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A RARE COMBINATION OF SKELETAL CLASS III AND DENTAL CLASS I WITH SEVERE HORIZONTAL GROWTH PATTERN TREATED EFFICIENTLY BY NON-SURGICAL, NON-EXTRACTION LINE OF TREATMENT – A CASE REPORT

Case Report

[1]Kumar Mukesh, [2]Goyal Manish, [3]Kushwah Ashish, [4]Premsagar Shruti
[1,2]Orthodontics and Dentofacial Orthopedics, Teerthanker Mahaveer Dental College and Research Centre, Delhi Road, Moradabad.
[3]Department of Orthodontics and Dentofacial Orthopedics, Institute of Dental Education & Advance Studies,Gwalior.
[4]New Delhi.

Abstract: Treating skeletal Class III malocclusion is often a challenge for an orthodontist and on top of that a severe skeletal Class III with complete dental decompensation requires a precise and thorough treatment planning. The presence of Class I molar type 3 relation, proclined lower anteriors and retroclined upper anteriors projecting anterior cross-bite were sufficient to think in terms of camouflage. Defying the usual trend of surgical line of treatment or single arch extraction, an attempt to treat this case non-surgically and without any extraction was effectively carried out. In spite of severe horizontal growth pattern of the patientnear ideal mid facial proportions and vertical dental relationship were attained.

Keywords:
Skeletal Class III malocclusion, dental decompensation, horizontal growth pattern, anterior cross-bite, Ellis Class II fracture, camouflage.

Conflict of interest: No
Source of support : Nill

INTRODUCTION: Treatment of skeletal class III malocclusion is one of the most difficult problem for an orthodontist in his practice. When young patients and adolescents are diagnose dearly with developing class III tendency, they can be treated easily with growth modulation appliances like functional regulator-III, reverse twin block, chin-cup and reverse pull headgear. Patients whose growth potential is completed must be surgical and camouflaged by orthodontic means. Camouflage treatment is the orthodontic tooth movement relative to their supporting basal bone to compensated egree of severity. Hence, after thorough analysis, it was decided to treat the patient non-surgically.[1, 2]

In case of severe skeletal discrepancy it is wise to consider surgical treatment. However, camouflage treatment with orthodontics alone reported success with remarkable soft tissue changes and profile improvement.[3]

The most common differential skeletal Class III type was mandibular prognathism with a normal maxilla (43%), followed by maxillary retrognathism with a normal mandibular position (19.6%), while the combination of maxillary retrognathism and mandibular prognathism was found to be rare (<5%). Maxillary retrognathia appeared to also have a vertical facial pattern, suggesting a tendency towards vertical growth as a possible compensation mechanism. Those with mandibular prognathia tended to exhibit a horizontal facial growth pattern and typically included more pronounced dento – alveolar compensation, that is, proclination of maxillary incisors and retroclination of mandibular incisors.[4]

Tseng et al5found in his study that six cephalometric measurements were identified as minimum number of discriminators required to obtain the optimum discriminant effectiveness of diagnosis between surgical and nonsurgical treatment of skeletal Class III malocclusions.They are, a) overjet $\leq$ - 4.31mm, b) Wits appraisal $\leq$ -11.18 mm, c) L1-MP angle $\leq$ 80.8°, d) Mx/Mn ratio $\leq$ 65.9%, e) overbite $\leq$ -0.18 and f) Gonial angle $\geq$ 120.8°.

In this case report an adolescent patient with a rare

combination of skeletal class III and dental class I with severe horizontal growth pattern treated efficiently by nonsurgical, non-extraction line of treatmentwas carried out.

History

A 19 years old male patient came to our department with the complaint of overlapping of upper front teeth by lower front teeth. The patient gave no relevant medical or habit history.

DIAGNOSIS : The patient presented with class III malocclusion with its typical facial pattern i.e. an anterior divergent profile and mandibular prognathism (Fig.1 and Fig.2). The patient displayed amesocephalic head type and mesoprosopic facial form with no gross facial asymmetry and decreased lower anterior facial height (58 mm). Patient also presented with normal vertical proportions except lower third (Fig. 2) and shallowmentolabial sulcus.

