Timing of Class III Treatment with Unfavorable Growth Pattern

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When treating young patients with Class III malocclusion, factors such as timing and an accurate prediction of growth of the mandible are very important. Even though early interceptive treatment of Class III might often be successful, clinicians should be careful to not initiate early treatment with premolar extractions which will compromise the success of orthognathic surgery later due to mandibular prognathism. This case report presents an adolescent female patient who developed a severe Class III skeletal discrepancy during growth and was treated with surgery after her growth had finished.

Key words: Class III malocclusion, surgery.

INTRODUCTION

Timing of orthodontic treatment has long been a controversial issue, especially for young adolescents with developing skeletal Class III. If patients have Class III malocclusion such as dental anterior crossbite with a favorable growth pattern, treatment should be started as early as possible so that any factors that might inhibit growth and development of the maxilla can be removed. However, if patients have an unfavorable growth pattern, clinicians usually avoid early treatment because of long-term failure due to skeletal discrepancy in the growth of maxilla and mandible.[1-3]

Many clinicians believe that a developing mandibular prognathism with unfavorable growth pattern will reach a predetermined genetic potential that cannot be altered by phase I orthopedic treatment.[4] Therefore, if unfavorable growth is expected, orthodontic treatment should be delayed until growth is complete because orthognathic surgery combined with orthodontic treatment might be required in the future.

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In the present case, the patient was referred to relieve maxillary and mandibular crowding. If her maxillary second and mandibular first premolars were extracted to establish Class I molar relationships and to relieve crowding, it would not have been possible to bring the case to a successful conclusion due to an unfavorable skeletal Class III growth pattern. Furthermore, premolar extraction would have compromised her chance to have orthognathic surgery.

CASE REPORT

Diagnosis and Treatment Planning

A 8-year and 5-month-old female patient presented with a chief complaint of severe crowding (Figure 1 and Table). She had a convex profile. A review of her medical history showed nothing remarkable. During a temporomandibular joint evaluation, she did not show muscle or joint pain or other symptoms typically associated with temporomandibular disease.

A clinical examination showed that severe crowding was developing on the maxillary and mandibular arch. The patient had Class III molar relationships on both sides. She had a 1 mm overjet and 5% overbite. When her mandible was guided in a centric relation, no functional shift was detected, and her dental midline was coincident with her facial midline. When she swallowed, she exhibited a tongue thrusting habit.

A panoramic radiograph showed all permanent teeth were present. Lateral cephalometric analysis revealed a skeletal Class III tendency (Wits: -1.8 mm) with hyperdivergent growth pattern (SN-MP: 42.8°). The maxillary and mandibular incisors were proclined (U1 to SN: 108.6°, IMPA: 94.8°) (Figure 2 and Table).

To resolve her crowding and deepen her bite, her maxillary second and mandibular first premolars could have been extracted, but since she was still growing and her mother showed skeletal Class III pattern, we decided to observe her growth rather than start her orthodontic treatment by extracting premolars. The patient and her mother were informed about the surgical possibility combined with orthodontic treatment after her growth is complete.

Treatment Progress

To prevent the tongue thrust habit, the patient was instructed to push her tongue against her hard palate and to clench posterior teeth while swallowing. Because the mother was concerned about her daughter's crowding, upper and lower non-removable W-arches were banded to the permanent first molars to expand both arches. Even though a facemask was recommended for use during phase I treatment, both the mother and the patient elected to not use it. Ten months later, the anterior crowding on both arches were relieved (Figures 3 and 4). The W-arch appliances were removed and removable retainers were delivered. After that, she was seen every 6 months to monitor her growth.

Pre-surgical orthodontic treatment was initiated when she was 16-years and 9-months-old after serial lateral cephalometric radiographs, hand-wrist radiographs and vertical height assessment indicated completion of her growth.[5,6] Before commencing with her orthodontic treatment, she had her mandibular third molars extracted. At this point, it was also noticed that her maxillary right second molar was erupting very slowly (Figures 5 and 6).

