Case Report

Case Report: Long-Term Outcome of Class II Division 1 Malocclusion Treated with Rapid Palatal Expansion and Cervical Traction

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Abstract: A case of a Class II Division 1 malocclusion with reduced transpalatal width and unfavorable axial inclinations of the posterior teeth is reported. Rapid palatal expansion (RPE) was used for maxillary enhancement and molar distalization therapy to correct the anteroposterior dental discrepancy. This case report illustrates the results of the method of treatment used with a long-term (16-year–posttreatment) follow-up. (*Angle Orthod* 2000;70:89–94.)

Key Words: Rapid palatal expansion, Cervical traction, Class II Division 1, Nonextraction

Patient JG, a white female, was first evaluated at the age of 12 for orthodontic treatment. She was in good health, with a history of allergic rhinitis. She was a mouth breather who snored at night and formerly bit her fingernails. Her upper lip was thin, with hypertonic labial musculature. Her facial profile was mesognathic-straight, despite the nasal airway problem; her lower-face height was slightly short. She had narrow dental arches, resulting in poor smile characteristics. She presented with a Class II Division 1 malocclusion and inadequate jaw size for her erupting permanent teeth. Temporomandibular joint evaluation revealed some difficulty with lateral movement, especially on the left side.

The patient's chief complaints were the blocked-out maxillary canines and the unpleasant smile (Figures 1 and 2). Cephalometric analysis showed a Class I skeletal pattern. Both the maxilla and mandible were slightly retrusive relative to the anterior cranial base reference plane (SNA 80°, SNB 77.5°). Her lower lip was positioned 3 mm behind the *E*-plane (Figures 3 and 4). Intraoral radiographs showed a deficiency in the amount of space available for the maxillary canines.

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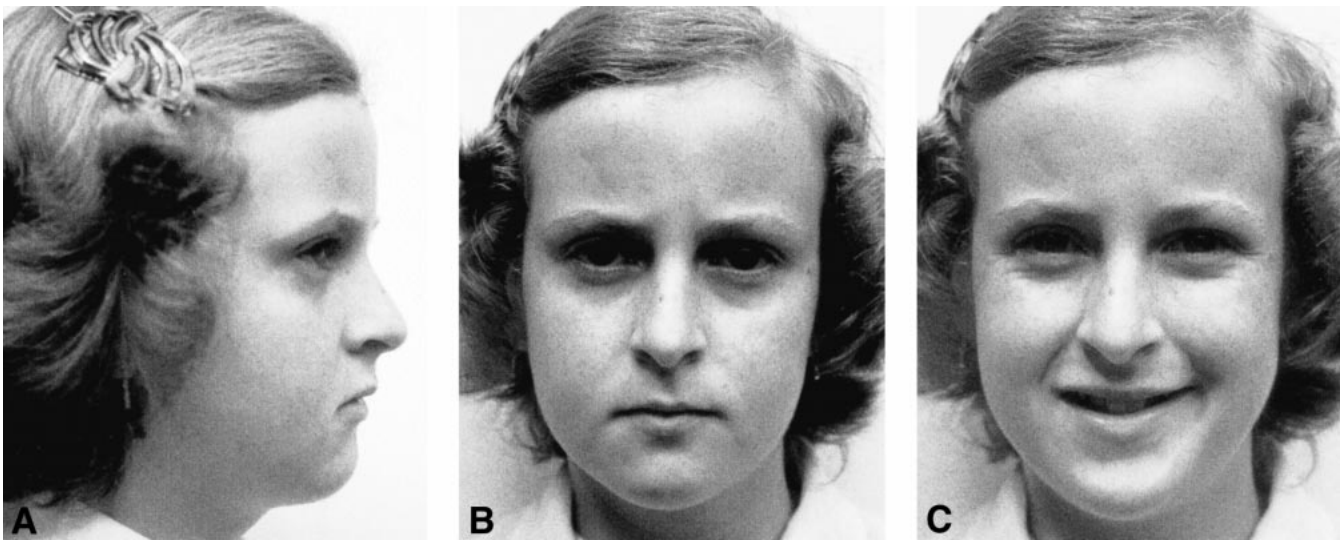

FIGURE 1. Pretreatment facial photographs at 12 years of age. Note the ''negative space'' on smile (buccal corridor in prosthetic terms).

