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Orthodontic Management of A Class I Malocclusion with Severe Crowding: A Case Report

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Abstract
This case report describes the successful orthodontic management of a 16-year-old Malay female patient presenting with a Class III incisor relationship on a Class I skeletal base with severe crowding in both maxillary and mandibular arches. Treatment involved the extraction of all first premolars, followed by fixed orthodontic therapy using a pre-adjusted edgewise appliance (MBT prescription). The objectives were to correct anterior and posterior crossbites, achieve an optimal occlusion, and improve facial aesthetics. The treatment duration was 17 months, culminating in a well-aligned dentition with stable occlusion. Post-treatment assessment revealed significant cephalometric and occlusal improvements with no evidence of root resorption or enamel decalcification.

INTRODUCTION

In adolescents, orthodontic treatment is influenced by ongoing craniofacial growth, whereas in adults, treatment is limited to tooth movement alone [1]. Additionally, treatment planning in adults is often dictated by symptoms reported by the patient, whereas in adolescents, it is based more on clinical signs observed by practitioners or parents [2]. A significant factor influencing treatment motivation among adolescents is esthetics, leading to heightened expectations regarding treatment outcomes, reduced adaptability to appliances, and a critical evaluation of final results [3]. Fixed appliance therapy plays a crucial role in enhancing facial esthetics while simultaneously addressing dental irregularities [4]. The growing awareness of orthodontic treatment has contributed to an increasing number of patients seeking solutions for even minor malalignments to achieve an improved smile and facial profile [5].

Class I malocclusion is the most prevalent form of malocclusion, followed by Class II and Class III [6,7]. The demand for orthodontic treatment, particularly among adolescents, has risen due to increased emphasis on facial esthetics and the desire for efficient treatment outcomes with minimal discomfort [8]. Various treatment modalities are available for managing Class I malocclusions, depending on factors such as anteroposterior discrepancies, age, and patient compliance [9]. One of the most debated aspects of

orthodontic treatment is the indication for premolar extractions, which remains a topic of discussion among practitioners [10]. In cases of severe crowding, extraction-based treatment may provide the necessary space to achieve ideal dental alignment and occlusal balance [11].

This case report presents the orthodontic management of a Class I malocclusion with severe crowding in an adolescent female patient with significantly proclined maxillary and mandibular anterior teeth. The treatment plan involved the extraction of four premolars, followed by fixed appliance therapy using the MBT mechanotherapy system. The extraction protocol employed in this case illustrates how strategic space management and controlled retraction can transform a crowded, unaesthetic dentition into an ideal functional and esthetic smile through conventional orthodontic treatment [12,13].

Case Report

A 16-year-old female of Malay descent, presented with a chief complaint of irregular front teeth and dissatisfaction with her smile. Her medical history was unremarkable, and a comprehensive clinical and radiographic evaluation was conducted to formulate an appropriate treatment plan.

Pre-Treatment Assessment

Extra-oral examination revealed a mild Class III skeletal pattern with an orthognathic facial profile, an average maxillomandibular plane angle, and incompetent lips. Intra-orally, she exhibited severe maxillary arch crowding of 16 mm, with a lack of space for the alignment of buccally displaced maxillary canines. The constricted upper arch resulted in an anterior crossbite of the maxillary lateral incisors and a posterior crossbite involving the maxillary left first and second premolars. The mandibular arch was well-developed with a U-shaped configuration, though crowding of 10 mm was noted in the anterior segment along with a 2 mm curve of Spee. The occlusal analysis indicated a Class III incisor relationship with an overjet ranging from 0 to -0.5 mm and an overbite of 0 mm. The upper dental midline was coincident with the facial midline, whereas the lower midline was shifted 1.5 mm to the left. The buccal segment relationship was half-unit Class II on the left and Class I on the right. Crossbites were identified between tooth 11 and 41, 12 and 43, 22 and 33, 24 and 34, and 25 and 35, while maxillary canines were buccally blocked out, and lateral incisors were Palatally displaced.