Pre-adjusted appliances with .018 brackets (Miniature Twin, 3M Unitek Corp, Monrovia, Calif) were bonded for leveling and alignment. Her maxillary and mandibular arches were leveled with continuous arch wires, starting with .014-in nickel-titanium and progressing to .016 × .022-in nickel-titanium. After her teeth had been straightened, .017 × .025-in stainless steel archwires were engaged as final archwires (Figures 7 and 8). Based on a consultation with an oral surgeon, one-jaw surgery, intraoral vertical ramus osteotomy (IVRO), was performed to set back the distal segments approximately 8 mm bilaterally (Figure 9). Post-surgical orthodontic treatment took about 6 months and used up-and-down elastics (Figure 10). A fixed retainer was placed canine to canine in the mandible and on the lateral incisor to lateral incisor in the maxilla after debonding. Wraparound removable retainers were also delivered to secure the stability of both arches (Figure 11).

Table. Cephalometric measurements

Measurement	Norm	Pre-treatment 8y5m	Progress 9y8m	Progress 16y9m	Post-treatment 18y10m
SNA (°)	82.0	78.7	78.4	79.0	78.5
SNB (°)	80.0	75.9	75.9	78.8	74.4
ANB (°)	2.0	2.8	2.5	0.2	4.1
Wits (mm)	1.1	-1.8	-2.5	-5.0	1.5
SN - MP (°)	34.0	42.8	42.5	40.8	44.6
FH - MP (°)	28.2	33.9	33.5	31.7	34.6
LFH(ANS-Me/N-Me) (%)	55.0	55.8	55.3	54.5	54.7
U1 - SN (°)	104.0	108.6	111.2	104.5	105.8
U1 - NA (°)	22.0	29.9	32.8	25.5	27.3
IMPA (°)	90.0	94.8	92.3	94.0	90.0
L1 - NB (°)	25.0	33.5	30.8	33.6	28.9
U1/L1 (°)	124.0	113.8	114.0	120.7	119.7
Upper lip (mm)	1.2	-0.1	-0.5	0.2	-1.1
Lower lip (mm)	2.0	1.1	0.4	0.6	0.1

Treatment Results

Post-treatment records revealed that the treatment objectives had been achieved. Facial photographs showed an improved smile and profile esthetics. The patient's facial profile, especially the position of lower lip and soft-tissue pogonion, was improved. Class I canine and molar relationships were established and an acceptable overbite and overjet were achieved. The patient's maxillary right second molar was starting to emerge (Figure 11).

A post-treatment panoramic radiograph showed acceptable root parallelism with no significant signs of bone resorption. Post-treatment lateral cephalometric analysis and superimposition revealed skeletal changes (ANB: 4.1°, SN-MP: 44.6°). The mandibular incisors showed ideal inclination (IMPA: 90°) and there was no significant change in the inclination of the maxillary incisors (U1 to SN: 105.8°) when compared with the pre-surgical cephalometric measurement (Figures 12, 13 and Table).

At an 18-month follow-up, the results of the orthognathic and orthodontic treatment were maintained (Figures 14 and 15).

DISCUSSION

Patients with Class III malocclusions are different from patients with Class I malocclusions. Skeletal and dental characteristics of Class III patients are already present in the deciduous or mixed dentition.[7,8] For example, the maxilla is positioned slightly retrusive and constricted, and mandibular lengths are significantly larger and the mandible is located more anteriorly than with Class I malocculsion patients.[8-10] Therefore, Class III malocclusion patients often visit orthodontists with chief complaints of anterior crossbites, and is sometimes combined with posterior crossbites.

With Class III patients, treatment timing with early interceptive treatment is most important and early treatment is usually recommended after permanent maxillary first molars, central and lateral incisors are present.[4] The goals for early treatment of Class III patients are to achieve as much maxillary advancement as possible with a facemask in combination with appropriate fixed appliances and to provide a favorable environment for normal growth, improve occlusal relationship and improve facial esthetics for a more normal psychological development.[4]

Class III malocclusion patients usually present with maxillary retrusion, mandibular protrusion, or a combination of both.[11] Turpin[12] proposed guidelines for the correction of Class III malocclusion. He suggested early Class III malocclusion correction if the patients were young adolescents with functional shift, symmetrical condylar growth, mild skeletal discrepancy (ANB less than -2°), no familial skeletal Class III tendency, good facial profile with convergent facial type, and where good cooperation was expected. On the other hand, he recommended delaying orthodontic treatment until growth was completed if the patients exhibited no functional shift, asymmetrical condylar growth, had severe skeletal discrepancy (ANB greater than -2°), familial skeletal Class III tendency, poor facial profile with a divergent facial type, and where poor cooperation was expected.

Figure 1. Pre-treatment facial and intraoral photographs.