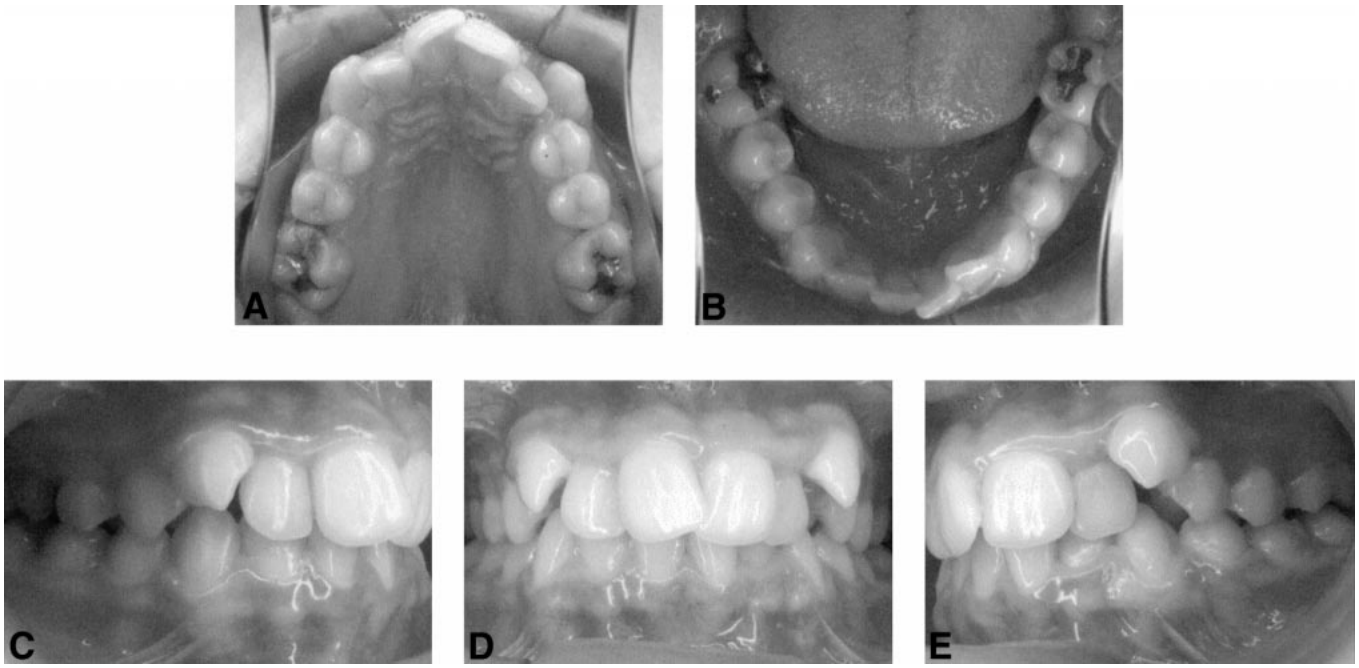

FIGURE 2. Pretreatment intraoral photographs at 12 years of age.

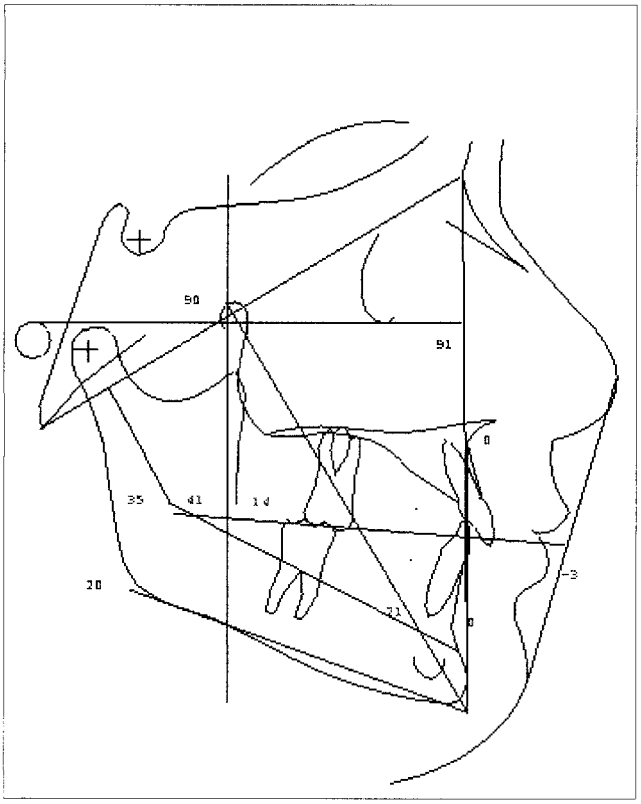

FIGURE 3. Pretreatment cephalometric tracing.

