CASE REPORT

Non-surgical treatment of skeletal class III malocclusion

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SUMMARY

The incidence of skeletal class III malocclusion has a mean of 3% in the Caucasian population, 5% in African-American adolescents and about 14% in the Asian population. In India, the incidence of class III malocclusion is reported to be 3.4%. A patient having class III malocclusion shows findings ranging from edge-to-edge bite to large reverse overjet, with extreme variations of underlying skeletal jaw bases and craniofacial form. This is a case report of a 20-year-old man having skeletal class III malocclusion with concave profile, anterior crossbite and a negative overjet of 3 mm treated non-surgically with extraction of only one lower left first premolar.

BACKGROUND

Skeletal class III malocclusion is one of the most difficult problems for an orthodontist in his practice. When young patients and adolescents are diagnosed early with developing class III tendency, they can be treated easily with growth modification appliances like functional regulator-III, reverse twin block, chin-cup and reverse pull headgear. Patients whose growth potential is completed must be camouflaged by orthodontic tooth movement with fixed appliances or treated surgically. Camouflage treatment is the orthodontic tooth movement relative to their supporting basal bone to compensate

(A)

(B)

(C)

Figure 1 (A) Pretreatment front view of the patient. (B) Pretreatment profile of the patient. (C) Pretreatment intraoral view of the patient.

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Table 1 Pretreatment cephalometric analysis

Parameters	Normal values	Patient values
SNA (°)	82	81
SNB (°)	80	87
ANB (°)	2	-6
AO-BO (mm)	-1	-6
N ⊥ FH-Pt A (mm)	0	-11
N ⊥ FH-Pog (mm)	-4 to 0	-7
NPog-FH (°)	87.5	86
N-A-Pog (°)	0	-11
FMA (°)	25	23
GoGn-SN (°)	32	18
Gonial angle (°)	129	125
Y axis (°)	59.5	60
Jarabak ratio (%)	62–65	75.22
⊥ to NA (°, mm)	22, 4	42, 9
⊥ to NB (°, mm)	25, 4	21, 6
⊥ to SN (°)	102	126
IMPA (°)	90	91
Aesthetic angle (FMIA) (°)	65	63
Soft tissue facial angle (°)	90–92	90
Soft tissue profile angle (°)	161	170
Subnasale to chin (mm)	-4 to -6	-3
Upper lip to S-line (mm)	0	0
Lower lip to S-line (mm)	0	5

ANB, point A Nasion point B, the full form of; AO-BO, Witt's appraisal; FMA, Frankfurt mandibular plane angle; FMIA, Frankfurt mandibular incisor plane angle; IMPA, incisor mandibular plane angle; SNA, Sella nasion point A angle; SNB, Sella nasion point B angle.

for any jaw discrepancy. The camouflage technique to treat skeletal malocclusion was developed as an extraction treatment and introduced into orthodontics in the 1930s and 1940s.¹ The camouflage technique to treat class III malocclusion usually involves proclination of the maxillary incisors and retroclination of the mandibular incisors to correct reverse/negative overjet. The case reported was of an adult skeletal class III with

Figure 2 Pretreatment lateral cephalogram of the patient.

moderate degree of severity. Hence, after thorough analysis, it was decided to treat the patient non-surgically.

CASE PRESENTATION

A 20-year-old man reported with a forwardly placed lower front teeth and difficulty in biting with front teeth. On examination, the patient had a concave profile with deficient midface and mildly prognathic chin. On intraoral examination, the patient was found to have a class III molar and canine relationship on the left side whereas class I molar and canine relationship on the right side with 3 mm negative overjet of the anterior teeth. The maxillary dental midline was coincident with the facial midline whereas there was 3 mm deviation of the mandibular dental midline to the right ([figure 1A–C](#)). Cephalometrically ([table 1](#)), there was a class III jaw relationship due to retrognathic maxilla, orthognathic mandible and a horizontal growth pattern. He was in good health, and his medical history showed no significant abnormality. The patient reported of a distant cousin with similar facial features.

INVESTIGATIONS

Lateral cephalogram ([figure 2](#)) and orthopantomogram were taken and the following analyses were performed:

- ▶ Steiner's skeletal and dental analysis
- ▶ Witt's appraisal
- ▶ McNamara's analysis
- ▶ Down's analysis

(A)

(B)

Figure 3 (A) Midline correction spring. (B) Lower loop archwire for space closure.

- Tweed's analysis
- Jarabak's ratio
- Soft tissue analysis

TREATMENT

Treatment objectives included correction of anterior crossbite, correction of class III molar and canine relationship, correction of midline discrepancy, improvement of facial profile and establishment of a stable occlusion.

Phase I: The upper and lower arches were anchored with transpalatal arch and lingual arch, respectively. Then the patient was referred to the department of oral surgery for extraction of the lower left first premolar. The upper and lower teeth were bonded with MBT 0.022 prescription brackets, and glass ionomer cement blocks were placed on lower first molars to assist bracket positioning on upper anterior teeth. Initial alignment and levelling of upper and lower teeth was achieved using 0.016", 0.018", 16×22" nickel titanium (NiTi) wires and later on with 17×25 NiTi wires.