Figure 2. Pre-treatment radiographs; A, pahotamic radiograph; B, lateral cephalogram.

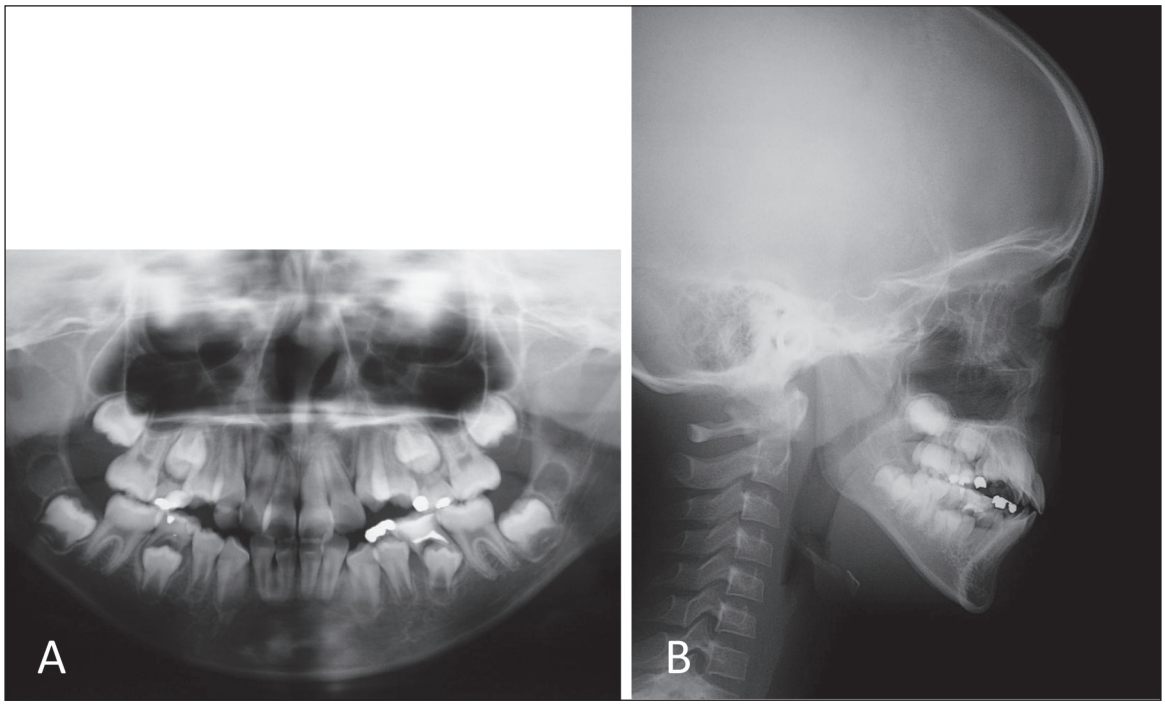


Figure 3. After 10 months, her anterior crowding on both arches were relieved with W-arches.

Figure 4. Progress radiographs; A, panoramic radiograph; B, lateral cephalogram.