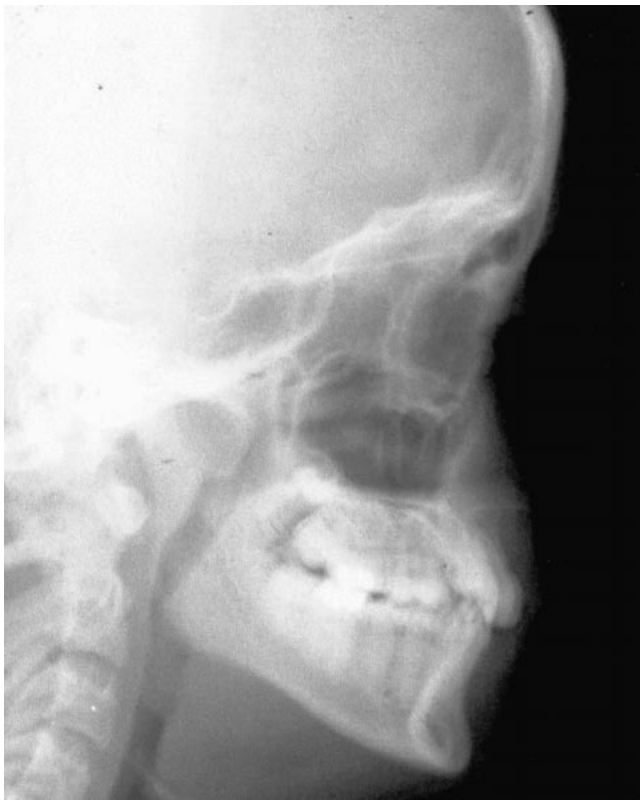

FIGURE 4. Pretreatment lateral cephalogram.

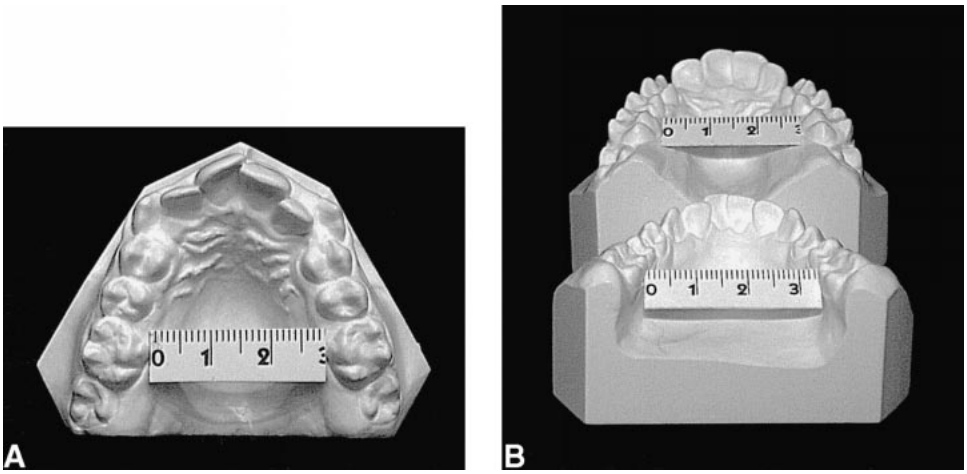

FIGURE 5. Pretreatment model casts at 12 years of age. Note the maxillary deficiency and unfavorable inclination of posterior teeth (maxillary teeth inclined buccally and mandibular teeth inclined lingually).