Phase II: The extraction space on the left side was closed with retraction of lower left canine, first by using laceback and later

on with active tieback over 17×25 stainless steel (SS) archwire. After completion of canine retraction, the midline correction was attempted using Margolis and Nanda's² midline correction spring (figure 3A) made up of 17×25 titanium molybdenum alloy wire, and force was exerted using an elastomeric chain from the lower left first molar to drag the four incisors towards the left side. After correction of midline, even spaces were created bilaterally distal to lower incisors which were closed using teardrop-shaped loop archwire (figure 3B) made up of 19×25 SS. As the incisors were retracted using loop archwire, the negative overjet was also corrected.

Phase III: Final finishing and detailing was done using 0.016 Wilcock SS archwire and with M-shaped settling elastics.

OUTCOME AND FOLLOW-UP

After finishing and detailing, class I canine relationship was achieved on both the sides whereas molar relation remained as it was pretreatment, that is, class I on the right side and class III on the left side. The patient's chief complaint of anterior crossbite was successfully relieved and normal overjet and overbite and a stable occlusion with good intercuspation

Figure 4 (A) Post-treatment front view of the patient. (B) Post-treatment profile of the patient. (C) Post-treatment intraoral view of the patient.

Table 2 Post-treatment cephalometric analysis (figure 5)

Parameters	Normal values	Patient values
SNA (°)	82	83
SNB (°)	80	86
ANB (°)	2	-3
AO-BO (mm)	-1	-2.5
N ⊥ FH-A (mm)	0	-9
N ⊥ FH-Pog (mm)	-4 to 0	-8
NPog-FH (°)	87.5	85
N-A-Pog (°)	0	-8
FMA (°)	25	25
GoGn-SN (°)	32	20
Gonial angle (°)	129	124
Y-axis (°)	59.5	60
Jarabak ratio (%)	62–65	74.54
⊥ to NA angular, linear (°, mm)	22, 4	38, 8.5
⊥ to NB angular, linear (°, mm)	25, 4	11, 2
⊥ to SN (°)	102	122
IMPA (°)	90	80
Aesthetic angle (FMIA) (°)	65	72
Soft tissue facial angle (°)	90–92	89
Soft tissue profile angle (°)	161	163
Subnasale to chin (mm)	-4 to -6	-6
Upper lip to S-line (mm)	0	2
Lower lip to S-line (mm)	0	3

ANB, point A Nasion point B, the full form of; AO-BO, Witt's appraisal; FMA, Frankfurt mandibular plane angle; FMIA, Frankfurt mandibular incisor plane angle; IMPA, incisor mandibular plane angle; SNA, Sella nasion point A angle; SNB, Sella nasion point B angle.

was achieved. The patient's profile was dramatically improved from concave to straight profile with very pleasing aesthetics (figure 4A–C). As it can be seen from table 2 (figure 5), the

Figure 5 Post-treatment lateral cephalogram of the patient.

post-treatment cephalometric readings also confirm the success of the treatment results. Class III malocclusions are self-retaining when corrected with more than normal overbite which is an affirmation for long-term stability and this is how this case was also treated. Thus, no retention protocol was needed for this patient. The total treatment time from starting until removal of orthodontic appliance was 3 years.

DISCUSSION

Management of skeletal class III malocclusion usually involves surgical intervention. Patients are always sceptical about undergoing surgery and want a non-surgical alternative. Our case was that of unilateral class III molar relationship on the left side and lower dental midline deviation towards the right side; hence, only single lower first premolar on the left side was decided to be extracted. An exactly similar case of unilateral class III molar relation and lower midline shift was reported by Weisner³ in which he did unilateral extraction and used single miniscrew implant to correct midline and anterior crossbite. Another case was reported by Guilherme *et al*⁴ in 2010, in which they used asymmetric intermaxillary class III elastics to correct the unilateral class III molar relationship. However, the success of his method depends on patient's compliance in wearing the elastics and it also carries the risk of canting the occlusal plane. Others like Vladimir *et al*⁵ and Zhenhua *et al*⁶ have reported treating skeletal class III cases but in growing adolescents. Very few studies have been reported doing successful correction of asymmetric class III malocclusion in adults. Yamashiro and Takada⁷ in 1995 reported a non-surgical management of adult class III case with extraction of lower first molar with lower midline deviation to the opposite side. Jiuxiang and Yan⁸ have reported treating 13 skeletal class III patients with lower second molar extractions. The result of our case as well as those of others shows that surgery with involved risk, cost and prolonged treatment duration can be avoided and camouflage treatment can be attempted to successfully treat mild to moderate skeletal class III cases.

Learning points

- ▶ Not all skeletal class III cases require surgical intervention.
- ▶ Moderate cases of skeletal class III can be successfully treated with camouflage.
- ▶ Proper application of biomechanics and using the right appliances can make the most difficult challenge an easy task.

Contributors All authors contributed in diagnosing and treating the patient. All authors also contributed in writing the manuscript.

Competing interests None.

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