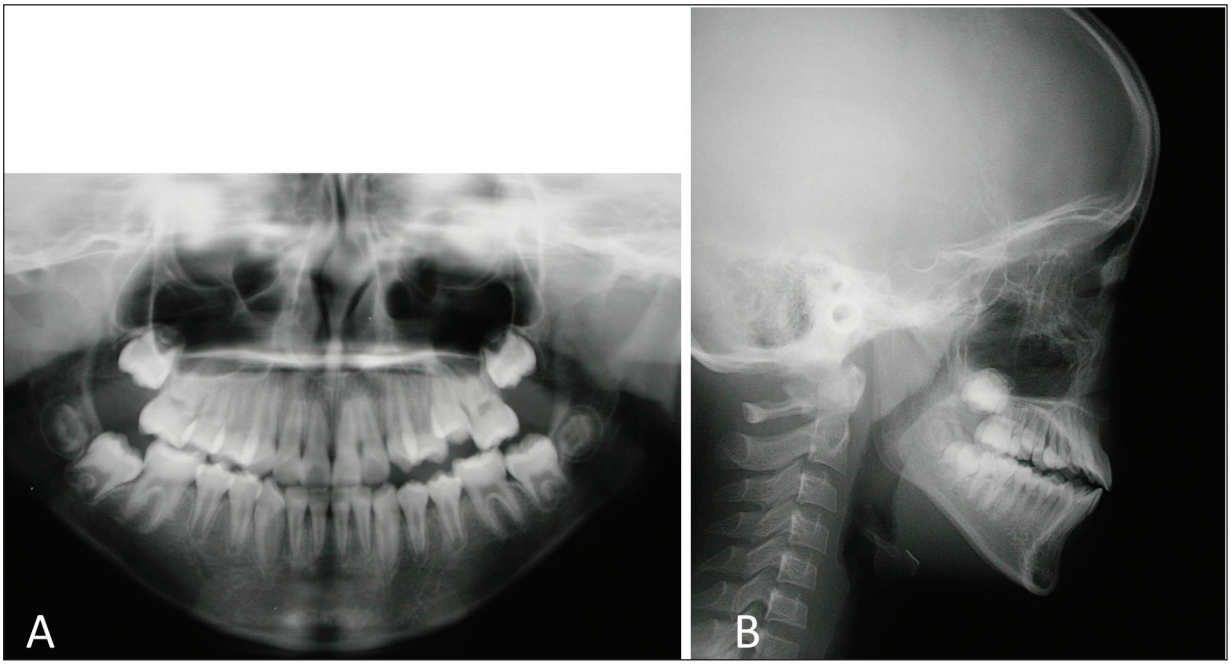


Figure 5. During her growth, she developed anterior and posterior crossbites.

Figure 6. Progress radiographs; A, panoramic radiograph; B, lateral cephalogram.

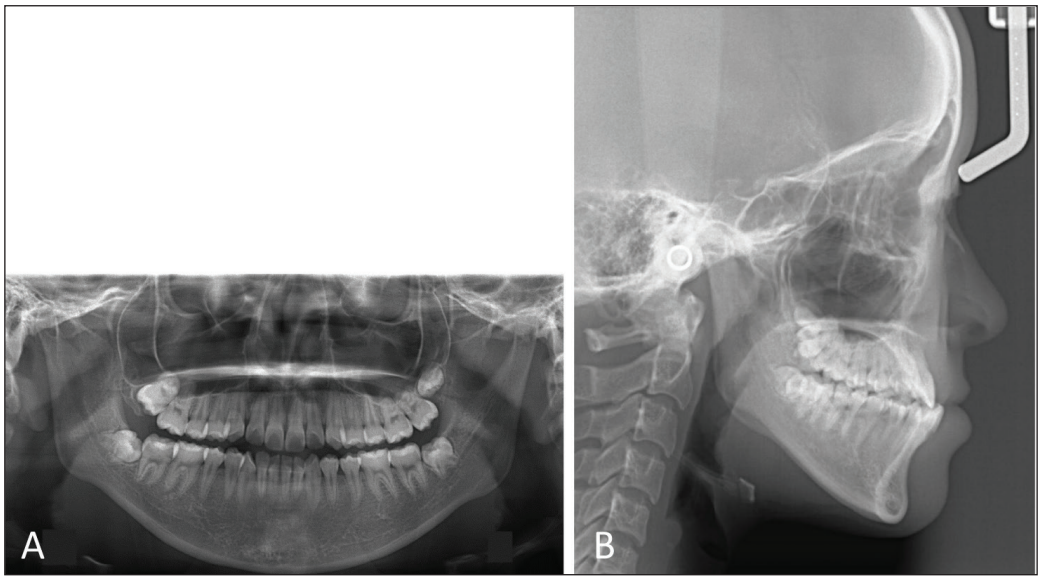


Figure 7. Intraoral photographs before surgery.

Figure 8. Radiographs before surgery; A, panoramic radiograph; B, lateral cephalogram.

