Treatment and Long-term Follow up of Twins with Skeletal Class III Malocclusions

Fraternal twins, one male and one female, presented for orthodontic treatment with a chief complaint of complete anterior crossbite extending into the right posterior segments and crowding.



The frontal views indicated the female's chin was deviated to the left side, while the male's chin was deviated to the right side.



The lateral facial views revealed that both patients exhibited a protrusive lower jaw. The female had a moderate lower jaw protrusion, but the male had a markedly prognathic mandible.



9y4m

The male's chin was deviated to the right, and his midface was deficient, as evidenced by a concave infraorbital and malar regions.

The principle diagnosis was mandibular protrusion associated with maxillary retrusion, a severe Class III malocclusion. Both the panoramic films and intra-oral photographs indicated many caries lesions and residual roots of deciduous teeth, indicating a long history of poor oral hygiene. There was crowding in both arches and the maxillary canines had insufficient space for eruption.

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The parents and patient were informed that the prognathic mandible and deficient maxilla required an additional phase of orthodontic treatment combined with orthognathic surgery. Space creation in the upper arch was indicated to assit eruption of the upper canines. The lower E space was required to facilitate eruption of lower premolars.



■ 9y5m - 9y10m - 10y3m - 10y5m

Early treatment was planned to gain spaces for upper canines, and maintain the lower E space by placing a lingual holding arch. The correction of anterior crossbite was postponed until the second stage of orthodontic treatment combined with orthognathic surgery. The upper dentition was well aligned, and spaces were opened for the upper canines to erupt.



10y7m

The patient's mandible had become more protrusive. The parents fully understood the current early treatment objective was merely to align the dentition, not to correct the intermaxillary discrepancy.

All the permanent teeth in the buccal segments had erupted except for the maxillary canines.



■ 11y2m - 11y11m - 12y2m - 12y11m

After 1 year and 9 months of orthodontic treatment, both arches were well aligned.



12y11m

Although both dental arches were well aligned, the severe Class III malocclusion persisted with a large reverse overjet. The extra-oral photographs demonstrated a severe concave appearance due to deficient infra orbital and malar regions, in addition to a very prognathic mandible.



14y11m

The 2-year follow up examination indicated an increasing degree of mandibular prognathism and Class III malocclusion.



■ 18y6m

The patient still had severe Class III skeletal malocclusion with a retrognathic maxilla (*midface deficiency*) and a prognathic mandible. All four third molars were present, but the two upper second molars were extruded, because they had no antagonists due to a lack of eruption of the lower third molars.



■ 18y9m

The two extruded upper second molars and two lower third molars were extracted.

The second stage of orthodontic treatment was delayed until full eruption of two upper third molars. Orthodontic alignment of both arches will be followed by orthognathic surgical correction of the severe Class III skeletal problem.



9y4m

12y11m

14y10m



■ 9y4m - 12y11m - 14y10m - 18y9m

This longitudinal series of photographs was collected over 9 years and 5 months of recall follow up.

Early nonextraction orthodontic treatment was performed with the aim to align the dentition in each arch. The retrognathic maxilla and prognathic mandible were diagnosed in the initial examination, and the skeletal Class III pattern continued throughout the active growth period.

What we can learn from this case:

- (1) These different sex siblings are obviously fraternal, not identical twins. However, they are an interesting comparison of opposite sex siblings that are the same age at any point in time. Throughout his development, the male twin was more severely affected by Class III malocclusion, both from a dental and skeletal perspective.
- (2) In terms of severe skeletal Class III malocclusions, these twins are a rare situation where a definitive diagnosis can be formed at a young age. Space management should be the primary treatment goal in early phase of treatment. Any early orthopedic intervention or dental compensations will be counterproductive. Second stage orthodontic treatment, after completion of growth, combined with orthognathic surgery was indicated in the initial treatment plan.
- (3) Severe caries is a common phenomenon in young patients in Taiwan. In this case, many cavities and residual roots of deciduous teeth were found in the initial examination. Early orthodontic management of the crowding was achieved and the arches were leveled. Despite the Damon system's MEAW effect on the dental correction of Class III malocclusion, the severe skeletal problem will persist. Furthermore, the dentition will relapse to an increasingly Class III relationship as growth continues.
- (4) Early treatment involving orthopedic appliances, such as chin cup or face mask, are in the author' s experience counterproductive. There is no clinical evidence or reliable literature that supports successful early correction of severe, skeletal Class III malocclusions.
- (5) Due to the recent advancement of temporary anchorage devices (TADs),¹ many treatment methods have been proposed to provide early intervention in severe Class III cases. Many patients were treated early with mini-plates.^{2, 3} Some studies reported very good treatment results, but only temporarily, because skeletal Class III malocclusions tend to relapse both dentally and skeletally, during the adolescent years. Although TADs may be a very effective clinical adjunct for severe Class III treatment, proper diagnosis remains the critical aspect of successful treatment. In general, treatment of sever Class III malocclusion is not predictable until facial growth is complete, or nearly so.
- (6) Early extraction treatment in severe Class III cases is contraindicated unless extreme crowding and/ or arch irregularity are involved. Treatment options are more predictable after completion of active growth. In the present patient, the upper anterior teeth seemed very flared when the patient was about 10 years of age. However, after the patient turned 18, the proclined upper incisors no longer appeared as severe as before. In conclusion, do not conduct early extraction treatment to correct proclination of upper incisors.
- (7) In this case, the extruded upper second molars and lower impacted third molars were removed when the patient was over 18 years of age. The pre-surgical orthodontic treatment didn't begin until later, when mandibular growth was expected to be complete, or nearly so.