Fig 1: Pre Treatment Extra Oral Photographs

Fig 2: Pre Treatment Intra Oral Photographs

Radiographic analysis, including a panoramic radiograph (DPT) and lateral cephalogram, confirmed the presence of all teeth with no missing or poor prognosis teeth.

Variable	Pretreatment	Normal
SNA	75^0	$82^0 \pm 3$
SNB	73.5^0	$79^0 \pm 3$
Wits appraisal	1.5^0	$3^0 \pm 1$
SN to maxillary plane	12^0	$8^0 \pm 3$
Wits appraisal	+4mm	0 mm
Upper incisors to maxillary plane angle	115^0	$108^0 \pm 5$
lower incisors to maxillary plane angle	99.5^0	$92^0 \pm 5$
Interincisal angle	115^0	$133^0 \pm 10$
Maxillary mandibular plane angle	31^0	$27^0 \pm 5$
Upper anterior face height	49mm	
Lower anterior face height	58mm	
Face height ratio	54%	55%
Lower incisors to A-pog line	7mm	0-2 mm
Lower lip to Ricketts E Plane	+3mm	-2 mm

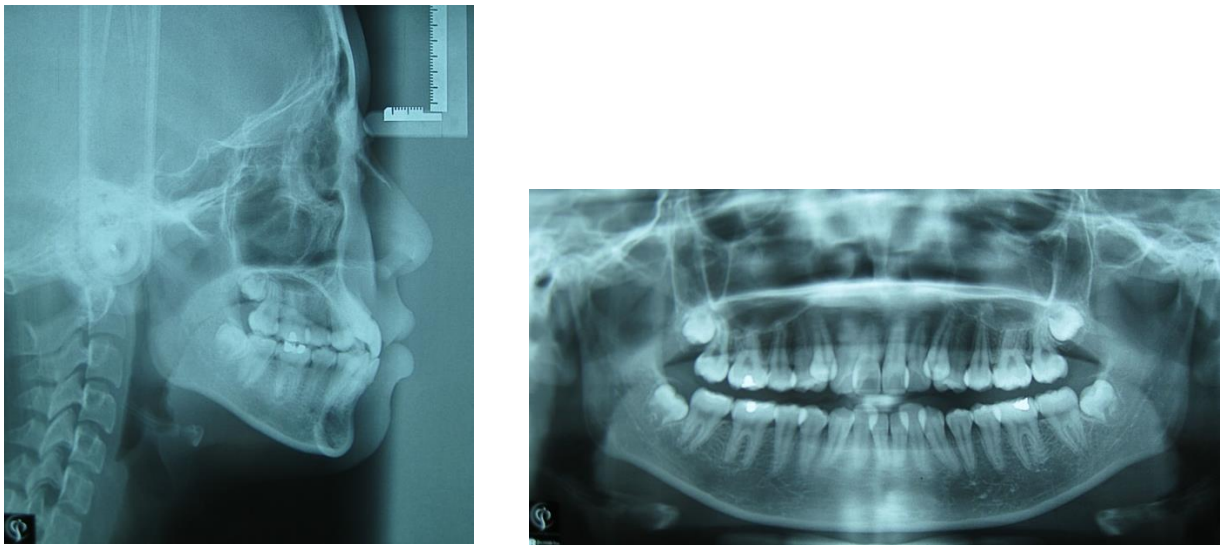

Fig 3: Pre Treatment Radiograph

Cephalometric analysis showed a mild Class III skeletal pattern with an ANB angle of 1.5° and a Wits appraisal of +4 mm. The mandibular-maxillary plane angle was within normal limits at 31°, and the face height ratio was 54%. The upper and lower incisors displayed minimal proclination, with an interincisal angle of 115°. Soft tissue evaluation indicated a minimally protrusive lower lip in relation to Ricketts' E-plane.

Diagnostic Summary

The patient was diagnosed with a mild Class III skeletal pattern accompanied by severe crowding of both the maxillary and mandibular anterior teeth. She exhibited a straight facial profile with incompetent lips and a reduced overjet and overbite. Additionally, crossbites involving the upper lateral incisors and posterior maxillary left bicuspids were noted. The dental health component of the Index of Orthodontic Treatment Need (IOTN) was graded as 4c, while the aesthetic component was rated at 8.