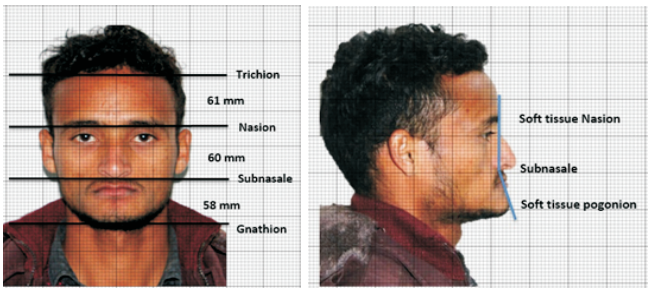

Fig. 1:Facial assessment

Dental examination revealed Angle's Class I molar relation with class III canine and incisor relationship bilaterally (Fig 6). Lower incisors were proclined and spacing were found in between 33-34, 42-43 and 43-44.Further intraoral examination revealed all permanent dentition with complete eruption of teeth along with the characteristic negative overjet (3 mm) and increased overbite (5 mm). Occlusal features revealed U shaped maxillary and mandibular arch. The lower midline was coinciding with respect to the upper midline along with rotation in relation to 25, 34and 35. He had generalised attrition in relation to upper anteriors, caries in relation to 36 and Ellis class II fracture in relation to 34 (Fig 3).

Fig.2:Pre-Treatment extraoral records

Fig.3: Pre-Treatment intraoral records

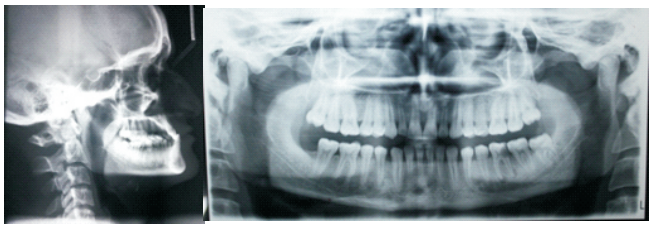

Fig.4: Pre-Treatment radiographs

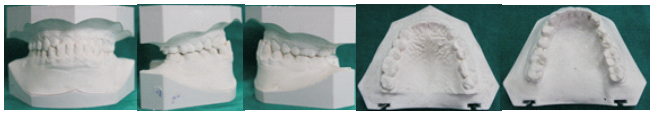

Fig.5Pre-Treatment models

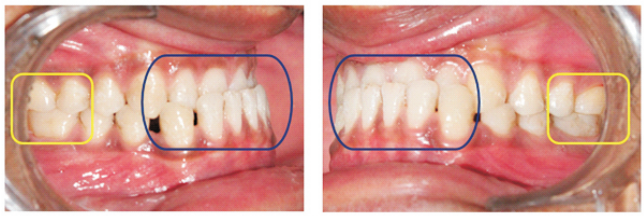

Fig.6: Anterior compensation in skeletal Class III

The smile assessment revealed 7 mm incisal display on smiling with no gingival exposure (Fig.2). The oral hygiene status was average.

Temporomandibular joint (TMJ) assessment revealed no history of pain or clicking on maximum opening and closure. The right and left excursive movements were normal. Maximum mouth opening was 39 mm.

OPG and cephalometric analysis

Panaromic radiographic examination showed that all teeth were presentexcept mandibular third molar in fourth quadrant and revealed optimum bone support for orthodontic mechanotherapy (Fig 4). TMJ space revealed normal size, shape and position of the condylar heads.

On cephalometric assessment the pre-treatment ANB angle was found to be- 5° and MPA was 26° pointing to a Class III skeletal base and a hypodivergent growth pattern (Table 1). As clinical examination already revealed proclined lower incisors hence the 1/NB and IMPA angulations were found to be increased i.e. 28° and 97° respectively.

TABLE 1:Readings of the Patient's Lateral Cephalograms Tracing.