9y4m

The female twin also presented with a Class III malocclusion, but it was less severe both dentally and skeletally compared with her twin brother. In addition, she had a more orthognathic profile, but there was Insufficient space for the upper canines to erupt. The parents were informed early treatment was necessary for space management, but the correction of the skeletal problem would be delayed until mandibular growth was complete.

The patient's chin was deviated to the left, coinciding with the deviated dental midline. The premature loss of deciduous right upper canine was noted, as were many badly decayed primary teeth along with multiple residual roots.



■ 9y5m - 9y10m - 10y1m - 10y5m

No early orthopedic treatment was attempted. A fixed appliance (*Damon II brackets, Ormco*) was placed on the upper arch to create enough spaces to facilitate eruption of the permanent canines.



11y2m

The right upper canine had partially erupted, but the left one had not penetrated the mucosa. Both the lower dental midline and the skeletal chin point were deviated to the left side.



The skeletal chin point was further deviated to the left, coinciding with the deviated lower dental midline.



12y4m

The first stage orthodontic treatment successfully aligned the dentition, but there was no attempt to correct the Class III malocclusion at this time.



13y4m

After 1 year of orthodontic alignment, the patient still exhibited signs of severe Class III malocclusion. Consistent with the objective for only dental alignment, the lower dental midline, as well as the skeletal chin point, were deviated to the left. The lateral profile revealed a slightly prognathic mandible.



■ 14y11m

The Class III malocclusion continued to progress, but the patient's profile was almost straight.



15y10m

The right side Class III relationship was more severe than on the left. Both the chin point and dental midline were deviated to the left. The patient maintained a straight profile, but the overbite had decreased.



17y4m

The frontal views showed that both the chin point, and the lower dentition are more deviated to the left compared to the upper dental midline. The slight overbite had progressed to an open bite. Fortunately, the patient has still maintained an orthognathic facial profile.

Moderate crowding was found in the left lower second premolar region, with buccoversion of the second premolar, i. e. it was blocked out.

The patient planned to study abroad in 18 months. The initial treatment plan was to correct the Class III open bite by retracting the whole lower dentition with buccal shelf mini-screws, but considering the lower arch crowding, the treatment time was expected to to be longer than 18 months. In order to shorten the treatment time and correct the deviated dental midline, the right lower first premolar and left lower second premolar were extracted. Prior to lower arch extraction, one should confirm the presence of the lower third molars, because they will be the future antagonists for the upper second molarsupper second molars.

Damon Q Torque Options						
	Maxillary			Mandibular		
	1	2	3	1	2	3
Super	+22°	+13°	+]]°	-	-	+13°
STD	+15°	+6°	+7°	-3°	-3°	+7°
Low	+2°	-5°	-9°	-11°	-11°	O°

Various torque options of the Damon Q brackets.



17y6m

A full fixed appliance (*Damon Q brackets, Ormco*) was installed. The low torque lower incisor bracket (-110) were placed upside down to express a high torque value of +11°. Also, high torque brackets were bonded on the lower canines to prevent lingual tipping while the lower anteriors were retracted. Low torque brackets were used on the upper arch to avoid flaring of upper incisors while using the Class III elastics.



18y9m

After 1 year and 5 months of active treatment, the Class I canine occlusion was achieved and the orthognathic profile was maintained. The various torque options of the Damon system were used to keep upper incisors and lower incisors upright throughout the treatment.

Since only two lower premolars were removed and nonextraction therapy was performed on the upper arch, the final occlusion remained in a Class III molar relationship. The open bite was resolved. For single arch extraction treatment in Class III cases, one should always confirm the presence of the lower third molars, because they will serve as antagonists for the upper second molars in the final occlusion.



18y10m

To prevent excessive extrusion of the upper second molars before eruption of the lower third molars, while the patient was studying abroad, the extruded upper second molars were removed. The patient was finished with Class I canine, Class III molar relationships, an esthetic smile, and an orthognathic profile. Treatment was completed in time, so she could leave for her studies abroad.





9y4m

13y4m

17y4m

18y9m



What we can learn from this case:

- (1) When considering single arch extraction treatment, one should always evaluate whether a future antagonist tooth is present or not. In this case, if the lower third molars are present, extraction of lower premolars is an appropriate treatment option. If not, then upper second premolars should be extracted also. The MEAW effect and various torque options of the Damon system have simplified Class III treatment.⁴ The low torque brackets on upper incisors can effectively prevent the side effects of Class III elastics; furthermore, the upside down low torque brackets can be used as super high torque brackets on lower incisors to avoid lingual tipping when the premolar extraction spaces are closed.
- (2) The twins both exhibited characteristics of severe Class III malocclusion in the initial consultation, although the male appeared to have a more severe prognathic profile. The female appeared to have a better prognosis, despite her severe Class III malocclusion. Both the patients and parents were informed about the possibility of future orthognathic surgery. Fortunately the female maintained an orthognathic profile after turning 17. Therefore, no surgical correction was indicated for her.

- (3) Optimal correction of severe Class III malocclusions is very difficult with traditional orthodontic treatment. Passive self-ligating brackets, combined with the Damon Q system's MEAW effect, renders Class III early treatment possible, but late mandibular growth may be a relapse problem. Early treatment is only suggested for patients and parents who prefer that option, but fully understand the probability of relapse and retreatment. In this case, early treatment was only suitable for the less severe female, but it was contraindicated for the male.
- (4) If there was no time constraint for treatment of the female, the author would have recommended removing the lower third molars and retracting the whole lower dentition with buccal shelf bone screws. As such, the uncertainty of the third molar occlusion could be eliminated. Given the treatment performed, the eruption and position of the lower and upper third molars will be closely monitored. If there are eruption problems, further orthodontic treatment may be indicated.

References

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