

Vertical Control in Nonextraction Treatment of Growing Patients with Anterior Skeletal Open Bite

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In this article, we describe how open-bite malocclusions and lower anterior skeletal excess can be treated with a combination of fixed (transpalatal bar¹) and removable (high-pull headgear) appliances, along with progressive vertical reduction of the deciduous canines and first and second molars. The anterior open bite is closed by means of extrusion or eruption control of the maxillary first permanent molars and the maxillary and mandibular deciduous molars, clockwise rotation of the palatal plane, and counterclockwise rotation of the mandible.

Case 1

An 8-year-old female in the early mixed dentition presented with a tendency toward anterior open bite (Fig. 1, Table 1); the lateral incisors and second permanent molars had not yet erupted. Clinical examination revealed a tongue-thrust habit during speech and at rest.

A transpalatal bar was inserted between the

maxillary first permanent molars, with an acrylic button added to improve patient comfort and increase the tongue's contact surface at rest and during swallowing and speech (Fig. 2). A palatal cleat was bonded to the lingual surface of the upper central incisor to function as a tongue crib.

The transpalatal bar was progressively lowered in the palatal vault to increase the action of the tongue in intruding or at least counteracting the extrusion or eruption of the molars. The ends of the bar were then activated to rotate both molars distally (Fig. 3). Once the molar rotation had been achieved, a high-pull headgear was fitted. The outer bow was kept at the same length and vertical level as the inner bow to generate a vertical intrusive force on the maxillary first permanent molars. The patient was instructed to wear the headgear 12-14 hours a day.

Prevention of extrusion or eruption of the

TABLE 1
CASE 1 CEPHALOMETRIC DATA

	Norm	Pre-treatment	Post-Treatment
SNA	82°	82°	81°
SN-Po	80°	80°	80°
AN-Po	2°	2°	1°
SN-ANS/PNS	8°	10°	9°
SN-GoGn	33°	34°	34°
ANS/PNS-GoGn	25°	25°	25°
U1-ANS/PNS	110°	124°	75°
L1-GoGn	94°	98°	93°
L1-APo	2.0mm	2.7mm	2.2mm
Overjet	3.5mm	4.0mm	1.0mm
Overbite	2.5mm	-1.0mm	1.0mm
Interincisal angle	132°	116°	132°



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maxillary permanent molars resulted in a loss of occlusal contact with the mandibular arch. Therefore, the deciduous teeth were ground with a diamond bur as needed to reestablish contact

with the mandibular molars (Fig. 4). Treatment was continued until the anterior open bite had closed. Total treatment time was 24 months (Fig. 5, Table 1).