TABLE 1. Problem List and Treatment Objectives

Site	Problem List	Treatment Objectives
Maxilla	Transverse maxillary deficiency	Expand transverse relationships
Mandible	Slightly retruded	Encourage forward posture
Maxillary dentition	Severe crowding; high canines; Buccal inclined posterior teeth (Intermolar width, 29 mm)	Gain arch length; proper position canines; correct posterior teeth axial inclination
Mandibular dentition	Moderate crowding; lingual inclined posterior teeth (intermolar width, 34 mm)	Gain arch length; upright lingual inclined posterior teeth; Prevent labial movement of incisors
Occlusion	Dental class II; deep overbite	Achieve class I dental relationship; correct deep overbite; establish good functional occlusion
Esthetics	''Negative space'' on smile; poor dental esthetics; flat profile	Improve smile characteristics and dental esthetics; maintain facial profile

FIGURE 6. Posttreatment facial photographs at age 20.5 years. Note improved smile characteristic due to the increased fullness of midface and facial profile.

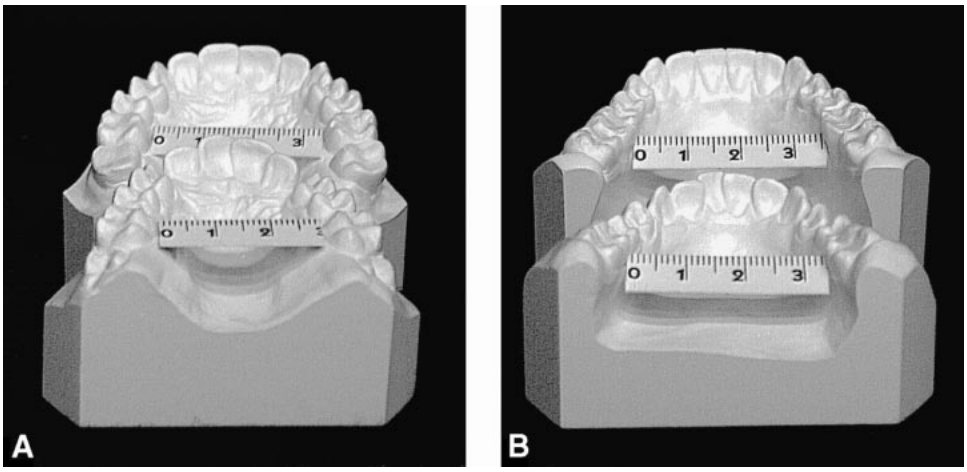

FIGURE 7. Model casts. (A) Posterior maxillary occlusal view at 12 and 30 years of age. (B) Posterior mandibular occlusal view at 12 and 30 years of age. Note the stability of width dimension, changes in the axial inclination of the posterior teeth, and leveling of the curve of Wilson.

TREATMENT OPTIONS

Two treatment options were developed: extraction and nonextraction.

Extraction

Because of severe crowding in the upper arch, moderate crowding in the lower arch, and the dental Class II relationship, one treatment alternative included the extraction of maxillary first and mandibular second premolars. As a result of the transverse maxillary deficiency (a 29-mm maxillary intermolar distance), negative space was evident when the patient smiled. Extracting permanent teeth would resolve the arch length deficiency but would also reduce improvement in the smile because of a decreased transverse dimension.[1] Considering the facial appearance of the 12-year-old patient and projecting the likely increase of nasal size and chin prominence, it was thought that extractions would increase the potential for a negative effect on the facial profile.

Nonextraction

A nonextraction alternative would require rapid palatal expansion (RPE)[2] and distalizing mechanics. Because of the reduced transpalatal width (Figure 5A), both maxillary and mandibular posterior teeth were compensated, resulting in an unfavorable inclination of the mandibular segments lingually and the maxillary segments buccally (Figure 5B). By widening the maxillary dental arch and apical base through RPE, it would be possible to increase maxillary and mandibular arch length, correct the axial inclination of the posterior teeth, and improve the smile. In addition, this procedure would remove functional interferences caused by the maxillary constriction, especially in the premolar area, allowing the mandible to seek a more comfortable anterior position. This would contribute to the anteroposterior correction. Cervical traction with light force would improve the Class II relationship via distal molar movement and would also increase the lower-face height.[3,4]

Table 1 summarizes the problems and treatment objectives.

FIGURE 8. Long-term posttreatment facial photographs at age 30.

