

# CASE REPORT

## Late Expression of Class III Malocclusion

GUILHERME JANSON, DDS, MS, PHD, MRCDC  
JANINE ARAKI, DDS, MS, PHD  
ARNALDO PINZAN, DDS, MS, PHD  
LÍVIA MARIA ANDRADE DE FREITAS, DDS, MS, PHD  
MARCOS ROBERTO DE FREITAS, DDS, MS, PHD

**E**arly intervention in a Class III case with some combination of a protraction face mask, Fränkel and fixed appliances, and a chin cup generally has a good prognosis,<sup>1,2</sup> as long as the patient is followed until growth has ceased.<sup>3-5</sup> Late Class III manifestation, on the other hand, can severely complicate orthodontic treatment. While exacerbation of a known Class III malocclusion is not uncommon,<sup>6-8</sup> late expression in a previously diagnosed Class I malocclusion is rare.<sup>9,10</sup>

This article describes a patient who was initially diagnosed with a Class I malocclusion, but developed a Class III tendency

that worsened after completion of treatment. The Class III malocclusion manifested itself in an unusual asymmetrical pattern, becoming evident first on the right side and later on the left.

### Diagnosis and Treatment Plan

A male age 13 years, 9 months, presented at our orthodontic clinic with the chief complaint of dental crowding (Fig. 1). He had a Class I malocclusion with a normal transverse interarch relationship and 4mm of maxillary and mandibular anterior crowding. The maxillary

right lateral incisor was in cross-bite with the mandibular right canine. The patient's facial appearance was harmonious and symmetrical, with competent lips. A panoramic radiograph showed that all teeth were present except the mandibular right third molar. Cephalometric analysis revealed a Class I skeletal relationship with proportional jaws and the craniofacial pattern in equilibrium (Table 1). The lower anterior facial height was somewhat short, and the mandibular incisors were upright in the basal bone.

The treatment plan was to eliminate the dental crowding and establish a good occlusion. Two



