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Treatment of a Patient with Unerupted Mandibular Molars, Lateral Open Bite, and Class II Subdivision Malocclusion

José Nelson Mucha, DDS, MS, PhD[1]

This case report describes the treatment of a patient with three unerupted mandibular right molars and a lateral open bite in a Class II subdivision malocclusion with mandibular arch asymmetry. Sequential uprighting and traction of the three mandibular unerupted teeth with a compressed open-coil spring, reverse sliding jig, and light force system was used in the treatment and are described in detail. The results remained stable during the 8-year 6-month posttreatment and 4-year postretention periods. World J Orthod 2004;5:345–356.

Unerupted teeth are often encountered in orthodontic practice. The treatment and prognosis are influenced by various factors and may include a broad range of options. Many methods of treatment of unerupted teeth have been described.[1] These vary from passive observation, creation of space and the "watch and wait" approach, exposure with traction of the teeth, to a more aggressive decision to extract the teeth. Most clinicians find a solution somewhere between the extremes. Surgical exposure is often carried out, and an attachment is fixed to the unerupted tooth to allow traction. The force on the unerupted tooth can be provided by springs, neodymium iron magnets,[2] or elastics from a variety of fixed or removable appliances.

For the patient described in this article, three mandibular molars and a maxillary second molar on the same side were involved, which caused distal drifting of the mandibular teeth and mandibular arch asymmetry, with a Class II canine relationship on the right side. Specific orthodontic mechanics were used and are described.

CASE HISTORY

The patient was a Brazilian male, 17 years 6 months of age at the time of initial records. His chief concerns were that his "lower right teeth are delaying to erupt." The medical history was unremarkable, and there was no history of trauma or eruption problems associated with the primary dentition in this area. The patient had regular dental care, with a composite restoration on the maxillary left central incisor, as a result of previous trauma. No other significant medical or dental findings were contributory to this malocclusion.

DIAGNOSIS AND ETIOLOGY

Facially, the patient appeared to be symmetrical, and he had satisfactory lip support, with a good profile appearance. Skeletally, he had a mildly retrognathic mandible, with good chin prominence (Fig 1).

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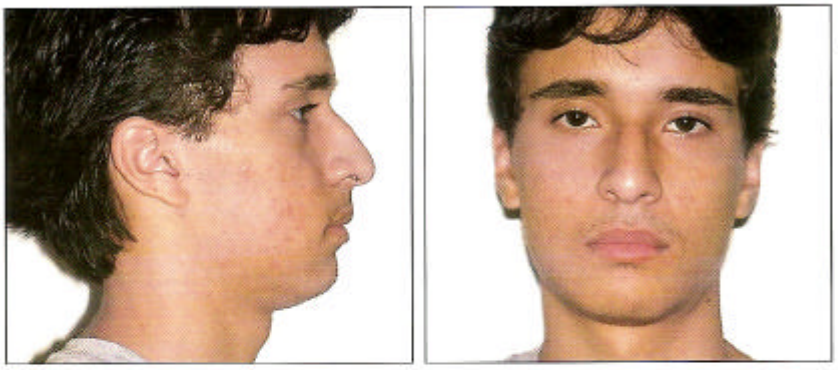


Fig 1 Pretreatment facial photographs (17 years 6 months of age).

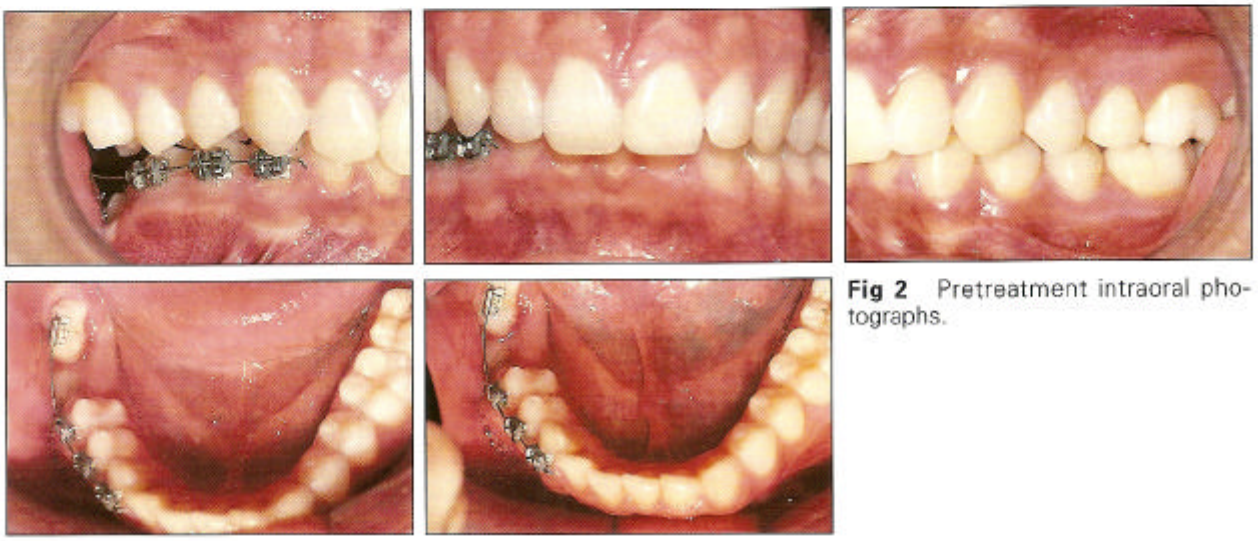


Fig 2 Pretreatment intraoral photographs.