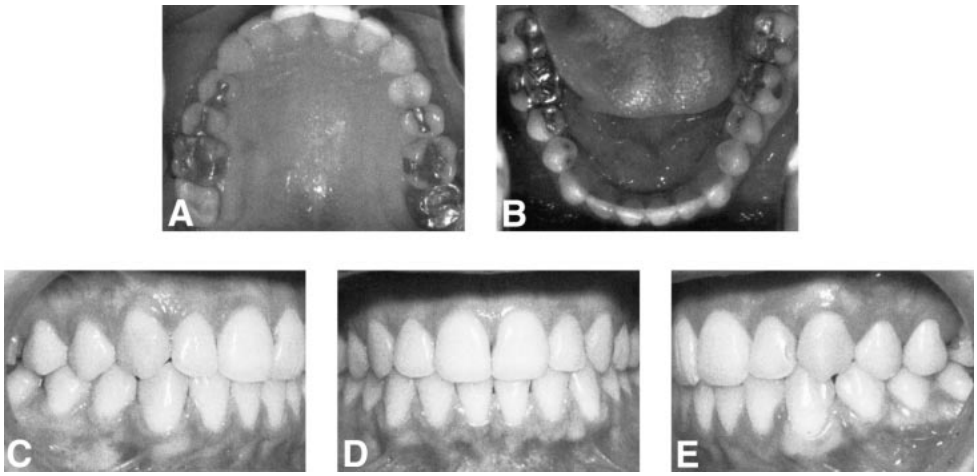

FIGURE 9. Long-term posttreatment intraoral photographs at age 30.

TABLE 2. Treatment Effects

Site*	Pretreatment	Posttreatment	Long-Term
Age of patient	12 years	14 years, 6 months	30 years
Maxilla	29 mm	34 mm	34 mm
Mandible	34 mm	35 mm	36 mm

* Measured at tooth-gingival intersection.

TREATMENT AND RETENTION

Because of the patient's young age, moderate mandibular incisor crowding, and esthetic considerations, the nonextraction treatment plan was chosen. This plan included expansion of the maxilla through RPE.[5,6] A Kloehn cervical headgear (GAC International Inc., Central Islip, New York) with light force and Tandem mechanics with Class III elastics were selected to correct the dental Class II relationship and gain lower arch length. Vertical correction would be achieved by the downward vector of force produced by cervical headgear therapy and by intrusion of the maxillary and mandibular anterior teeth. For retention, the patient was instructed to wear a maxillary Hawley retainer with an anterior bite plane 24 hours a day for 2 years and at night for another 6 months. In addition, the patient was instructed to wear a fixed, lower canine-to-canine (.036″) lingual retainer until the third molars erupted or were extracted.

Treatment progress

A Haas-type RPE appliance was cemented, activated 2 turns per day, and stabilized after 12 mm of activation. Cervical traction and Tandem mechanics with Class III elastics were started for anteroposterior correction and to increase maxillary and mandibular arch length during the first 12 months. The force applied to the maxillary molars ranged from 200 to 250 g per side, 12 to 14 hours per day. The outer bows of the headgear were elevated to move the roots distally, and the inner bow was expanded and adjusted every visit to maintain the transverse dimension and rotate the molars during anteroposterior correction. When a solid Class I relationship at the molars and sufficient mandibular arch length were achieved, the maxillary and mandibular anterior teeth were bonded and aligned. Using .016″ × .022″ rectangular lever arches, the maxillary incisors were intruded and torqued and the mandibular incisors were intruded. When ideal overbite and overjet relationships had been established, the maxillary canines were bonded, aligned, and intruded. The premolars were not bonded because they achieved good functional occlusion as a result of the relationship created by the mechanics. Appliance adjustments were made every 4 to 5 weeks, and active treatment lasted 24 months.

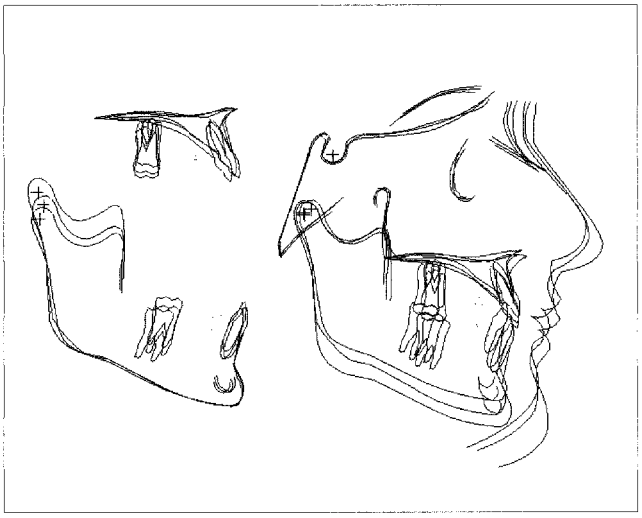

FIGURE 10. Cephalometric superimposition of tracings at ages 12, 14.5, and 30.