	NORM	PRE TREATMENT	POST TREATMENT
1. Skeletal parameters			
SNA	82°	82°	83°
SNB	80°	87°	86°
ANB	2°	-5°	-3°
MPA	32°	26°	28°
Upper gonial angle	52-55°	44.5°	44.5°
Lower gonial angle	70-75°	57.5°	59°
Jarabak ratio	62-65%	81%	79%
2. Dental parameters			
U1-SN	102±2°	110°	115°
1/NA	22°	27°	32°
1-NA	4.0mm	4.6 mm	6.5 mm
1/NB	25°	28°	24°
1-NB	4.0mm	-0.6 mm	-2 mm
IMPA	90°	97 °	94°
1/1	131°	143°	135°
Wits	-1 mm	-7.8mm	- 5mm
Overjet	2 mm	-3 mm	2 mm
3. Soft tissue parameters			
Naso-labial angle	102±4°	95°	89°
Facial angle	87±3°	107°	105°
Facial convexity	0±2°	-13 °	-10 °

MODEL ANALYSIS : Carey's analysis showed 4 mm space available in mandibular arch and Arch perimeter analysis concluded no tooth material and arch perimeter discrepancy in maxillary arch. Bolton's analysis revealed a mandibular anterior tooth material excess of 1.3 mm while overall mandibular tooth material excess was 0.42 mm(Fig 5).

TREATMENT OBJECTIVES : The treatment objectives for this patient were to correct class III skeletal base and incisor relationship, to maintain class I molar relationship and ideal overjet and overbite along with normal soft tissue profile.

TREATMENT PLAN : Twotreatment plans were decided; first being a surgical treatment option i.e. BSSO setback after decompensation, second was camouflage treatment plan involving the non-extraction treatment approach by labio–lingual / labio-palatalincisal movement to compensate for class III incisor relationship.First treatment option was discarded as the patient sought orthodontic treatment only in form of a conservative approach.

The second treatment approach was chosen as it was more conservative which involved masking the skeletal discrepancy by non-extraction camouflage line of treatment. A maximum or a "Group A" anchorage was essential to maintain a Class I molar relationbilaterally and achieve Class I canine and incisor relationship on both side.

TREATMENT PROGRESS : Root canal treatment was carried out in relation to 36 before commencing bonding of the lower arch. Posterior bite plates were cemented on maxillary posterior teeth bilaterally and full fixed Preadjusted Edgewise appliance MBT of 0.022" (3M UnitekTM Gemini Metal Brackets) prescription was placed to level and align the lower arch (Fig 7) with 0.016" NiTi (3M Unitek Nitinol Super elastic wire) and gradually reached a thicker gauge wire of 0.016" X0.022" SS in the lower arch in a period of two months. Continuous elastomeric chain was used for space closure in lower arch on 0.017" X 0.025" stainless steel arch wire. After 2 months of bonding of lower arch upper arch was bonded (Fig. 8)with 0.016" NiTi (3M Unitek Nitinol Super elastic wire) and gradually reached a thicker gauge wire of 0.016" X 0.022" SS with spee in the upper arch in a period of two months and cinch back 2 mm distally to molar tube bilaterally. Spee was incorporated in the arch wire to facilitate proclination of upper anteriors which aided in the correction of overjet.After 5 months of bonding of lower arch, the posterior biteplates were removed (Fig. 9) and 0.014" NiTi arch wire was placed in relation to upper and lower arch along with settling elastic in short Class II fashion in between upper canine and lower first premolar (Fig. 10).