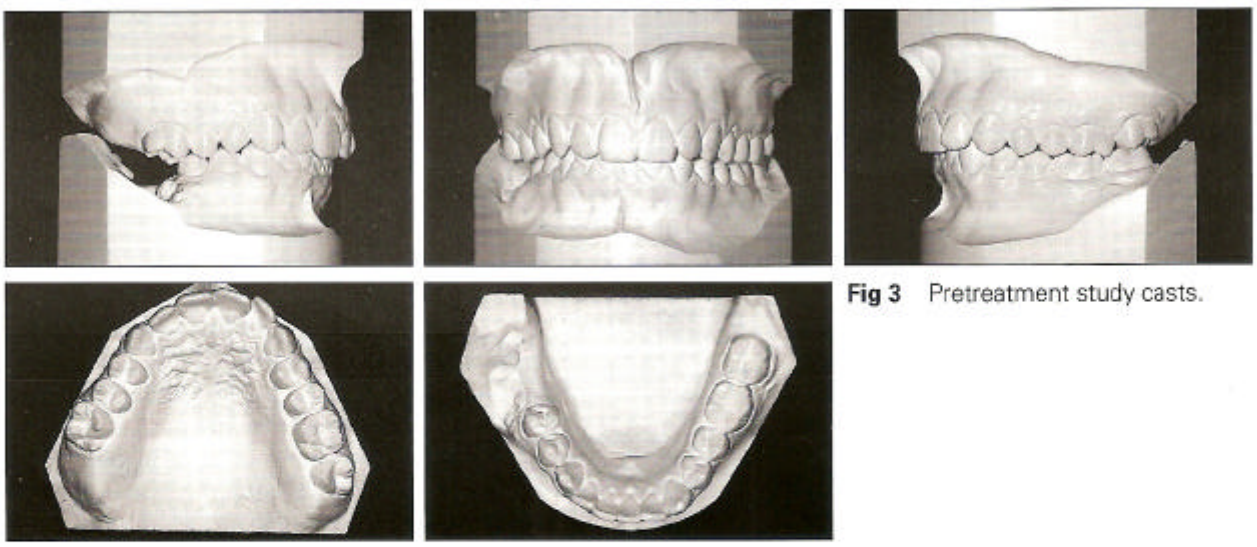


Fig 3 Pretreatment study casts.

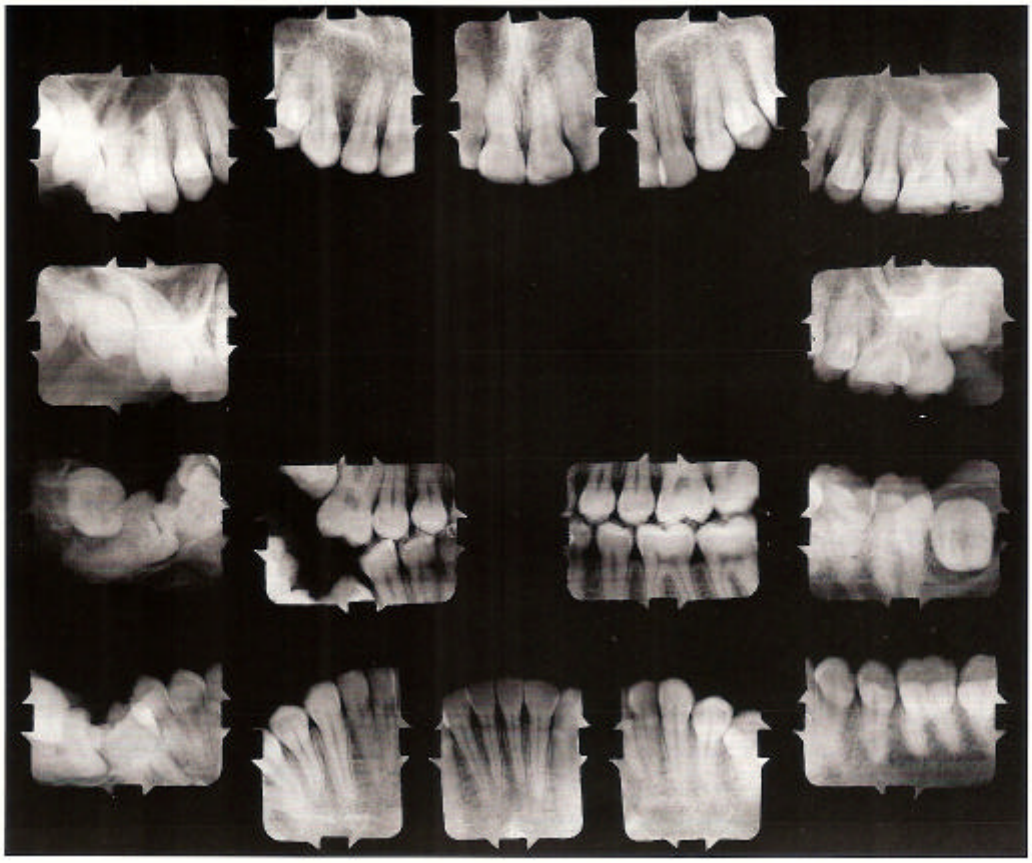
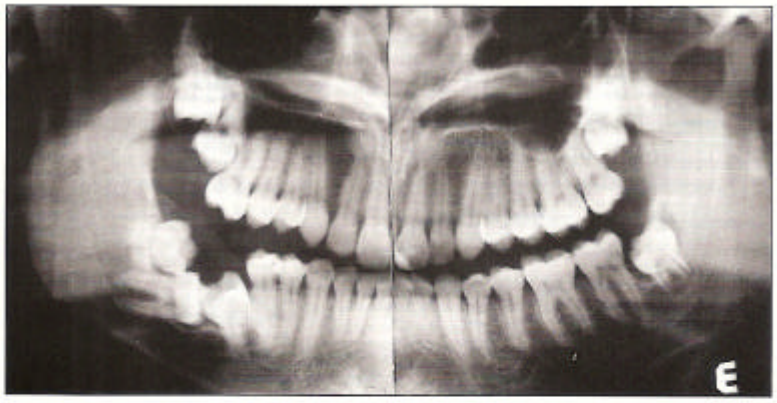


Fig 4 *(above)* Pretreatment periapical radiographs.