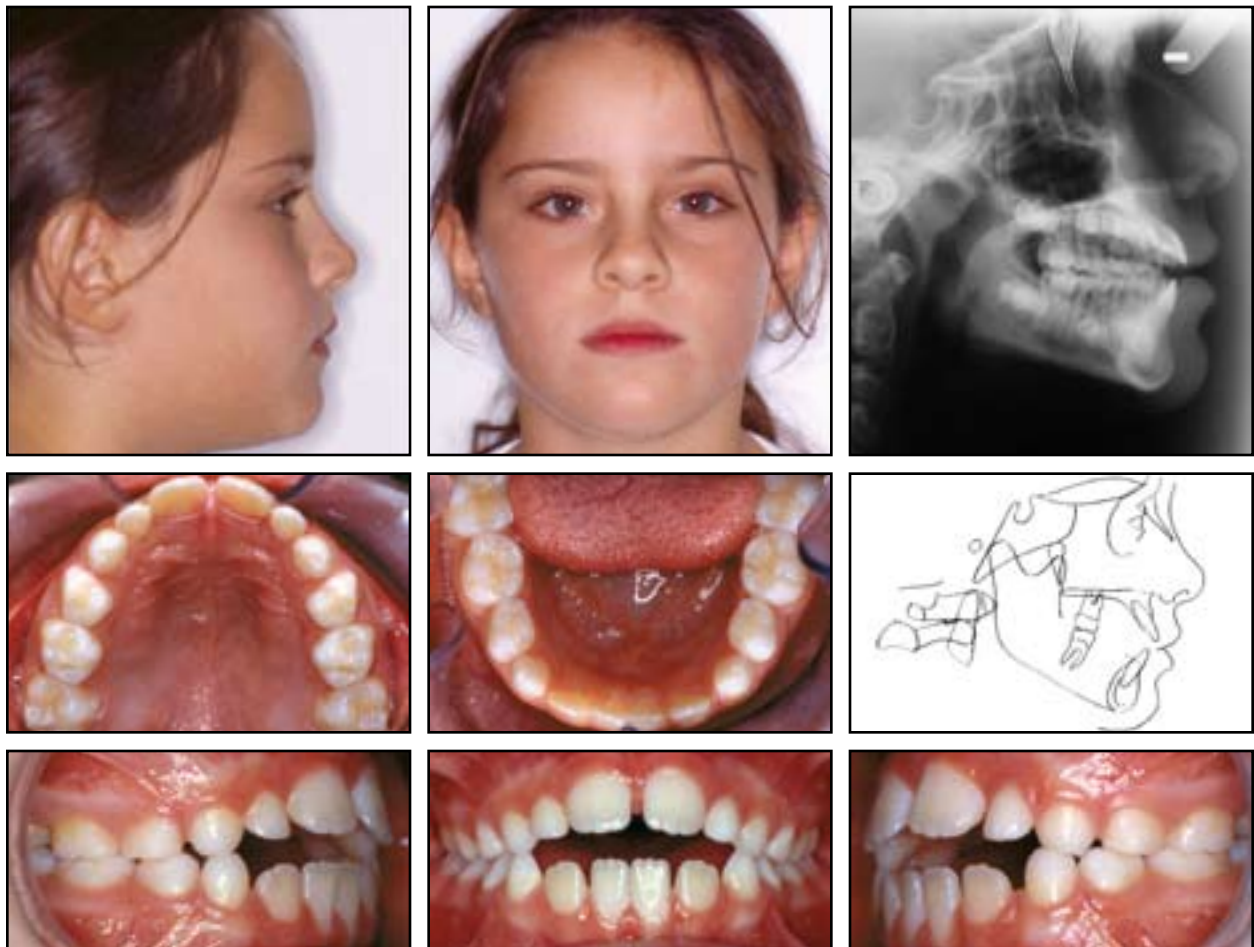


Fig. 1 Case 1. 8-year-old female patient with anterior open bite before treatment.



Fig. 2 Case 1. Transpalatal bar with acrylic button placed between first permanent molars to control vertical dimension; lingual cleat bonded to central incisor to discourage tongue-thrust habit.



Fig. 3 Case 1. Transpalatal bar activated for distal rotation of molars.



Fig. 4 Case 1. Deciduous molars ground with diamond bur.

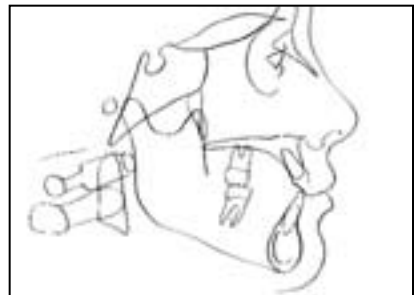


Fig. 5 Case 1. Patient after 24 months of treatment.