Fig.7:Mid-Treatment records: posterior bite-plane in maxillary arch and 0.016" NiTi in relation to mandibular arch

Fig.8: Mid-Treatment records: 0.016" NiTi in relation to maxillary arch and 0.016"X 0.022" Stainless steel arch-wire in relation to mandibular arch

Fig.9: Mid-Treatment records:2 mm distally cinch 0.016"X0.022" Stainless steel arch-wire with spee in relation tomaxillary arch and 0.017"X 0.025" Stainless steel arch-wire with continuous elastomeric chain in relation to mandibular arch

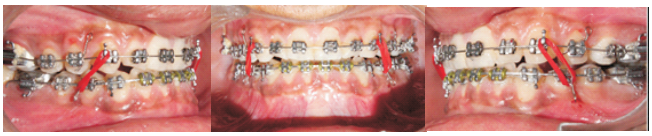

Fig.10: Mid-Treatment records: 0.014" NiTi arch wire in relation to maxillary and mandibular arch along with settling elastic in short Class II fashion

After 8 months of active treatment, class I molar relation was maintained bilaterally, and ideal overjet & overbite were achieved along with a pleasing soft tissue profile (Fig. 11). Following this, debonding was done and post treatment records were taken. The cephalometric measurements are displayed in Table 1. The patient's experience to the ongoingtreatment was satisfactory. Removable Hawley's retainers were placed in both the arches. Immediate composite build-up of the attrited upper anteriors could not be achieved as the patient had to go for his medical test for Indian army. Subsequent to his appointment in Indian army he reported back after one year as a follow-up recall, on this visit esthetic contouring was done in relation to 11, 21 and composite build up in relation to 12 and 22 was carried out efficiently (Fig. 18).

RESULT:

The post treatment facial photographs showed marked reduction of anterior divergence and concave profile (Fig. 11). His facial appearance and smile were significantly improved (Fig. 11). Mandibular anterior teeth protrusionwas corrected, and a Class I molar relationship was maintained on both sides and Class I canine and incisor relationship with ideal over jet and overbitewasachieved bilaterally (Fig 12). The upper incisors to NA plane increased from 27° to 32° and the lower incisors to NB plane decreased from 28° to 24° (Table 1, Fig. 13).IMPA has reduced from 97° to 94°. The labio-palatal / labio–lingual movement of the maxillary and mandibular anteriors contributed to correction of the dental overjet and overbite.

Fig.11: Post-Treatment extraoral records

Fig.12: Post-Treatment intraoral records

Fig.13: Post-Treatment radiographs

Fig.14: Post -Treatment models

Cephalometric superimposition illustrates and indicates a significant change in incisal relationship bylabio–lingual / labio-palatal incisal movement to compensate for class III incisor relationship. (Fig 15)

Fig 15. Superimposition: Sella - Nasion at Sella a) black line – Pre-treatment tracing b) Red line – Post-treatment tracing

One year follow up records (Fig. 16& Fig. 17) showed that changes achieved by fixed orthodontic therapy were stable.Composite build-up of attrited teeth in relation to 12 and 22 was done to enhance the aesthetics (Fig. 18).

Fig 16: One year follow up extraoral records

Fig 17: One year follow upintraoral records

Fig 18: Aesthetic changes before (A) and after (B) composite build up

PAR SCORING ASSESSMENT: Peer assessment rating (PAR) index was assessed under heading of anterior segments (upper and lower), buccal occlusion, overjet, overbite and centre line for pre-treatment and post-treatment intraoral records. Assessment of pre-treatment of intraoral records shows that he had 5 PAR scoring points which reduced up to zero (0) PAR scoring points in post-treatment intraoral records. So change in PAR score was 5 points and percentage change in PAR score was 100% which shows "greatly improved" orthodontic treatment results (Table 2).

CASE NUMBER		Pre-Treatment				Date April 2017										UN-WEIGHTED TOTAL	WEIGHTED TOTAL
PAR COMPONENTS	RIGHT														LEFT		
Upper anterior segments	3-2	0	2-1	0	1-1	0	1-2	0	2-3	0						0	X1
Lower anterior segments	3-2	0	2-1	0	1-1	0	1-2	0	2-3	0						0	X1
Buccal occlusion	Antero-posterior				Right	0	Left	0								0	X1
	Transverse				Right	0	Left	0								0	X1
	Vertical				Right	0	Left	0								0	X1
Overjet	Positive				Negative			4								4	X6
Overbite	Overbite		1		Openbite											1	X2
Centre line			0													0	X4
															TOTAL	5	