Dr. Janson



Dr. Araki



Dr. Pinzan



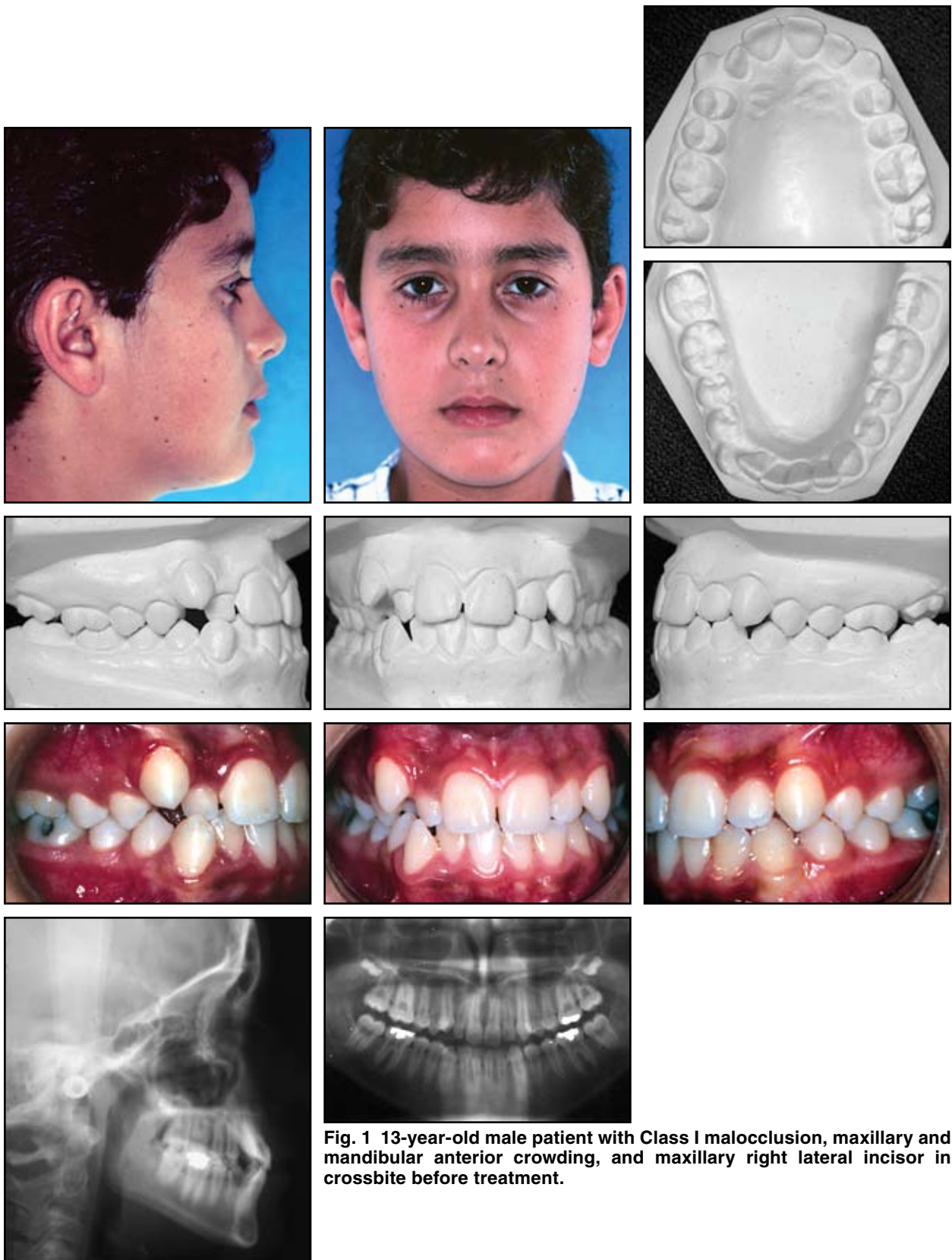
Dr. L.M.A. de Freitas



Dr. M.R. de Freitas

Dr. Janson is Professor and Head, Drs. Araki and L.M.A. de Freitas are graduate students, Dr. Pinzan is an Associate Professor, and Dr. M.R. de Freitas is a Professor, Department of Orthodontics, Bauru Dental School, University of São Paulo, Alameda Octávio Pinheiro Brisolla 9-75, Bauru, SP 17012-901, Brazil. E-mail Dr. Janson at jansong@travelnet.com.br.

# Late Expression of Class III Malocclusion



**Fig. 1** 13-year-old male patient with Class I malocclusion, maxillary and mandibular anterior crowding, and maxillary right lateral incisor in crossbite before treatment.

**TABLE 1**  
**CEPHALOMETRIC DATA**

	Norm*	Pretreatment	Norm*	Post-Treatment	Post-Retention	Post-Retreatment
SNA	80.7°	78.1°	81.4°	77.9°	75.4°	75.9°
Co-A*	96.5mm	80.4mm	100.0mm	84.3mm	84.3mm	84.3mm
SNB	77.3°	76.5°	78.2°	78.4°	79.6°	78.7°
Co-Gn*	126.5mm	108.0mm	133.6mm	117.6mm	122.9mm	123.0mm
ANB	3.4°	1.6°	3.2°	-0.5°	-4.2°	-2.8°
NAP	5.2°	1.9°	4.4°	-3.0°	-12.0°	-9.8°
Mx-MdDif*	30.0mm	27.6mm	33.0mm	33.3mm	38.6mm	38.7mm
FMA	27.7°	24.9°	28.7°	27.4°	29.4°	29.8°
SN-Occ	15.4°	21.8°	12.9°	19.6°	17.2°	13.7°
NS-GoGn	32.9°	33.2°	32.6°	34.4°	36.0°	36.3°
NSGn	67.6°	68.6°	67.3°	69.2°	67.5°	67.6°
LAFH	74.3mm	58.6mm	79.5mm	64.1mm	66.4mm	66.5mm
U1-NA	21.9°	21.3°	23.8°	31.5°	31.8°	33.7°
U1-NA	4.3mm	3.9mm	5.5mm	5.9mm	6.3mm	7.4mm
L1-NB	25.1°	18.4°	26.4°	16.9°	14.0°	6.6°
L1-NB	4.9mm	3.2mm	6.1mm	1.7mm	2.2mm	0.2mm
Nasolabial	111.0°	114.8°	111.0°	100.6°	119.3°	119.5°
H-NB*	7-15°	10.9°	7-15°	11.8°	1.7°	1.0°

\*Norms correspond to ages 14 and 16.<sup>11-14</sup> Co-A (effective maxillary length) = linear distance between condylion and A point. Co-Gn (effective mandibular length) = linear distance between condylion and gnathion. Mx-MdDif = difference between Co-A and Co-Gn. H-NB = angle formed between H line (tangent to soft-tissue chin and upper lip) and NB line.

options were considered: extraction of four premolars or expansion of the maxillary arch and buccal tipping of the mandibular posterior teeth to gain space in both arches.<sup>15</sup> Because the crowding was considered moderate and the patient was young, we felt that extractions could make the profile too retrusive. Therefore, the second option was chosen.

### Treatment Progress

A Quad Helix\* expansion appliance was placed and activated for 5mm of expansion. After expansion was completed, fixed appliances were bonded in both arches to level and align the dentition. Larger archwires were used in the lower arch to tip the

posterior teeth buccally.