Fig 5 *(right)* Pretreatment panoramic radiograph.

Fig 6 *(below)* Pretreatment cephalometric radiograph.

Fig 7 *(below right)* Pretreatment cephalometric tracing.



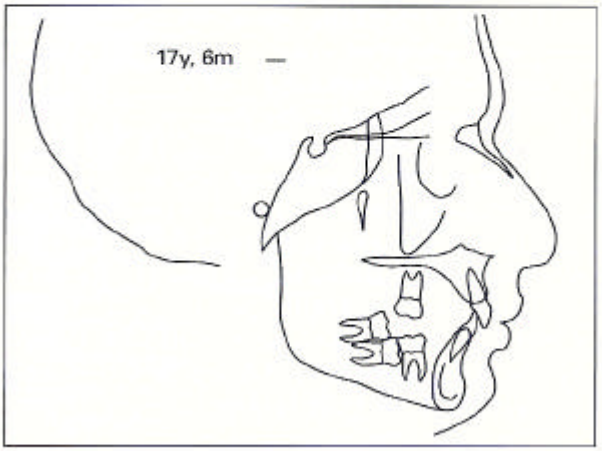


Table 1 Cephalometric summary

Measurement	Standard	17 y 6 mo	20 y	28 y 6 mo
Skeletal				
SNA (degrees)	80	83	83	82
SNB (degrees)	82	77	78	78
ANB (degrees)	2	6	5	4
Convexity angle (degrees)	+10 to −8.5	12	10	7
Y axis (degrees)	53 to 66	63	62	61
Facial angle (degrees)	82 to 95	85	87	89
SN-GoGn (degrees)	32	28	28	28
FMA (degrees)	25	19	20	18
Dental				
IMPA (degrees)	85 to 95	101	104	105
1-NA (degrees)	22	12	20	20
1-NA (mm)	4	3	4	5
1-NB (degrees)	25	25	30	30
1-NB (mm)	4	5	8	8
1-1 (degrees)	130	140	125	126
1-APo (mm)	1	0	4	4
Soft tissue				
Upper lip-S line (mm)	0	-1	0	−1
Lower lip-S line (mm)	0	-1	0	−1

The intraoral photographs and dental casts show that the patient had a Class II, Division 2, subdivision malocclusion, with a 7-mm overjet and 5-mm overbite. His maxillary midline was coincident with his facial midline, and the mandibular midline deviated 5 mm to the right (Figs 2 and 3). The right canine was in Class II malocclusion, with the maxillary first molar in crossbite. The mandibular dental arch anteroposterior asymmetry was about 7 mm from canine and premolar on one side to canine and premolar on the other side (see Fig 3).

The periapical radiographs and panoramic radiograph (Figs 4 and 5) also revealed the unerupted mandibular right first, second, and third molars, maxillary right second and third molars, and also the left third molars. The panoramic radiograph indicated no growth of the alveolar process in the mandibular unerupted molar area. There was a lack of space to accommodate all mandibular teeth in the unerupted area, and the mandibular right first molar had short roots.

The cephalometric radiograph and tracing (Figs 6 and 7) illustrated that the patient exhibited a mild mandibular retrognathia with relatively upright mandibular and maxillary incisors. The SNB angle of 77 degrees and an ANB angle of 6 degrees suggested a mildly retrognathic mandible. The IMPA angle of 101 degrees, the 1-NA of 12 degrees and 3 mm, and the 1-NB of 25 degrees and 5 mm confirms the malposition of the incisors (Table 1).

Partial or complete failure of posterior teeth to erupt produces a lateral (posterior) open bite. There are two possible causes: *(1)* mechanical interference with eruption, either before or after the tooth emerges from the alveolar bone; or *(2)* failure of the eruptive mechanism of the tooth, so that the expected amount of eruption does not occur. Mechanical interference with eruption may be caused by ankylosis of the tooth to the alveolar bone, which can occur spontaneously or as a result of trauma, or by obstacles in the path of the erupting tooth.[3]

Since the tooth fails to erupt, there is little or no growth of the alveolar process. This becomes clinically obvious when two or three adjacent teeth are involved; periapical radiographs can reveal the deficiency of interproximal bone.[4]

Many possible causes for asymmetries have been reported in the literature, including drifting and tipping of teeth.[5]

TREATMENT OBJECTIVES

1. *Facial esthetics.* Maintain the relationships among nose, upper lip, lower lip, and chin to assure a good facial profile.
2. *Occlusion.* Maintain the Class I occlusion on the left side and correct the Class II malocclusion to a Class I molar and canine relationship on the right side. Improve the mandibular arch asymmetry,

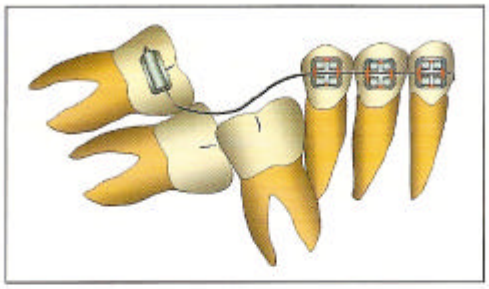


Fig 8 *(left)* Progress intraoral photograph.