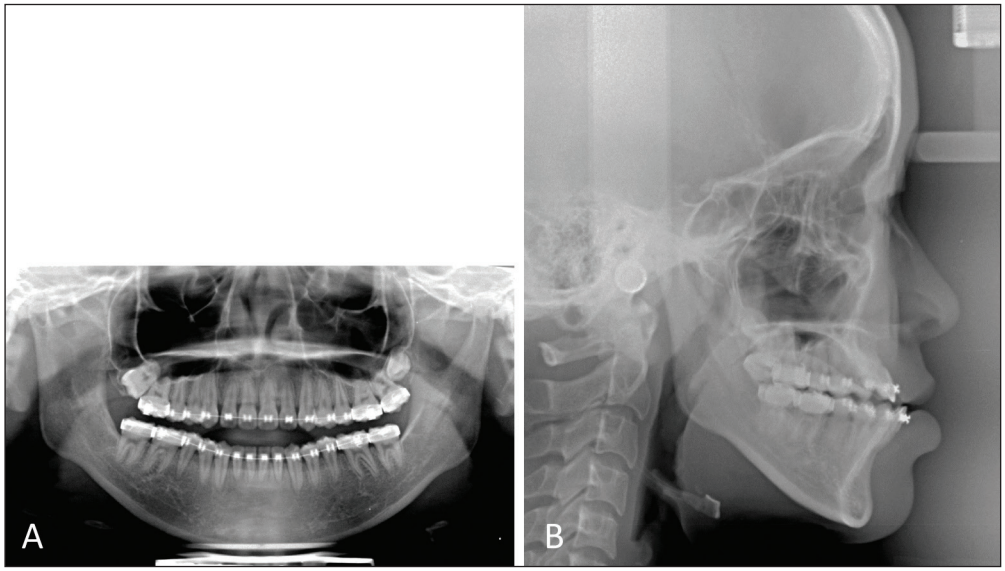


Figure 9. In the model surgery, the distal segments were set back approximately 8 mm bilaterally.

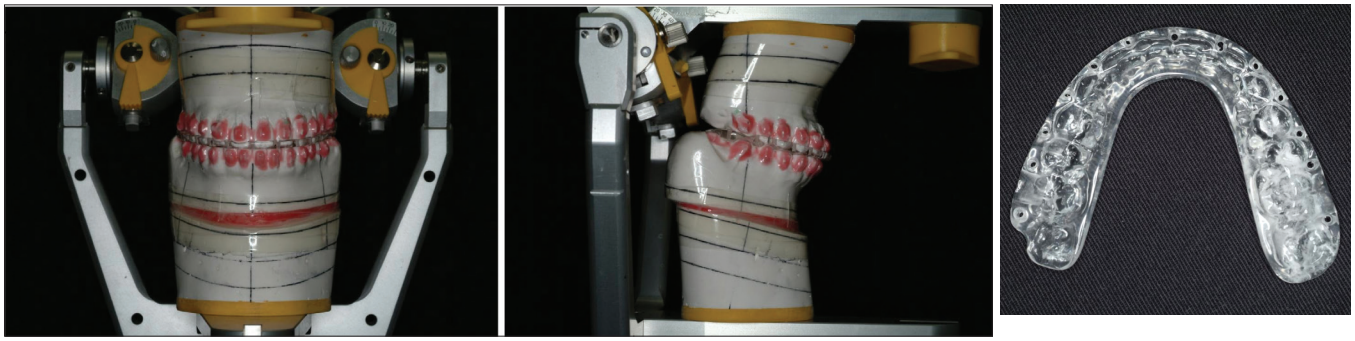


Figure 10. Intraoral photographs of post-surgical orthodontic treatment.

Figure 11. Post-treatment facial and intraoral photographs after 24 months of treatment.

Figure 12. Post-treatment radiographs; A, panoramic radiograph; B, lateral cephalogram.