After seven months of leveling and alignment, a developing Class III relationship was noted on the right side, with the right central and lateral incisors in crossbite and slight deviations of the mandibular dental midline and chin to the left. To correct this Class III canine relationship, the anterior crossbite, and the midline deviation, we extracted the mandibular right first premolar. The patient and his parents were not concerned about the mild chin deviation, since it did not compromise his facial appearance.

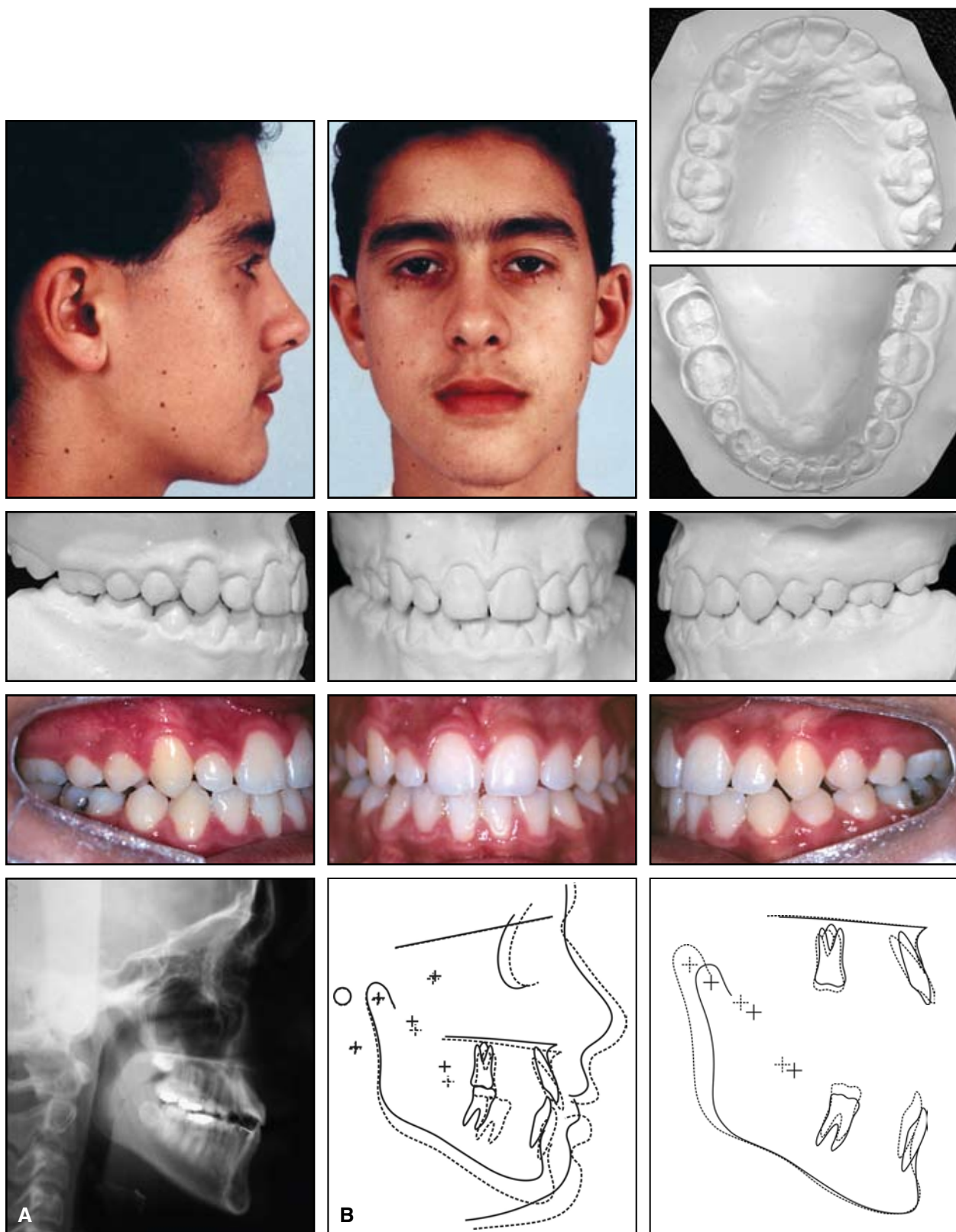
### Treatment Results

After 25 months of treatment, the fixed appliances were removed. The final occlusion showed a reasonable Class I canine relationship on both sides

and Class III and Class I molar relationships on the right and left sides, respectively (Fig. 2A). The maxillary incisors were tipped labially and the mandibular incisors slightly uprighted and retruded (Fig. 2B). Cephalometric analysis indicated an increase in the maxillomandibular differential toward a Class III malocclusion, along with a reduction in ANB (Table 1). A maxillary Hawley retainer was prescribed to be worn for two years. A 3-3 lingual retainer was bonded in the mandibular arch and was still in place eight years later.