Fig 9 *(right)* Treatment approach: segmented arch.

reduce the overjet and overbite, and correct the dental crossbite and posterior open bite.

3. *Maxillary dentition.* Level and align the teeth; slightly procline the incisors.
4. *Mandibular dentition.* Open space to allow eruption of the first and second molars and teeth leveling and alignment.

TREATMENT ALTERNATIVES

Treatment of patients with primary failure of eruption can be difficult and frustrating. If the patient truly has primary failure of eruption,[3] orthodontic force will likely be ineffective. The involved teeth tend to ankylose when orthodontic force is applied. Since an ankylosed tooth is perfect orthodontic anchorage, an effort to pull down a tooth that ankyloses soon after force is applied often results in intrusion of the contiguous teeth. This converts an isolated posterior open bite into a more general lateral open bite.[3]

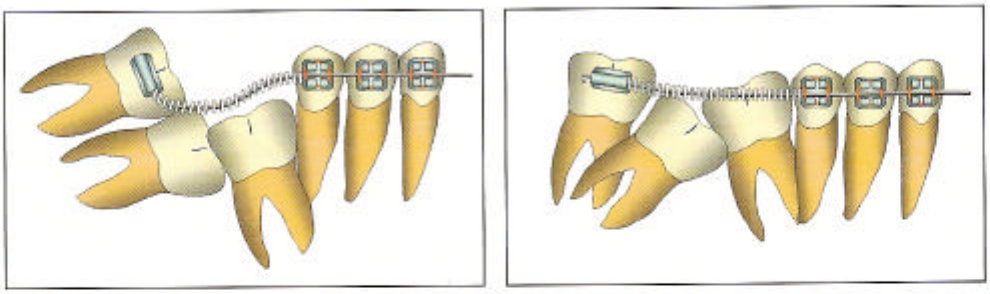
The main problem was to get space to move the unerupted teeth and align them in the mandibular arch. The first and easy option was to extract the mandibular right third molar. The problem was to confirm if the first and second molars were ankylosed. However, this would be difficult to confirm unless some tooth movement could be started. The second option was to extract the second molar and preserve the first and third molars. The available information strongly suggested that the extraction of second molars relieves crowding in the posterior segment of the arch, causes faster eruption of third molars, and diminishes the number of unerupted and/or impacted third molars.[6] However, it would require an extreme amount of surgical skill to extract the second molars without bone loss and with no tooth damage to contiguous molars. The third option was to extract the first molar instead of the second, but it also might compromise the other teeth and the bone level. The next possibility was to extract all affected teeth and place implants, but there was a lack of bone for this option, and the surgical procedures to improve the bone level could be difficult. On the other hand, cantilever prosthodontics could be an alternative, but in this event the Class II malrelationship would not be corrected. Bone resorption might continue and the occlusion remain untreated.

The treatment plan was to keep all teeth, to open space to confirm movement possibilities of all teeth, and then to extract one tooth, due to the lack of space, probably the third molar.

TREATMENT PROGRESS

The treatment plan consisted of opening space and testing the possibility of tooth movement of the three mandibular molars and to then correct the Class II malocclusion.

Appliances were placed using direct bonding. Morelli (Sorocaba, SP, Brazil) 0.022 × 0.028-inch slot standard edgewise appliances were used. Tube and brackets were initially set on the mandibular right third molar, second premolars, first premolars, and canine. The initial segmented leveling was accomplished with the use of 0.0155-inch coaxial stainless steel over an 8-week period (Figs 8 and 9). The main reason for this procedure was to test the possibility of movement of the third molar, and consequentially to open space. This was followed by placement of the appliances on all teeth, and a sequence of leveling with 0.016, 0.018, and 0.020 stainless steel archwires in the maxillary and mandibular arch. During this sequence, an open-coil spring was incorporated in the mandibular archwire to improve the space opening (Fig 10). The panoramic radiograph taken 9 months later (Fig 11), shows the spontaneous uprighting of the first and second molars and bone deposition under the teeth. In the maxillary arch, a 0.021 × 0.25-inch stainless steel archwire was used for anchorage. Once the mandibular arch was leveled, a continuous 0.018 × 0.022-inch stainless steel archwire was placed from third molar to second molar, except on the right first and second molars. A



Figs 10a and 10b Treatment approach: open-coil spring.

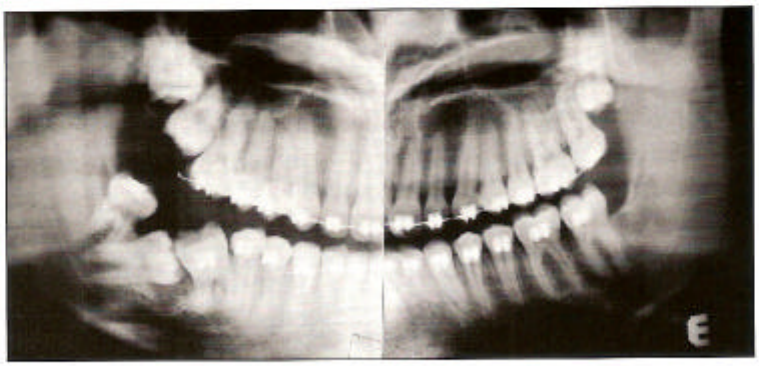


Fig 11 Progress panoramic radiograph.