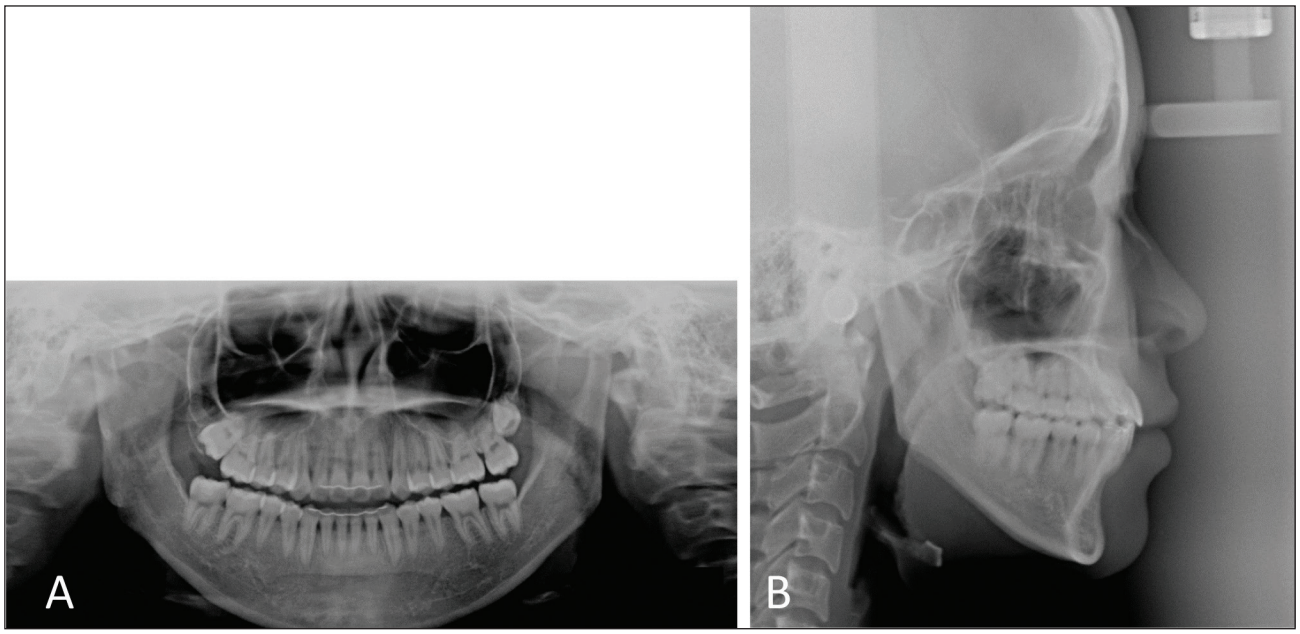


Figure 13. Cephalometric superimposition. Black, pre-treatment; blue, progress; red, post-treatment.

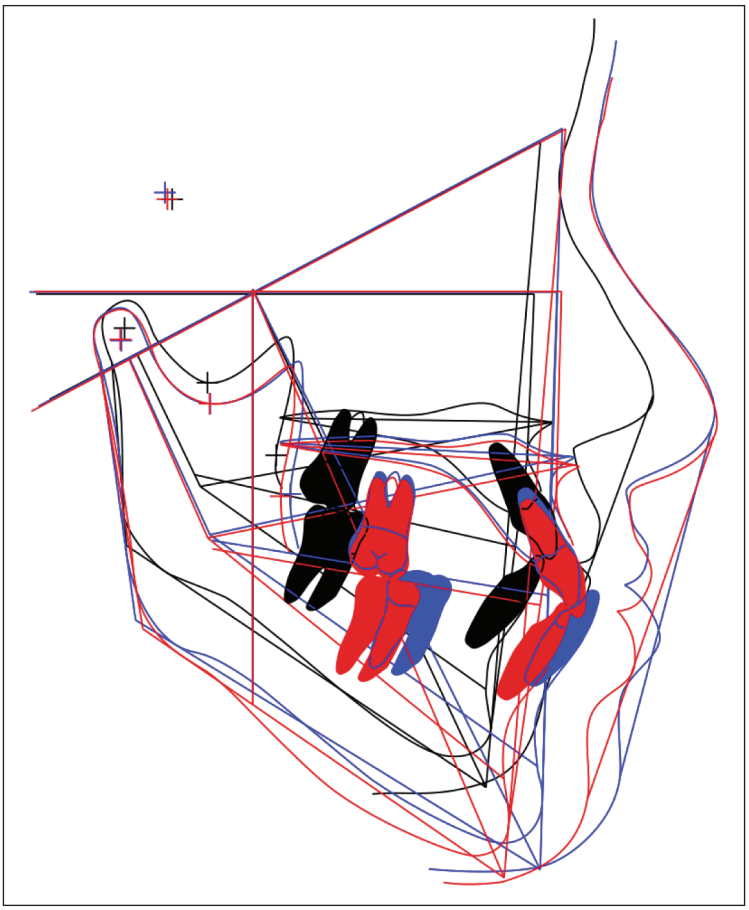
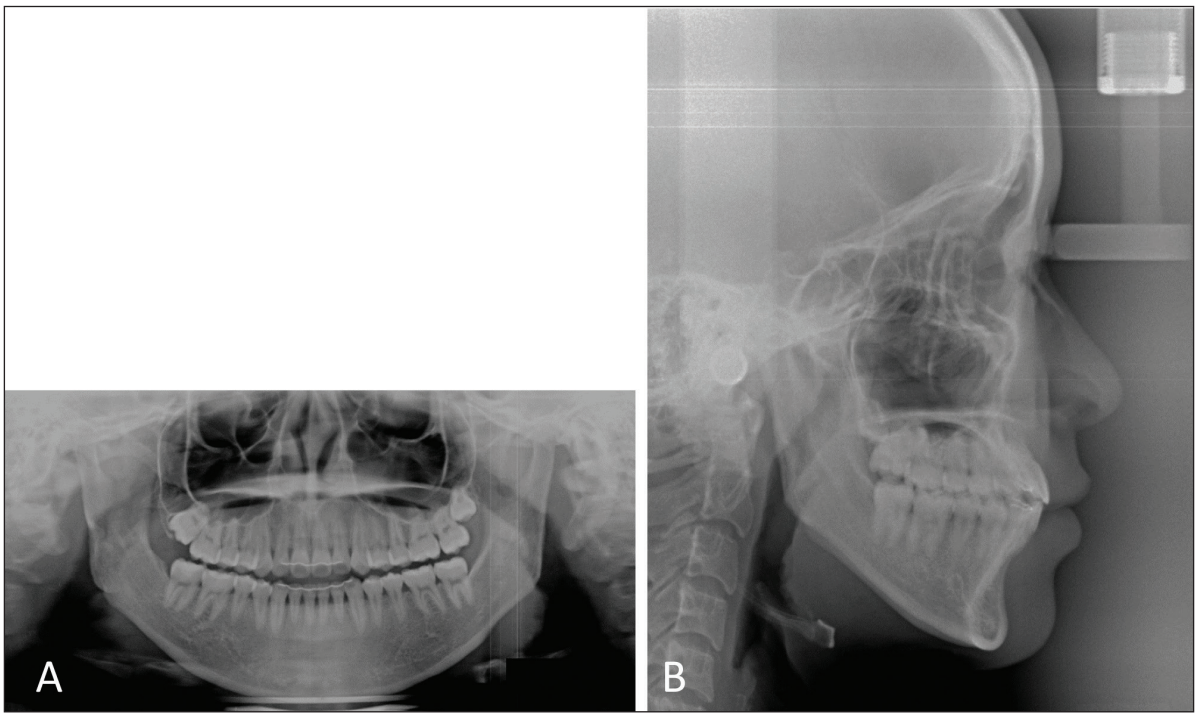