CASE NUMBER		Post-Treatment				Date Dec 2017										UN-WEIGHTED TOTAL	WEIGHTED TOTAL
PAR COMPONENTS	RIGHT														LEFT		
Upper anterior segments	3-2	0	2-1	0	1-1	0	1-2	0	2-3	0						0	X1
Lower anterior segments	3-2	0	2-1	0	1-1	0	1-2	0	2-3	0						0	X1
Buccal occlusion	Antero-posterior				Right	0	Left	0								0	X1
	Transverse				Right	0	Left	0								0	X1
	Vertical				Right	0	Left	0								0	X1
Overjet	Positive		0		Negative											0	X6
Overbite	Overbite		0		Openbite											0	X2
Centre line			0													0	X4
															TOTAL	0	

PAR SCORE		IMPROVEMENT	
Change in PAR score	5	Greatly improved	✓
% change in PAR score	100	Improved	
		Worse or no different	

TABLE 2. PAR scoring assessment of outcome

DISCUSSION : Malocclusions can be treated in several ways according to the characteristics associated with the problem, such as the anteroposterior discrepancy, age and complications associated with treatment.[6]

Management of skeletal class III malocclusion usually involves surgical intervention. Patients are always sceptical about undergoing surgery and want a non-surgical alternative.

Beggs /tip edge technique7 favours incorporation of excess labial crown torque when compared to other pre-adjusted bracket prescriptions, which favours correction of anterior cross-bite[8].

Certain modifications in MBT prescriptions have been suggested to aid class III cases. Placement of contra-lateral canine brackets on the lower canines9to encourage distal crown tip, this distal crown tipping in turn helps in distalmovement of lower anteriors to camouflage class III reducing anchorage strain.

Burns et al[10] identified limits for incisal movement to compensate for classIII. Accordingly upper anteriors may be proclined up to 120° to sella -nasion line and lower anteriors may be retroclined up to 80° to mandibular plane in most cases without deleterious effects to the periodontium(Fig. 19).However, proper diagnosis and realistic treatment objectives are necessary to prevent undesirable sequelae. In this case,pre-treatment values for upper anteriors and lower anteriors were 110° and 97° respectively which changed to 115° and 94° after treatment to correct anterior cross-bite.

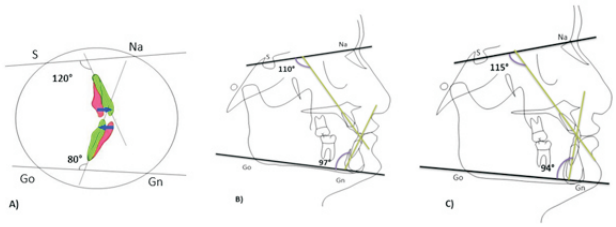

Fig 19: Limits for incisal movement to compensate for class III A) according to Burns et al B) pre-treatment values C) post-treatment values

The Class III treatment overcorrection helpscontrol the disproportional growth betweenthe maxilla and the mandible. The increase ofthe overjet with labial crown torque of theupper incisors reduce the relapse; therefore, the overcorrection must always be achieved during thepubertal growth, a period when the mandibulargrowth is greater than the maxillary one.[11]

The occlusal intercuspation allowed the maxillato follow the

mandibular growth. Thus, the dental corrections presented skeletal benefits, contributing to the occlusion stability. Therefore, the early treatment provided a good occlusal relation for the normal maxillary growth, promoting long-term post treatment stability.[12]

CONCLUSION: There are reports on treatment of a Class III patient with extraction of mandibular first premolar and lower incisor. However, in some caseslabio-lingual angulation of upper and lower incisors may help clinician to camouflage the skeletal Class III condition on the basis of which this treatment approach was planned and accordingly, the proposed treatment objectives to obtain a stable dental articulation and good aesthetics were achieved.

Declaration of patient consent

The author certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity can't be guaranteed.

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CORRESPONDING AUTHOR:

Dr. Mukesh Kumar

Vasant Kunj, New Delhi-110005

E-mail: drmukeshortho@yahoo.co.in