Problem List

- Severe crowding of upper and lower anterior teeth.
- Anterior crossbite of upper lateral incisors with lower canines
- Posterior crossbite of upper left first and second premolars with lower bicuspids.
- Reduced overjet and overbite.
- Lower dental midline shifted to the left.
- Need for improvement in facial profile and lip competency.

Aims and Objectives of Treatment

The primary goals of treatment included maintaining good oral hygiene, correcting the severe anterior crowding, and resolving the anterior and posterior crossbites. Additionally, achieving ideal overjet, overbite, and Class I molar and canine relationships was prioritized. Midline correction and the establishment of an aesthetically pleasing profile with a stable occlusion were also objectives. Retention strategies were planned to ensure long-term stability.

Treatment Plan

The proposed treatment plan involved the extraction of all first premolars to create adequate space for alignment. A pre-adjusted edgewise appliance with an MBT prescription (0.022" x 0.028" slot) was selected for orthodontic mechanotherapy. Anchorage control was reinforced using lacebacks and cinchbacks to prevent unwanted space loss. Minor and major adjunctive surgical interventions were deemed unnecessary. Professional oral hygiene maintenance and periodontal therapy were incorporated as part of the overall management strategy.Retention was planned with both upper and lower fixed retainers, complemented by removable retainers to be worn full-time for one year, followed by nighttime wear for an additional six months. The prognosis for stability was deemed favorable due to the patient's well-balanced facial features, interdigitating occlusion, and competent lips post-treatment.

TREATMENT PROGRESS

- Start of active treatment: June 2011
- Age at start of active treatment: 16 years 2 months
- End of active treatment: September 2012
- Age at end of active treatment: 17 years 5 months
- End of retention: Ongoing

KEY STAGES IN TREATMENT PROGRESS

1. 11/06/2011: Upper arch bonded with 0.022 slot MBT brackets & 0.012" nitinol wires fixed. Lace backs fixed on buccally placed canines.
2. 24/08/2011: Lower arch bonding done and 0.012 nitinol wires fixed.
3. 26/10/2011: Continuous archwires placed in the upper arch engaging the buccally placed canines.
4. 20/01/2012: Upper and lower 0.016" x 0.022" nitinol fixed and class II elastics advised on the left side only.
5. 01/06/2012: Upper and lower 0.019" x 0.025" nitinol wires fixed.
6. 10/08/2012: DPT and Lateral cephalograms were taken to check the root parallelism and inclination of upper anteriors to the facial axis.
7. 27/09/2012: Upper and lower debonding done and fixed retainers were bonded. Impressions were taken for the fabrication of upper and lower vaccum formed retainers for the delivery next day.

Fig 4: Mid-treatmet Intra Oral Photographs

SECTION 3. POST-TREATMENT ASSESSMENT

OCCLUSAL FEATURES

Incisor relationship: Class I

Overjet (mm): 2 mm

Overbite: 2 mm

Centrelines: coinciding, lower midline slightly shifted to left (0.5 mm)

Left buccal segment relationship: Class I (mild open bite in 25 area)