Figure 14. Post-retention facial and intraoral photographs 18 months after debonding.

Figure 15. Post-retention radiographs; A, panoramic radiograph; B, lateral cephalogram.



Predicting the growth of the Class III malocclusion with mandibular prognathism is of great concern to clinicians because it is difficult to predict the growth of Class III patients. Tahmina *et al*[10] investigated craniofacial morphology of 56 Class III adolescent patients who had stable and unstable results after orthodontic treatment. In their study, they found that gonial angle, N-A-Pog (facial convexity) angle, and ramal plane to SN plane angle are important parameters for discriminating stable and unstable outcome groups. After a series of orthodontic treatment, the unstable outcome groups showed gradually increased gonial angle and progressively decreased the ramal plane to SN plane angle. In other words, in poor Class III malocclusion treatment outcome groups, the mandible exhibited a clockwise rotation during the early treatment stage and then rotated in a counterclockwise direction, and indicated the anterior displacement of the mandible by excessive forward growth and upward-and-forward rotation.

In Class III malocclusion, early treatment is important to improve jaw and dental relationships. As Turpin[12] mentioned, although early interception of Class III patients is often effective, caution is advised to not undertake treatment that would compromise the success of subsequent orthognathic surgery if the mandible happens to grow forward excessively during a growth spurt. In the present case, the patient was referred to relieve her maxillary and mandibular crowding. If her maxillary second and mandibular first premolars had been extracted to establish Class I molar relationships and to relieve crowding, the case would not have finished successfully because she did have an unfavorable skeletal Class III growth pattern. Furthermore, her premolar extraction would have compromised her orthognathic surgery.

CONCLUSION

Our case served to demonstrate why when treating Class III malocclusion, timing and an accurate prediction of growth of the mandible are very important. Even though early interceptive treatment of Class III patients is often successful, clinicians should be careful to not start early treatment with premolar extractions which could compromise the success of orthognathic surgery later due to mandibular prognathism. The timing and prediction of the Class III malocclusion is still a dilemma that needs more investigation.

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