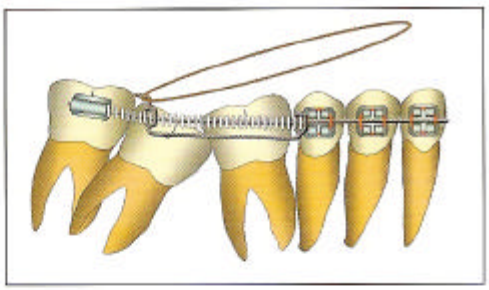


Fig 12 Treatment approach: reverse sliding jig.

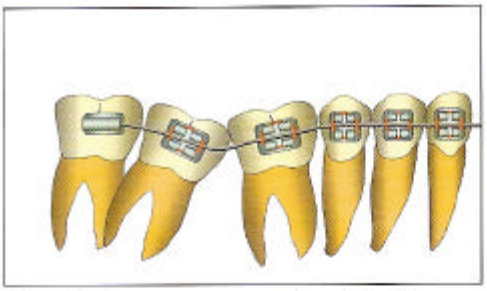


Fig 13 Treatment approach: re-leveling.

reverse sliding jig was placed and Class II elastics, with 150 g of force, were used to move the mandibular posterior teeth forward, extrude the posterior teeth, and close the posterior open bite (Fig 12). A 0.019 × 0.026-inch stainless steel archwire followed, with the reverse sliding jig, until enough space was achieved to incorporate the first and second molars. At this point, the mandibular arch was realigned and leveled, with 0.014-, 0.016-, and 0.018-inch nickel titanium archwires (Fig 13), a 0.19 × 0.026-inch stainless steel archwire to maintain original arch form and canine-to-canine distance, and Class II elastics with 150 to 200 g of force (Fig 14). Hooks were incorporated in the right posterior area in the maxillary and mandibular archwires. The mandibular archwire was segmented between the second premolar and first molar, and vertical elastics (100 to 150 g of force) were used during the final 2 months of treatment to settle the occlusion (Fig 15). The appliance was then removed, with the extraction of the mandibular third molar (Fig 16).

A maxillary circumferential removable retainer (wraparound) was used for retention; this was worn 24 hours a day for the first 6 months and at night only for another 6 months. A mandibular lingual bonded retainer, with a 0.028-inch round stainless steel wire from canine to canine, was used posttreatment for 4.6 years.

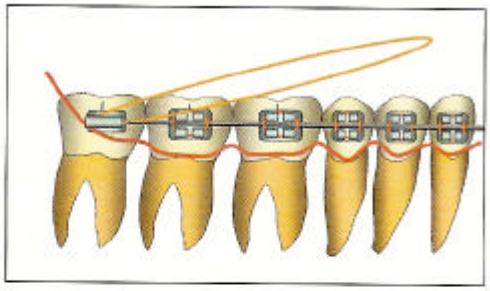


Fig 14 Treatment approach: Class II elastics.

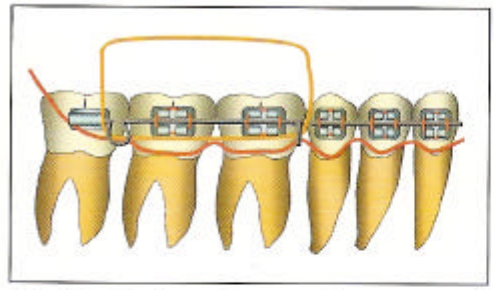


Fig 15 Treatment approach: segmented arch with vertical elastics.

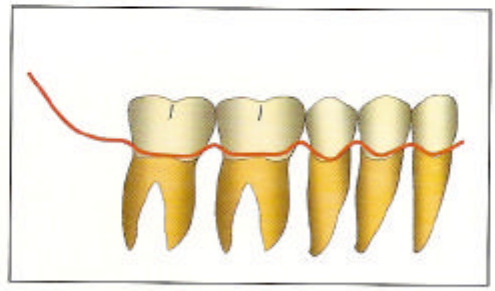


Fig 16 Treatment finishing with third molar extraction.

TREATMENT RESULTS

1. *Facial esthetics.* The overall good facial esthetics were maintained (Fig 17).
2. *Occlusion.* The Class I molar relationship on the left side was maintained, and a Class I molar and canine relationship on the right side was achieved. The mandibular arch asymmetry was corrected, excessive overjet and overbite were reduced, and the dental crossbite and posterior (lateral) open bite were corrected (Figs 18 and 19).
3. *Maxillary dentition.* The dental arch was leveled and arch form improved (see Fig 19).
4. *Mandibular dentition.* The collapse in the posterior region was eliminated, the third molars were extracted, and the arch achieved good leveling and alignment. The mandibular incisors were slightly proclined. The dental casts (see Fig 19) show a Class I canine and molar occlusion with normal overjet and overbite, and midline corrected.
5. *Function.* The patient exhibits canine and incisor guidance in mandibular movement, without occlusal interferences and with centric occlusion in same position as maximum intercuspation.

The periapical radiographs revealed root parallelism and confirmed that no pathosis or root resorption had occurred. It is important to note that the mandibular right first molar had short roots at the beginning of treatment (Fig 20).

The posttreatment cephalometric radiograph, tracing, and superimposition (Figs 21 to 23) illustrate the changes that were achieved with treatment. The mandibular incisors were proclined to an IMPA angle of 104 degrees and a 1-NB from 5 mm to 8 mm (see Table 1). The composite tracing illustrates these modifications (see Fig 23).

The results remained stable during the 8-year 6-month post treatment and 4-year postretention periods (Figs 24 to 30).