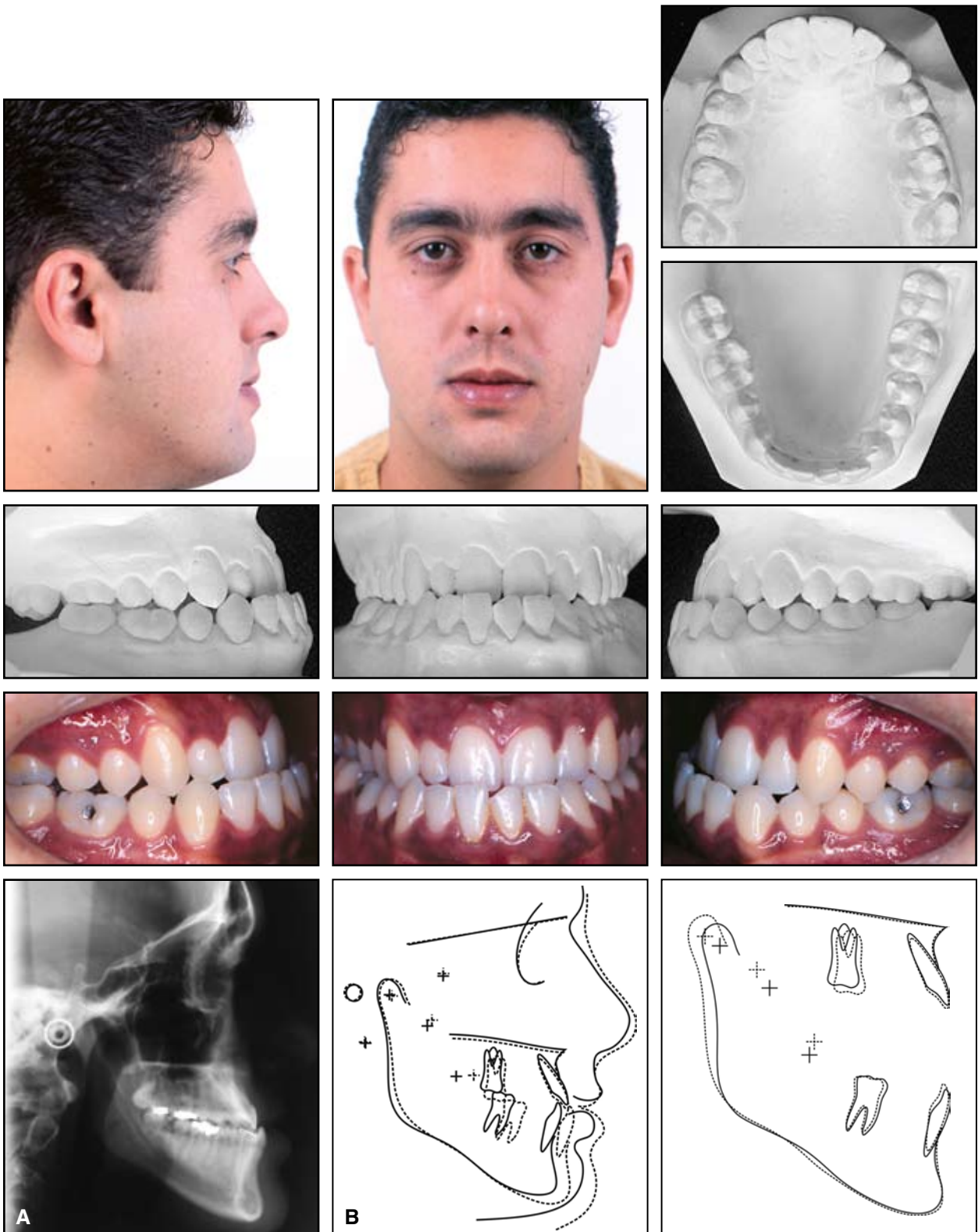
At age 24, the patient returned, complaining of lower lip protrusion and anterior crossbite. Clinical evaluation showed a unilateral Class III canine and molar relationship on the left side, with a negative overjet of 2mm (Fig. 3A). ANB had decreased to -4.2°,

\*Rocky Mountain Orthodontics, 650 W. Colfax Ave., Denver, CO 80204; www.rmortho.com.



**Fig. 2 A.** Patient after 25 months of fixed appliance treatment. **B.** Superimposition of pre- and post-treatment cephalometric tracings.





**Fig. 3 A.** Post-retention records taken eight years and two months after end of active treatment, showing unilateral Class III canine and molar relationship on left side. **B.** Superimposition of post-treatment and post-retention cephalometric tracings.



