

Disadvantages of lower incisor extraction

1. Upper/lower midline mismatch
2. Need for long-term rigid lingual retainer to prevent lingual collapse.

Upper second premolars and lower first premolars: To resolve large mandibular crowding and induce significant

tipping of mandibular arch. Used when the maxillary arch has lesser crowding. Class I buccal occlusion is achieved using this extraction pattern^[1].

Lower bicuspid only: When upper arch is well aligned or can be well aligned with dental expansion of arches, but lower arch needs significant space to resolve crowding and lingual tipping of mandibular incisors^[5].

Lower second molars: They are extracted to cause significant distalization of the entire lower dental arch using cervical headgear or intra-oral implants^[2].

Advantages of second molar extraction

1. Reduction in quantity and duration of therapy with fixed appliances.
2. Rapid eruption of third molar
3. Aiding in prevention of late incisor crowding
4. Facilitating distal movement of first molar and anterior dentition when over jet has to be corrected
5. Less residual spaces left at the end of orthodontic treatment
6. Reduction of probability of relapse due to greater stability given by the intercuspation between the bicuspid
7. Maintenance of facial aesthetics
8. Avoiding complications of surgical removal of impacted third molars.

9.3 Surgical approach

Involves setback of mandible (bilateral sagittal split osteotomy BSSO) with or without maxillary advancement (Lefort I osteotomy). Bi-jaw surgery is more stable surgical procedure and is used when the sagittal discrepancy is severe^[3].

A study was done by Rabie *et al.*^[6], 2008 to investigate the differences in morphological characteristics of borderline class III patients who had undergone camouflage orthodontic treatment or orthognathic surgery, and to compare the treatment effects between these two modalities. It was concluded from the study that a skeletal Class III patient needs definitively surgical treatment when:

1. ANB angle is greater than -4°
2. Maxillary and Mandibular length ratio equal to or less than 0.83
3. Holdaway angle less than 12°
4. Lower incisor to Mandibular plane angle less than 83° .

Twelve degree for the Holdaway angle can be a guideline in determining the treatment modalities for borderline class III patients, but the preferences of operators and patients are also important. The threshold value was 12° , which meant that if one patient had a Holdaway angle of greater than 12° , he/she would most likely to be successfully treated by orthodontics. This value was much higher than the 3.5° suggested by Kerr *et al.*^[7], 1992. The variable racial composition of the sample probably contributed to this difference.

10. Retention protocol

Upper removable Hawley Retainer and lower lingual fixed retainer is used as a means of retention after correction of skeletal Class III malocclusion. Positioners with hole in upper retainer in the palatal region for proper tongue positioning can also be used^[2].

11. Conclusion

A proper diagnosis and treatment planning is the key factor in determining the success of treatment outcomes in orthodontic patients. Camouflage of skeletal Class III malocclusions when the patient has an acceptable profile and lower anterior crowding need a meticulous effort in order to avoid unesthetic changes of the profile and to have a stable result. Mandibular incisor extraction may be a good choice of treatment for the correction of lower incisor crowding and also to maintain the facial profile. Extraction of two lower first or second premolars provides a viable treatment alternative for skeletal Class III cases to achieve normal overjet and overbite, Class III molar relationship and Class I canine relationship. Extraction of upper second premolar and lower first premolar in Class III cases helps to obtain Class I molar and Class I canine relationship.

The Holdaway angle can be a reliable guide in determining the treatment modality for patients who represent borderline class III surgical cases. The treatment effect of both treatment options (orthodontic camouflage or orthognathic surgery) should emphasize a change in the lower jaw and lower incisors. Both treatment modalities can acquire a satisfactory profile improvement when patient is properly selected.

12. References

1. William R. Proffit. Contemporary Orthodontics. In chapter Combined Surgical and Orthodontic Treatment. Fifth edition. 690-698.
2. OP Kharbanda Diagnosis, Management of Malocclusion, Dentofacial deformities. In chapter. Orthodontic treatment of borderline Class III malocclusion. Second edition. 557-570.
3. Proffit WR, Raymond White, David Sarver. Contemporary treatment of Dentofacial Deformity. In chapter Class III problems. 522- 527.
4. Kumaresan J, Kumar TS, Senthil Kumar. Skeletal class III camouflage by mandibular incisor extraction: A case report. APOS Trends in Orthodontics, 2014; 4(2):40-44.
5. Fang Ning, Yinzhong Duan. Camouflage treatment in adult skeletal Class III cases by extraction of two lower premolars. Korean J Orthod. 2010; 40(5):349-357.
6. A-Bakr M Rabie, Ricky WK. Wong and GU Min. Treatment in Borderline Class III Malocclusion: Orthodontic Camouflage Extraction Versus Orthognathic Surgery. The Open Dentistry Journal, 2008; 2:38-44.
7. Kerr WJ, Miller S, Dawber JE. Class III malocclusion: surgery or orthodontics? Br J Orthod. 1992; 19:21-24.