DISCUSSION

The reported case presents some characteristics that can generate several treatment alternatives. For the lack of space in the posterior area, the best option is to obtain space for the dental movement. There are many ways to get space, and the treatment approach was initially more conservative. As the space was obtained, new bone was deposited below these teeth. At the same time that the space was achieved, the Class II malocclusion, caused by the collapse of the unerupted teeth, was corrected with the use of the compressed open-coil spring and Class II elastics. In addition to the open-coil spring, a

Fig 17 Posttreatment facial photographs (20 years of age).

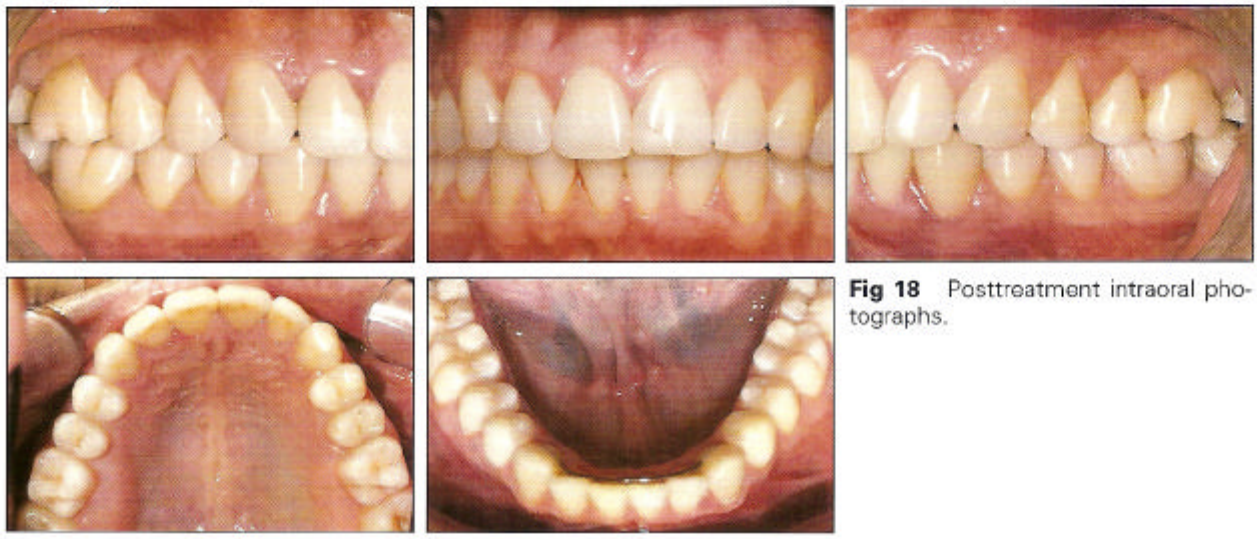


Fig 18 Posttreatment intraoral photographs.

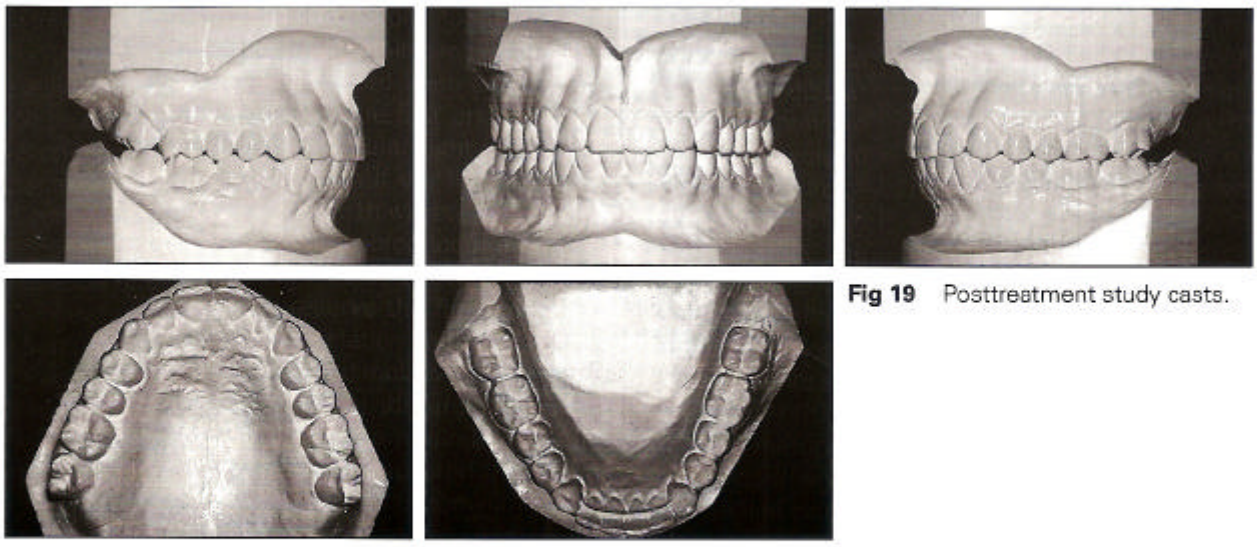


Fig 19 Posttreatment study casts.