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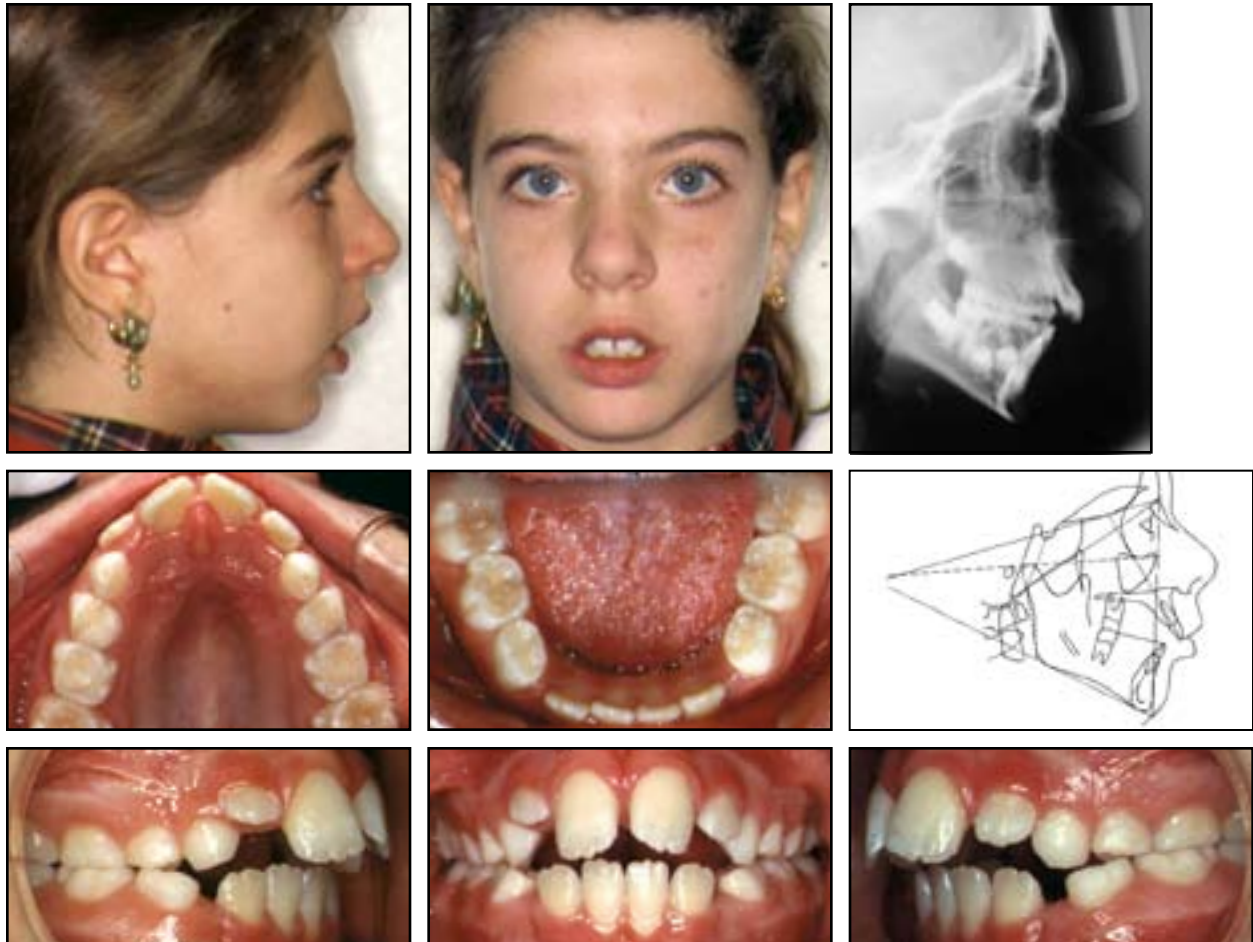


Fig. 6 Case 2. 8-year-old female patient with anterior open bite and lip incompetence before treatment.

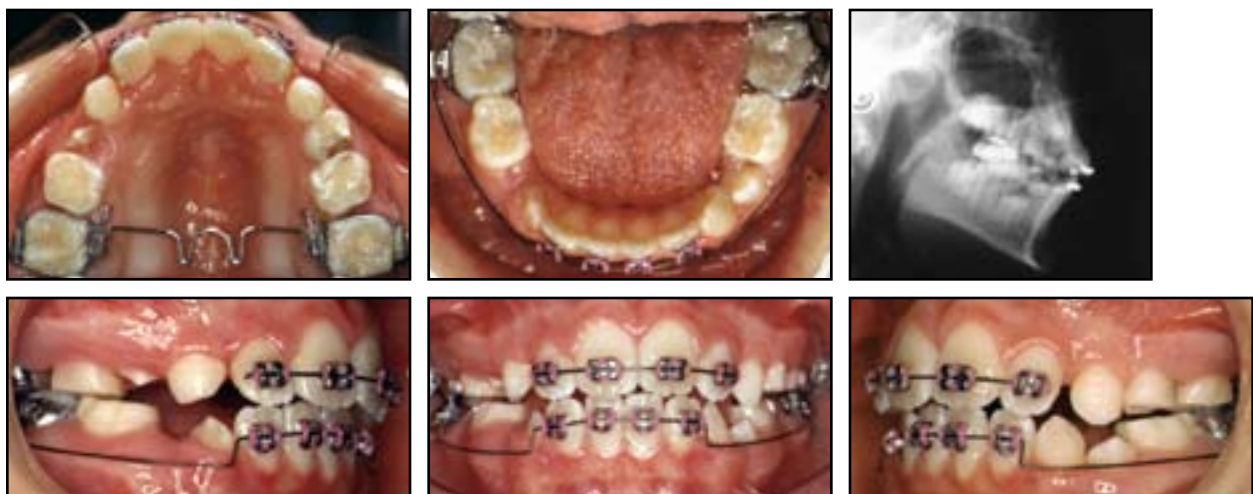


Fig. 7 Case 2. Patient after 11 months of first-phase treatment.