Right buccal segment relationship: Class I

Crossbites: Nil

Displacements: None

Fig 5: Post Treatment Intra Oral Photographs

Fig 6: Post Treatment Extra Oral Photographs

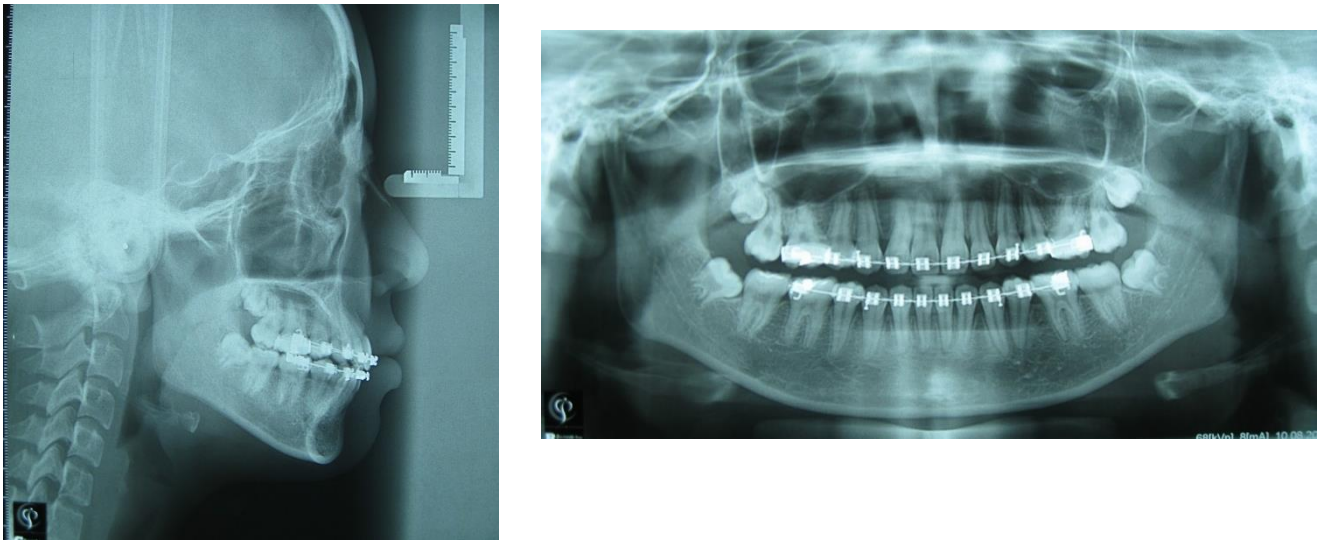

Fig 7: Post Treatment Radiograph

INTERPRETATION OF CEPHALOMETRIC CHANGES

The Angle SNA and SNB showed minimal changes. Upper incisor angulations were reduced due to retraction of upper anterior teeth. Lower incisor to mandibular plane angle reduced considerably with a difference of 7.5°

Inter incisal angle were normal compared to pretreatment values of 115° Face height ratio remained unchanged.

Soft tissue values were better compared to pre-treatment values of lower lip to Ricketts "E" plane.

Lower incisor to A- Pog line values indicates there was significant amount retraction of lower anteriors.

Variable	Pretreatment	Post treatment	Changes
SNA	75^0	76^0	1^0
SNB	73.5^0	74^0	0.5^0
Wits appraisal	1.5^0	2^0	0.5^0
SN to maxillary plane	12^0	13.5^0	1.5^0
Wits appraisal	+4mm	+2 mm	2 mm
Upper incisors to maxillary plane angle	115^0	114^0	-1^0
lower incisors to maxillary plane angle	99.5^0	92^0	-7.5^0
Interincisal angle	115^0	128^0	$+13^0$
Maxillary mandibular plane angle	31^0	27^0	-4^0
Upper anterior face height	49mm	48 mm	-1 mm
Lower anterior face height	58mm	59 mm	+1 mm
Face height ratio	54%	55%	1%

Lower incisors to A-pog line	7mm	4 mm	-3 mm
Lower lip to Ricketts E Plane	+3mm	+1.5 mm	-1.5 mm

CRITICAL APPRAISAL

Patient was highly motivated and throughout the treatment maintained high level of oral care, was very regular for appointments.

Duration of treatment was for 17 months. Aesthetically pleasing profile with good interdigitating occlusion was achieved at the end of treatment. There was a mild open bite present in the tooth 25 area, probably will settle over a period of time.

Patient was fitted with fixed retainers in upper and lower arches and also vacuum moulded retainers were issued at the end of active orthodontic treatment.

Since the upper lateral incisors were palatally blocked it would have been a good idea to invert the brackets to get more labial root torque

Iatrogenic:

No changes in root length were observed post treatment suggesting root resorption.

No signs of enamel decalcification were evident on the teeth after treatment

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