RESULTS

Both functional and esthetic objectives were achieved. The applied mechanics effectively eliminated maxillary and

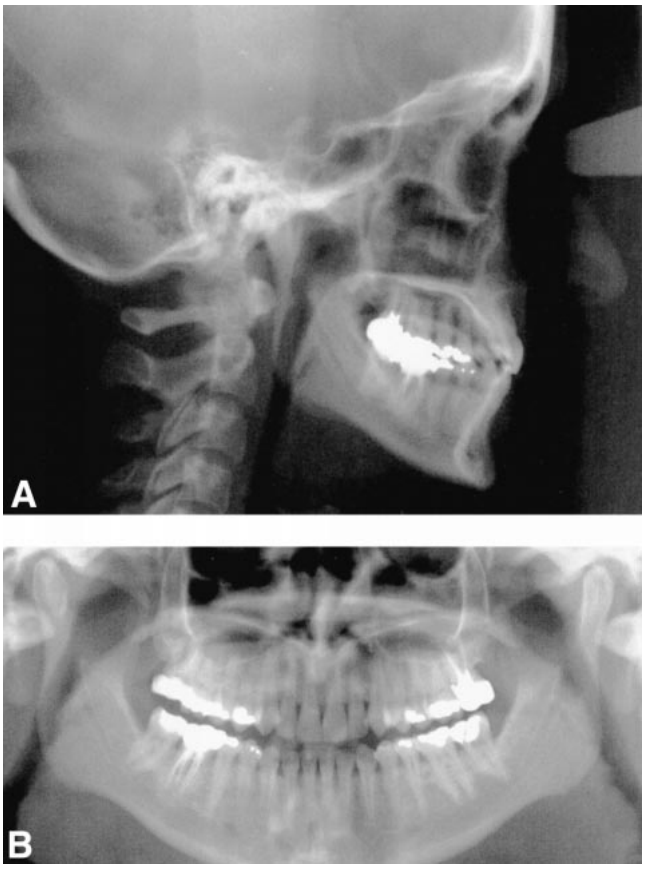

FIGURE 11. Cephalogram and panoramic view at age 30.

mandibular arch length discrepancies. The increase in fullness of the midface by RPE reduced the negative space[1] and was responsible for a broad and pleasant smile. The patient's profile was nicely maintained without any adverse effects during treatment (Figure 6). The effect of cervical headgear therapy was largely maxillary dentoalveolar. A small change in the position of the maxilla affected the mandible, and a slightly increased mandibular plane angle was observed posttreatment. Because of this increase in lower-face height, the contribution of the anteroposterior mandibular component of the facial profile became somewhat less important.

Long-term follow-up

The skeletal maxillary expansion produced an increase in the maxillary apical base, resulting in a more normal and stable relationship between the maxillary and mandibular dental arches, with the teeth in ideal transverse position and proper buccolingual inclination. Transpalatal width increased 5 mm and has remained stable for 16 years. The mandibular buccal teeth assumed a more upright position in response to changes induced by RPE, and mandibular intermolar width increased by 2 mm (Figure 7, Table 2). Cephalometric tracings revealed that anterior and posterior face height increased significantly. The mandibular incisors remained ideally positioned at +1 mm to the APo plane. Because of impaction, all 4 third molars were extracted at age 21. The final panoramic radiograph at age 30 showed good root parallelism in both arches (Figures 10, 11).

Fourteen years after removal of the upper Hawley retainer and 6 months after removal of the lower lingual retainer, which had been left in position longer than originally planned, the patient had no symptoms of temporomandibular disorder. Long-term posttreatment facial photographs show that the facial profile and the improvements in the smile characteristics have been maintained. Overbite and overjet are nearly ideal, and the teeth have settled into a good functional occlusion with excellent facial esthetics (Figures 8, 9).

CONCLUSION

This case report demonstrates the efficacy of combined palatal expansion and cervical retraction with lengthy postretention follow-up.

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