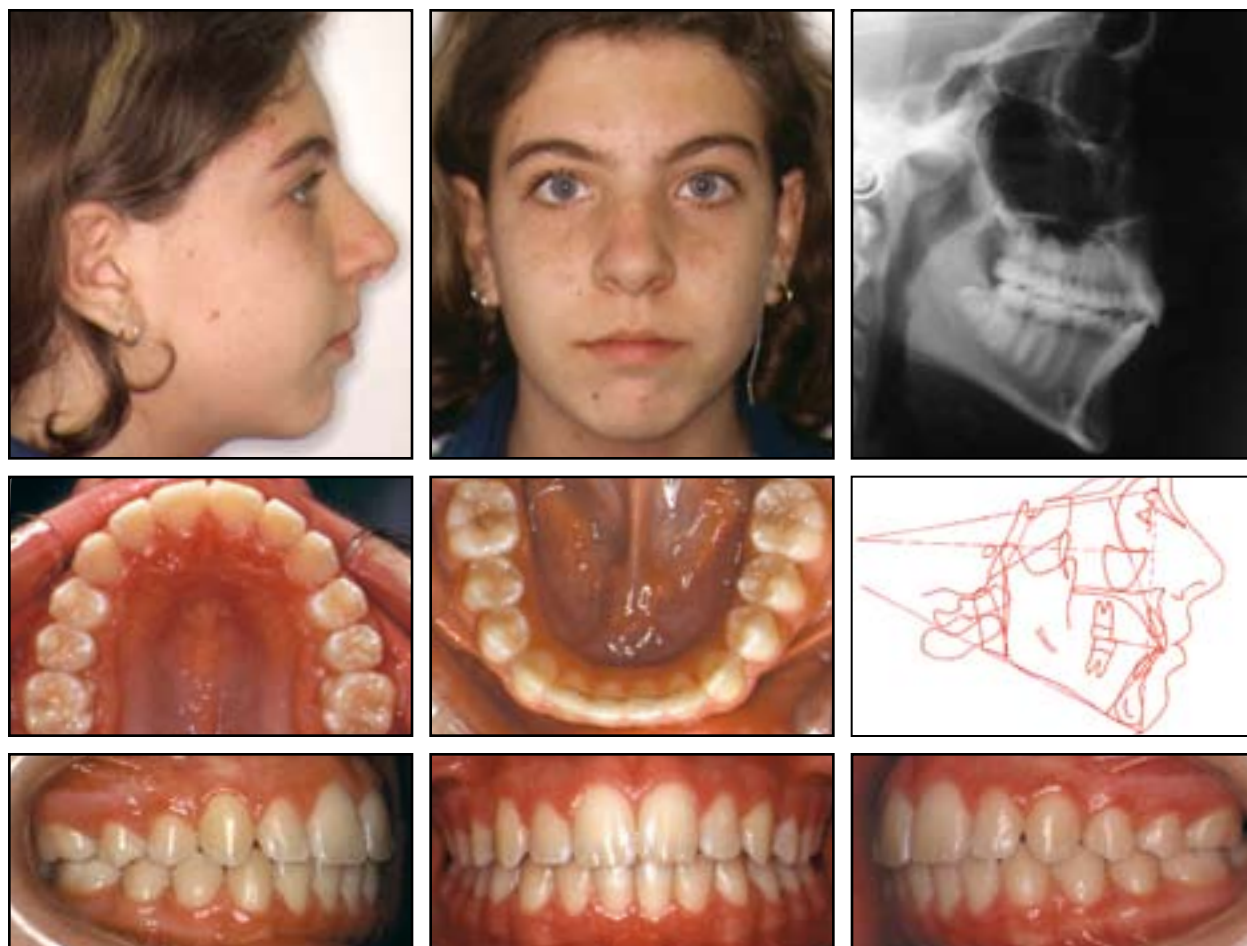


Fig. 8 Case 2. Patient after eight months of second-phase treatment.

Case 2

An 8-year-old female in the early mixed dentition presented with an anterior open bite and the characteristic accompanying lip incompetence at rest (Fig. 6, Table 2).

Treatment was delayed until the lateral incisors had completely erupted, when a transpalatal bar was inserted between the maxillary first permanent molars. To increase the tongue's contact surface, two extra loops were added to the mid-palatal Coffin loop. The patient wore high-pull headgear for at least 12-14 hours per day to take advantage of the intrusive force exerted by the tongue during chewing, swallowing, and speech. The maxillary incisors were bonded for leveling

and alignment; a Burstone arch (.018" Wilcock Australian Special Plus wire*) was placed to align the mandibular incisors and control the leeway space.