**Fig. 4** Bilateral Class II elastics in place, along with anterior intermaxillary elastic from palatal buttons on maxillary incisors to labial hooks on mandibular incisors.

and the maxillomandibular differential had increased by another 5.3mm (Fig. 3B, Table 1). Due to the severity of the malocclusion, the patient agreed to retreatment.

### Retreatment Options

We proposed two retreatment options: surgical-orthodontic correction with maxillary advancement, or orthodontic treatment involving extraction of the mandibular left first premolar.<sup>16,17</sup> Although the surgical-orthodontic approach was advocated as likely to provide superior results, the patient was extremely reluctant to undergo surgery and viewed his skeletal discrepancy as mild. Therefore, we proceeded with the nonsurgical option.

### Retreatment Progress

After extraction of the mandibular left first premolar, .022" × .028" preadjusted edgewise appliances were bonded in both arches. Leveling and alignment began with .014" and then .016" nickel titanium archwires. After three months, .016" stainless steel and .018" × .025" nickel titanium wires were placed in the upper

and lower arches, respectively, and asymmetrical anterior retraction was initiated in the lower arch. Bilateral Class III elastics were placed, with greater forces on the left side. An anterior intermaxillary elastic was attached from palatal buttons on the maxillary central incisors to labial hooks on the mandibular incisors (Fig. 4). This anterior elastic was worn for three months, until a positive overjet was obtained, while the bilateral Class III elastics were used until three months after closure of the left premolar extraction space, for a total of 10 months.

After finishing and detailing, the fixed appliances were removed and a maxillary Hawley plate and bonded mandibular 4-to-4 retainer were delivered. The patient was referred for restoration of the mandibular left central incisor and left first molar and the maxillary right lateral incisor. Total retreatment time was 27 months.

### Retreatment Results

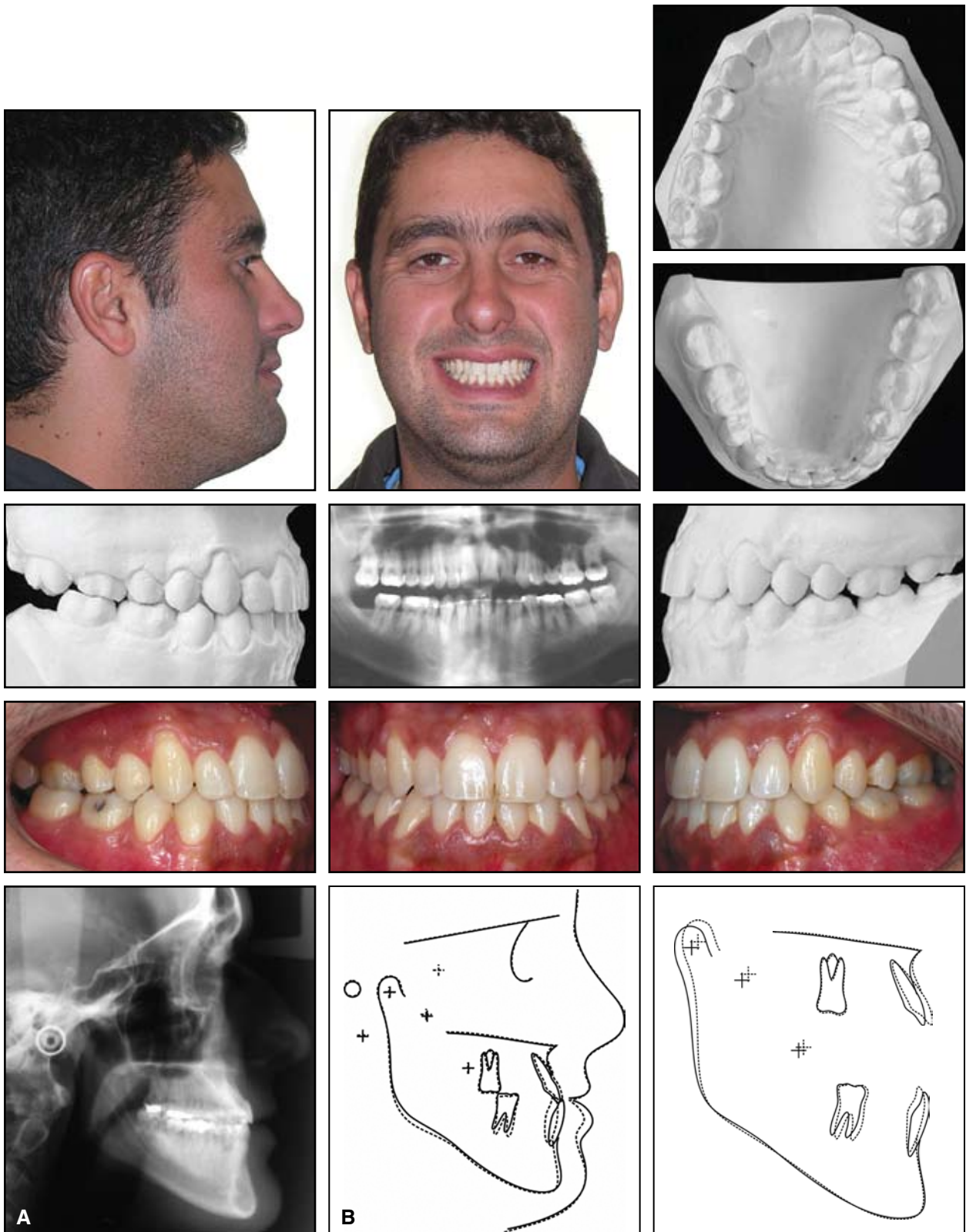
A significant improvement in the patient's occlusion resulted in a noticeably more esthetic pro-