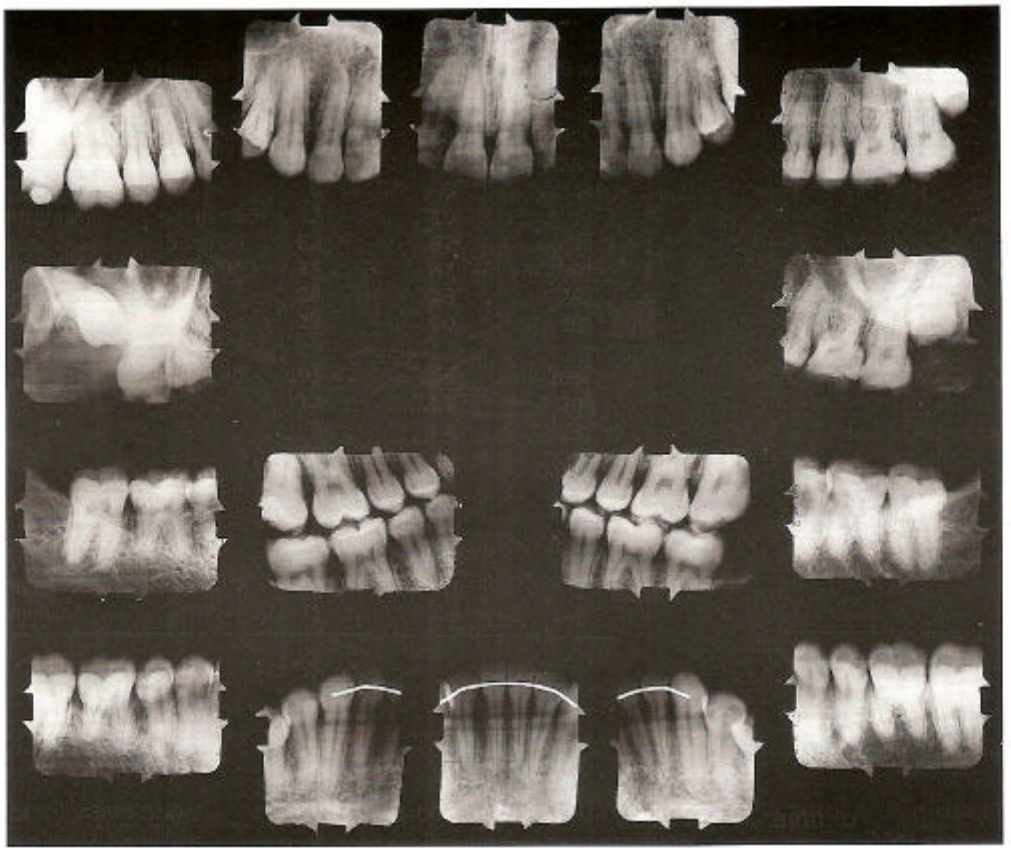


Fig 20 Posttreatment periapical radiograph.

Fig 21 *(above)* Posttreatment cephalometric radiograph.

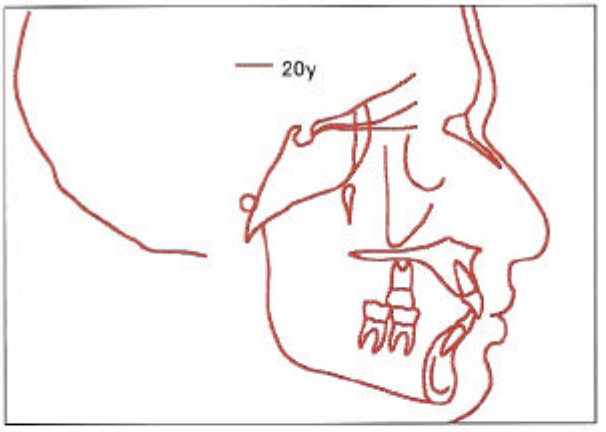


Fig 22 *(top right)* Posttreatment cephalometric tracing.

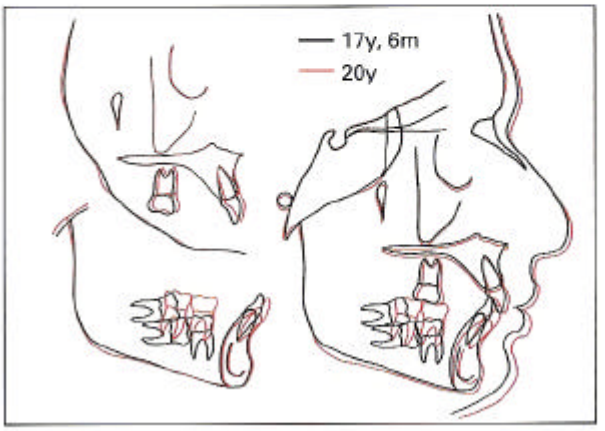


Fig 23 *(right)* Superimposed cephalometric tracings.

Fig 24 Postretention facial photographs (28 years 6 months of age).

Fig 25 Postretention intraoral photographs.