As the maxillary first permanent molars lost occlusal contact with the mandibular molars, the deciduous teeth were ground. Phase I treatment time was 11 months (Fig. 7). Once the bite had been closed and all permanent teeth had erupted, multibracket appliances were used to align all the teeth and finish the occlusion, for an additional eight months of active treatment (Fig. 8, Table 2).

*GAC International, Inc., 355 Knickerbocker Ave., Bohemia, NY 11716; www.gacintl.com.



Fig. 9 Case 2. Patient five years after debonding.

A follow-up examination five years after debonding revealed excellent stability, with no relapse of the open bite (Fig. 9).

Discussion

In 1937, Broadbent stated that the lower mandibular border grows in a constant angular relationship to the cranial structures.² Through longitudinal studies involving metal implants, however, Björk found that the mandible grows with either forward or backward rotation and with different centers of rotation.³ In contrast to Broadbent, he noted that patients with skeletal open bite do not have reduced posterior facial height, usually

due to excessive ramal height. More recently, Ligthelm-Bakker and colleagues observed that individuals with excessive anterior facial height grow differently: the lower anterior facial height increases faster than the upper facial height, which tends to accentuate the facial form established early in growth.⁴

Treatment timing is an important factor in cases of anterior open bite. Björk advised postponing treatment and delaying extractions until the end of the pubertal growth spurt.³ In contrast, Nanda found that children with excessive lower anterior facial height reached the pubertal growth spurt earlier than those with deficient anterior facial height,⁵ indicating that treatment should

TABLE 2
CASE 2 CEPHALOMETRIC DATA

	Norm	Pre-treatment	Post-Treatment
SNA	82°	80°	80°
SN-Po	80°	72°	75°
AN-Po	2°	7°	5°
SN-ANS/PNS	8°	8°	9°
SN-GoGn	33°	38°	37°
ANS/PNS-GoGn	25°	30°	28°
U1-ANS/PNS	110°	110°	106°
L1-GoGn	94°	96°	101°
L1-APo	2.0mm	10.0mm	6.0mm
Overjet	3.5mm	10.0mm	2.5mm
Overbite	2.5mm	-1.0mm	2.5mm
Interincisal angle	132°	120°	123°

begin as soon as possible. Early treatment for open bite allows compensatory craniofacial growth and reduces the need for a second phase of treatment that might involve extractions or orthognathic surgery. The treatment method described here produces the best results in growing patients in the late mixed dentition, because of the availability of leeway space, because tissues respond better to orthodontic treatment at this age, and because patient cooperation is generally better before social activity increases during adolescence.⁶

Skeletal open bite can be difficult to treat

with tongue cribs, whether fixed or removable; extractions in adolescent patients may flatten the profile and lead to unstable results. Moreover, these techniques usually require functional appliances and tongue exercises, demanding considerable patient cooperation. On the other hand, the early use of transpalatal bars, along with extraoral traction and progressive vertical reduction of the deciduous teeth, can easily close the bite and control the lower anterior facial dimension, while gaining significant space in the maxillary arch. This approach can expedite Phase II treatment, eliminating the need for extractions or, if extraction of permanent teeth is necessary, providing better control of posterior anchorage to further reduce vertical skeletal height, dental protrusion, and residual crowding.

REFERENCES

1. DeBerardinis, M.; Stretesky, T.; Sinha, P.; and Nanda, R.S.: Evaluation of the vertical holding appliance in treatment of high-angle patients, *Am. J. Orthod.* 117:700-705, 2000.
2. Broadbent, B.H.: The face of the normal child, *Angle Orthod.* 7:183-208, 1937.
3. Björk, A.: Prediction of mandibular growth rotation, *Am. J. Orthod.* 55:585-599, 1969.
4. Ligthelm-Bakker, A.S.; Wattel, E.; Uljee, I.H.; and Prah Andersen, B.: Vertical growth of the anterior face: A new approach, *Am. J. Orthod.* 101:509-513, 1992.
5. Nanda, S.K.: Patterns of vertical growth in the face, *Am. J. Orthod.* 93:103-116, 1988.
6. Graber, T.M.; Vanarsdall, R.L.; and Vig, K.W.L. (eds.): *Orthodontics: Current Principles and Techniques*, 4th ed., Elsevier Mosby, St. Louis, 2005.