file (Fig. 5A). Bilateral Class III molar and Class I canine relationships were achieved, and a slight maxillary protrusion and mandibular retrusion produced a clockwise rotation that improved the maxillomandibular relationship and reduced the facial concavity. The occlusal plane was rotated slightly counterclockwise, as is often the case when Class III elastics are used.<sup>7,18-21</sup> The maxillary incisors were tipped labially and protruded, and the mandibular incisors were lingually tipped and retruded, improving the lip position (Fig. 5B, Table 1). Mild root resorption was noted.

### Discussion

This patient's initial records could not have predicted his subsequent dental abnormality. He exhibited a Class I dental relationship, with no cephalometric indication of a developing Class III malocclusion.<sup>22,23</sup> The mandibular incisors showed a slight Class III tendency due to their subtle lingual inclination,<sup>6</sup> but such inclinations can also be found in Class II cases.<sup>24,25</sup> There was no family history of Class III malocclusion.

Seven months into treat-



**Fig. 5 A.** Patient after 27 months of retreatment. Radiographs show mild root resorption and minor maxillary protrusion and mandibular retrusion. **B.** Superimposition of post-retention and post-retreatment cephalometric tracings.

ment, the patient developed a Class III relationship on the right side. In an average male patient of this age, the effective mandibular length (Co-Gn) would be expected to increase twice as much as the effective maxillary length (Co-A).<sup>8,26</sup> In this patient, the effective maxillary length increased by 3.9mm during the treatment period, while the effective mandibular length increased by 9.6mm—1.8mm more than expected. The Class III relationship on the right side probably appeared as a consequence of this unusual mandibular overgrowth. Still, there were no clinically evident skeletal discrepancies, and treatment was resumed after extraction of the mandibular right first premolar.<sup>27</sup>

A more accentuated mandibular growth tendency continued in the post-treatment years, resulting in a complete Class III malocclusion on the left side. Maxillary protrusion (SNA) decreased by 2.5° and the effective maxillary length remained unchanged, while the effective mandibular length increased by 5.3mm (Table 1). This pattern produced a reduction in ANB and more of an increase in the maxillomandibular differential than would be expected in the patient's age group.<sup>28</sup> Therefore, it seems likely that the late Class III malocclusion was caused by an absence of maxillary growth in combination with an overgrowth of the mandible.<sup>28</sup> A more unusual aspect of this case is the asymmetrical manifestation of the Class III malocclusion, with an interval of several years between

the right and left sides.<sup>8,29</sup>

Unusual mandibular growth could be precipitated by condylar hyperplasia during or after orthodontic treatment. In this patient, however, we observed none of the common indications of hyperplasia, including severe facial asymmetry, excessive condylar neck length and/or head width, TMJ complaints, open bite on the affected side, a history of facial or mandibular trauma or injury, and hereditary or hormonal disturbances such as acromegaly.<sup>30-32</sup>

How could the late development of such an abnormal dental relationship have been prevented? After the unilateral Class III relationship developed on the right side, the case should have been handled as a Class III malocclusion, with follow-up visits scheduled every three months to monitor mandibular growth.<sup>33</sup> A chin cup or a functional appliance could have been prescribed until the end of the growth period.<sup>34</sup> Although relapse of Class II or Class III malocclusion is not uncommon, whether a patient has been treated with intermaxillary elastics,<sup>35</sup> headgear, or removable or fixed-functional appliances,<sup>36-38</sup> more active retention in this case might have reduced the Class III tendency or at least prompted early retreatment, when the discrepancy would have been more amenable to conservative orthodontics.