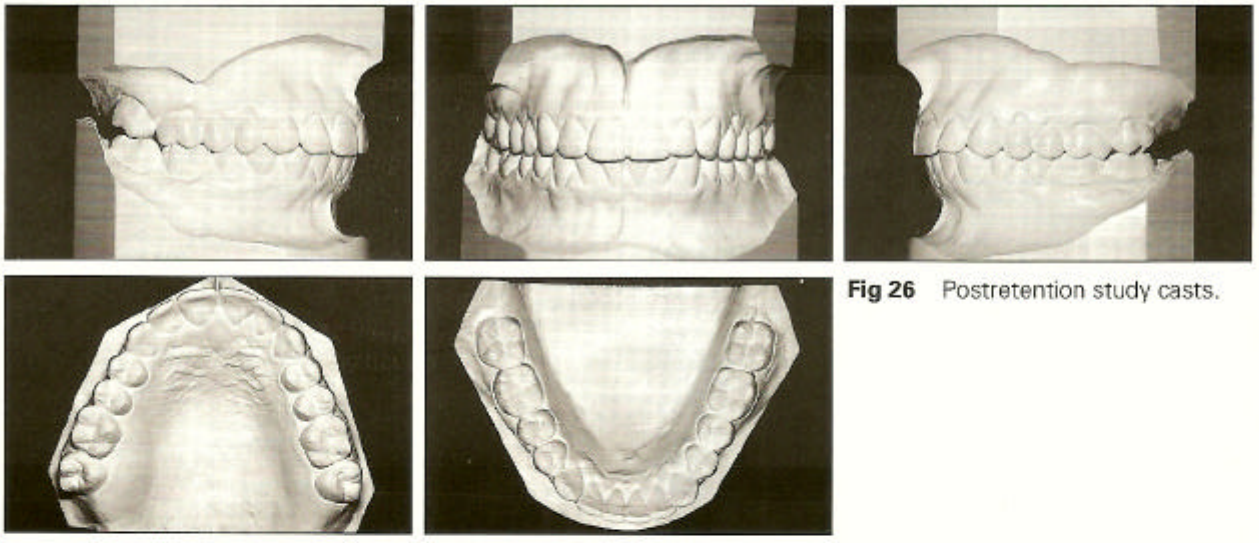


Fig 26 Postretention study casts.

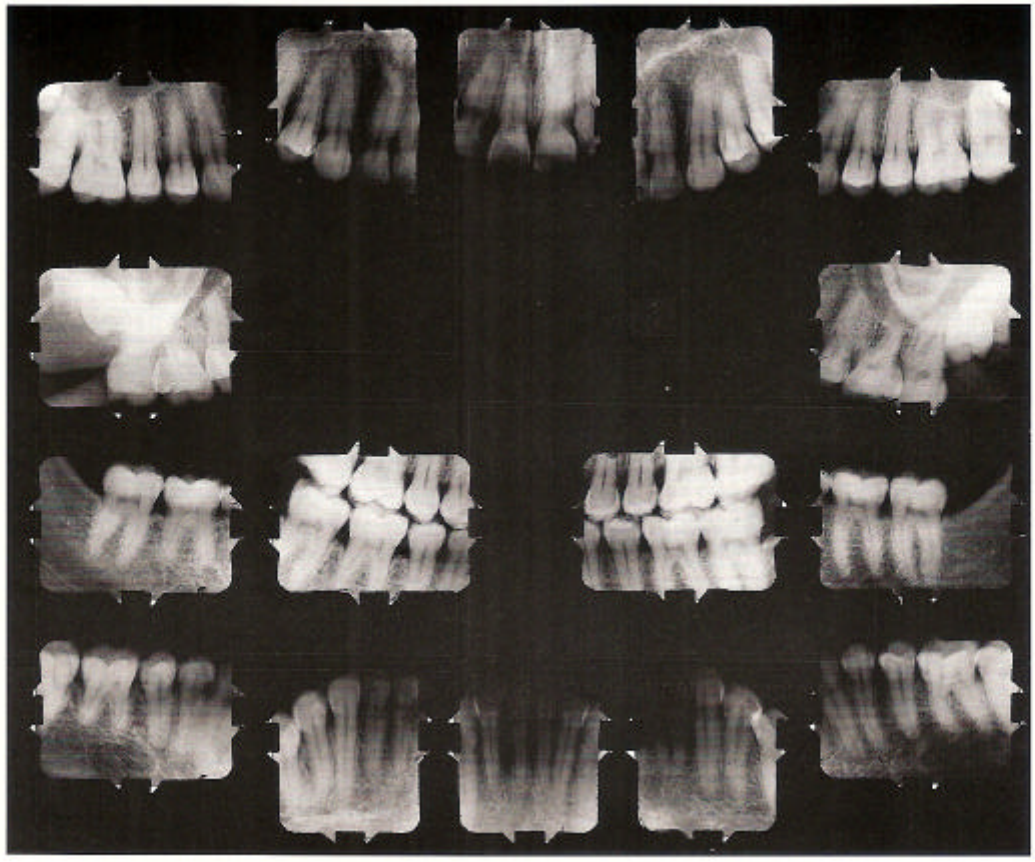
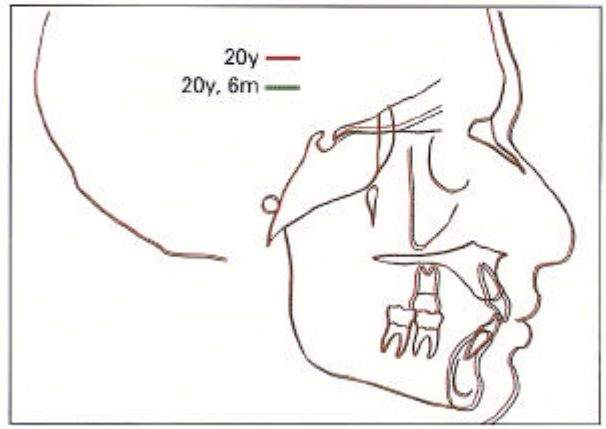


Fig 27 *(above)* Postretention periapical radiograph.

Fig 28 *(right)* Postretention panoramic radiograph.

Fig 29 *(below)* Postretention cephalometric radiograph.

Fig 30 *(below right)* Postretention cephalometric tracings.



reverse sliding jig with Class II elastics, with 150 grams of force, and Class II mechanics from the mandibular right third molar against the stabilized maxillary archwire allowed better forward movement of the collapsed mandibular arch. The Class II mechanics approach was used to correct the Class II subdivision and the mandibular arch asymmetry, with little labial inclination of mandibular incisors, still stable 8 years posttreatment, with optimal facial esthetics.

The impacted maxillary third molars were not removed; their removal might have been a treatment choice when the mandibular extraction was performed. However, their presence has not compromised the results, even more than 8 years later.

ACKNOWLEDGMENT

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