We are optimistic that our patient's skeletal correction will be stable, since he is now well beyond the active growth period.<sup>39,40</sup> The reasonably successful occlusal and esthetic results

obtained in retreatment of this case are a credit to the patient's excellent compliance in elastic wear, motivated in part by his reluctance to undergo surgery. He did finish with a less-than-ideal maxillary incisor display and an excessive mandibular incisor display, due to counterclockwise rotation of the occlusal plane from the use of Class III elastics. It seems evident that a surgical approach could have produced a superior skeletal correction and a somewhat more esthetic dental display. Since the patient's primary concerns were his dental alignment and avoidance of surgery, however, we feel that a reasonable result was obtained.<sup>1,41,42</sup>

### Conclusion

Careful observance of occlusal features suggesting a latent Class III tendency may help the clinician anticipate a delayed manifestation, either during or after treatment. Special attention should be given to patients exhibiting signs of such late growth, with active retention used to prevent relapse and follow-up visits scheduled every three months to monitor the patient's growth and occlusal relationship. Parents must receive detailed information on the pretreatment consent form and should understand that this kind of growth pattern is unpredictable and may complicate treatment, sometimes to the point of requiring surgery.

### REFERENCES

1. Stellzig-Eisenhauer, A.; Lux, C.J.; and Schuster, G.: Treatment decision in



- adult patients with Class III malocclusion: Orthodontic therapy or orthognathic surgery? *Am. J. Orthod.* 122:27-37, 2002.
2. Ghiz, M.A.; Ngan, P.; and Gunel, E.: Cephalometric variables to predict future success of early orthopedic Class III treatment, *Am. J. Orthod.* 127:301-306, 2005.
  3. Schudy, G.F.: Posttreatment craniofacial growth: Its implications in orthodontic treatment, *Am. J. Orthod.* 65:39-57, 1974.
  4. Ko, Y.I.; Baek, S.H.; Mah, J.; and Yang, W.S.: Determinants of successful chin-cup therapy in skeletal Class III malocclusion, *Am. J. Orthod.* 126:33-41, 2004.
  5. Ishikawa, H.; Nakamura, S.; Kim, C.; Iwasaki, H.; Satoh, Y.; and Yoshida, S.: Individual growth in Class III malocclusions and its relationship to the chin cap effects, *Am. J. Orthod.* 114:337-346, 1998.
  6. Ngan, P.; Hu, A.M.; and Fields, H. Jr.: Treatment of Class III problems begins with differential diagnosis of anterior crossbites, *Pediat. Dent.* 19:386-395, 1997.
  7. Ferro, A.; Nucci, L.P.; Ferro, F.; and Gallo, C.: Long-term stability of skeletal Class III patients treated with splints, Class III elastics, and chin-cup, *Am. J. Orthod.* 123:423-434, 2003.
  8. Love, R.J.; Murray, J.M.; and Mamandras, A.H.: Facial growth in males 16 to 20 years of age, *Am. J. Orthod.* 97:200-206, 1990.
  9. Bond, J.A.: Orthopedic/orthodontic treatment of a Class I malocclusion with a Class III skeletal pattern and maxillary deficiency: An American Board of Orthodontics case report, *Am. J. Orthod.* 91:429-437, 1987.
  10. Katz, M.I. and Berman, B.R.: An unexpected growth pattern: Considerations in management, *Int. J. Adult Orthod. Orthog. Surg.* 7:103-114, 1992.
  11. Riolo, M.; Moyers, R.; McNamara, J.; and Hunter, W.: *An Atlas of Craniofacial Growth*, Craniofacial Growth Series, Needham Press, Ann Arbor, 1974, p. 379.
  12. McNamara, J.A.: A method of cephalometric evaluation, *Am. J. Orthod.* 86:449-469, 1984.
  13. Scheideman, G.B.; Bell, W.H.; Legan, H.L.; Finn, R.A.; and Reisch, J.S.: Cephalometric analysis of dentofacial normals, *Am. J. Orthod.* 78:404-420, 1980.
  14. Holdaway, R.A.: A soft-tissue cephalometric analysis and its use in orthodontic treatment planning, Part I, *Am. J. Orthod.* 84:1-28, 1983.
  15. McNamara, J.A. and Brudon, W.L.: *Orthodontic and Orthopedic Treatment in the Mixed Dentition*, Needham Press, Ann Arbor, MI, 1995.
  16. Clifton, O.W.: Lower first premolar extraction: A viable alternative? *Am. J. Orthod.* 90:158-163, 1986.
  17. Creekmore, T.D.: Class III treatment planning: II, *J. Clin. Orthod.* 13:835-846, 1979.
  18. Janson, G.; de Souza, J.E.; Alves, F.A.; Andrade, P. Jr.; Nakamura, A.; Freitas, M.R.; and Henriques, J.F.: Extreme dentoalveolar compensation in the treatment of Class III malocclusion, *Am. J. Orthod.* 128:787-794, 2005.
  19. Kondo, E. and Arai, S.: Nonsurgical and nonextraction treatment of a skeletal class III adult patient with severe prognathic mandible, *World J. Orthod.* 6:233-247, 2005.
  20. Stewart, C.M.; Chaconas, S.J.; and Caputo, A.A.: Effects of intermaxillary elastic traction on orthodontic tooth movement, *J. Oral Rehab.* 5:159-166, 1978.
  21. Lin, J. and Gu, Y.: Preliminary investigation of nonsurgical treatment of severe skeletal Class III malocclusion in the permanent dentition, *Angle Orthod.* 73:401-410, 2003.
  22. Jacobson, A.; Evans, W.G.; Preston, C.B.; and Sadowsky, P.L.: Mandibular prognathism, *Am. J. Orthod.* 66:140-171, 1974.
  23. Battagel, J.: The aetiological factors in Class III malocclusion, *Eur. J. Orthod.* 15:347-370, 1993.
  24. Walkow, T.M. and Peck, S.: Dental arch width in Class II Division 2 deep-bite malocclusion, *Am. J. Orthod.* 122:608-613, 2002.
  25. Brenchley, M.L.: Is digit sucking of significance? *Br. Dent. J.* 171:357-362, 1991.
  26. Foley, T.F. and Mamandras, A.H.: Facial growth in females 14 to 20 years of age, *Am. J. Orthod.* 101:248-254, 1992.
  27. Janson, G.; Woodside, D.G.; Metaxas, A.; Henriques, J.F.C.; and Freitas, M.R.: Orthodontic treatment of subdivision cases, *World J. Orthod.* 4:36-46, 2003.
  28. West, K.S. and McNamara, J.A. Jr.: Changes in the craniofacial complex from adolescence to midadulthood: A cephalometric study, *Am. J. Orthod.* 115:521-532, 1999.
  29. Joondeph, D.: Retention and relapse, in *Orthodontics: Current Principles and Techniques*, ed. T.M. Graber and R.L. Vanarsdall, Jr., Mosby, Inc., St. Louis, 2000, pp. 985-1012.
  30. Egyedi, P.: Aetiology of condylar hyperplasia, *Austral. Dent. J.* 14:12-17, 1969.
  31. Feldmann, G.; Linder-Aronson, S.; Rindler, A.; and Soderstrom, U.: Orthodontic and surgical treatment of unilateral condylar hyperplasia during growth—a case report, *Eur. J. Orthod.* 13:143-148, 1991.
  32. Eales, E.; Jones, M.L.; and Sugar, A.W.: Condylar hyperplasia causing progressive facial asymmetry during orthodontic treatment—a case report, *Int. J. Paediat. Dent.* 3:145-150, 1993.
  33. Turley, P.K.: Orthopedic correction of Class III malocclusion: Retention and Phase II therapy, *J. Clin. Orthod.* 30:313-324, 1996.
  34. Deguchi, T.; Kuroda, T.; Minoshima, Y.; and Graber, T.M.: Craniofacial features of patients with Class III abnormalities: Growth-related changes and effects of short-term and long-term chin-cup therapy, *Am. J. Orthod.* 121:84-92, 2002.
  35. Riedel, R.A.: A review of the retention problem, *Angle Orthod.* 30:179-199, 1960.
  36. Janson, G.; Caffer, D.C.; Henriques, J.F.; Freitas, M.R.; and Neves, L.S.: Stability of Class II, division 1 treatment with the headgear-activator combination followed by the edgewise appliance, *Angle Orthod.* 74:594-604, 2004.
  37. Nanda, R.S. and Nanda, S.K.: Considerations of dentofacial growth in long-term retention and stability: Is active retention needed? *Am. J. Orthod.* 101:297-302, 1992.
  38. Teuscher, U.: A growth-related concept for skeletal class II treatment, *Am. J. Orthod.* 74:258-275, 1978.
  39. Kuc-Michalska, M. and Baccetti, T.: Duration of the pubertal peak in skeletal Class I and Class III subjects, *Angle Orthod.* 80:54-57, 2010.
  40. Alexander, A.E.; McNamara, J.A. Jr.; Franchi, L.; and Baccetti, T.: Semi-longitudinal cephalometric study of craniofacial growth in untreated Class III malocclusion, *Am. J. Orthod.* 135:700.e701-e714, 2009.
  41. Bilodeau, J.E.: Class III nonsurgical treatment: A case report, *Am. J. Orthod.* 118:560-565, 2000.
  42. Bilodeau, J.E.: Correction of a severe Class III malocclusion that required orthognathic surgery: A case report, *Semin. Orthod.* 2:279-288, 1996.