

Absence of multiple premolars and ankylosis of deciduous molar with cant of the occlusal plane treated using skeletal anchorage

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ABSTRACT

Ankylosis and the absence of premolars are two relatively common conditions encountered in the field of orthodontics. However, the absence of multiple premolars, particularly two adjacent premolars, along with ankylosis of deciduous teeth, is unusual. Herein, we present a case report and discuss some aspects related to these abnormalities. A 15-year-old boy was missing the upper right first and second premolars and the lower right and left second premolars. In addition, the deciduous lower left second molar was ankylosed and in infraocclusion, causing canting of the occlusal plane. The patient was treated with a mini-implant to correct the Class II malocclusion on the left side and a miniplate to correct the cant of the occlusal plan. After treatment, the upper right space was kept closed, with the canine in contact with the first molar, and the lower left space was opened to an implant-prosthetic rehabilitation. (*Angle Orthod.* 2015;85:134–141.)

KEY WORDS: Premolar absence; Cant of the occlusal plane; Class II malocclusion; Skeletal anchorage

INTRODUCTION

Absence of premolars is a relatively common abnormality that occurs with a frequency of about 1.5% in the upper dentition and 3% in the lower dentition.¹ However, in almost all cases, only one premolar is missing. The absence of both the first and second premolars on the same arch is rare and has been described in the literature only a few times, mainly in cases of oligodontia.² This condition is treated by closing the space orthodontically, by keeping the deciduous molar in position, or by restoring the space using implants and prostheses.^{3–8}

Ankylosis of deciduous teeth is another common condition, affecting about 6% of children and adolescents, and it is frequently observed in primary molars.^{9–11} The optimum time to extract the ankylosed teeth is of great concern and must be decided based on the age of the patient, the amount of growth expected, the level

of infraocclusion established, and, most importantly, the treatment plan: whether it is based on closing the space or opening it for restoration.^{3,10,12–14}

Canting of the occlusal plane is an abnormality that was difficult to treat orthodontically in the past. However, with the development of skeletal anchorage, this treatment has become easier, and there is no longer a need for patient compliance, as was the case with bite blocks, elastics, and headgear.¹⁵

Herein, we present a case report of a rare condition of ankylosis, absence of four premolars, and cant of the occlusal plane that was orthodontically treated by using skeletal anchorage with mini-implant and miniplate.

CASE REPORT

Diagnosis and Etiology

The parents of a 15-year-old boy sought orthodontic treatment for him because of an overretained lower left deciduous molar and an impaired smile. Facial analysis revealed a mesodivergent facial pattern, a straight profile, and a gummy smile, which was impaired by the accentuated overbite and the cant of the occlusal plane (Figure 1). The upper midline was deviated 3 mm to the right, and the lower midline was deviated 2 mm to the left. Clinical examination showed the molars in a Class II relationship, the canines in a Class II relationship on the left side and a Class I relationship on the right side, the lower left second

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Figure 1. Initial facial photographs.

deciduous molar in infraocclusion, and the absence of the upper right premolars and lower second premolars. The overbite was 100%, and the overjet was 4 mm. The occlusal plane had an accentuated inclination with the left side displaced downward, probably because of the infraocclusion of the lower left deciduous molar and the inclination of the adjacent permanent teeth toward the deciduous molar (Figures 2 and 3). Radiographic examination revealed the absence of both the upper right premolars and the lower left second premolar (Figure 4). The patient was referred to us at age 19, after 4 years of treatment by another orthodontist. His occlusal features were very similar to his initial condition (Figure 5).

Treatment Objectives

The objective of the treatment was to align and level both arches, thus reducing the accentuated overbite and eliminating the cant of the occlusal plane. The lower left deciduous molar was recommended for extraction and the space replaced by either an implant and prosthesis or prosthesis alone.

Treatment Alternatives

Three treatment alternatives were proposed and discussed with the patient's parents. The first option was to extract the upper left first premolar, open the space between the upper right canine and first molar, and restore the space with an implant and prosthesis. At the end of treatment, a Class I molar relationship would be established on the right side and a Class II relationship would be established on the left. The cant of the occlusal plane would be corrected with a miniplate positioned on the left side of the maxilla. The patient's parents refused this option because of the permanent tooth extraction and the necessity of placing another implant after treatment. The second option proposed was orthodontic-surgical treatment, with repositioning of the maxilla to correct the cant of the occlusal plane and eliminate the gummy smile. However, the parents refused any orthognathic type of treatment. The third option was distalizing the upper left teeth to reach Class I molar and canine relationships, extracting the lower left deciduous molar, and making the adjacent teeth upright, thus opening the



Figure 2. Initial intraoral photographs.

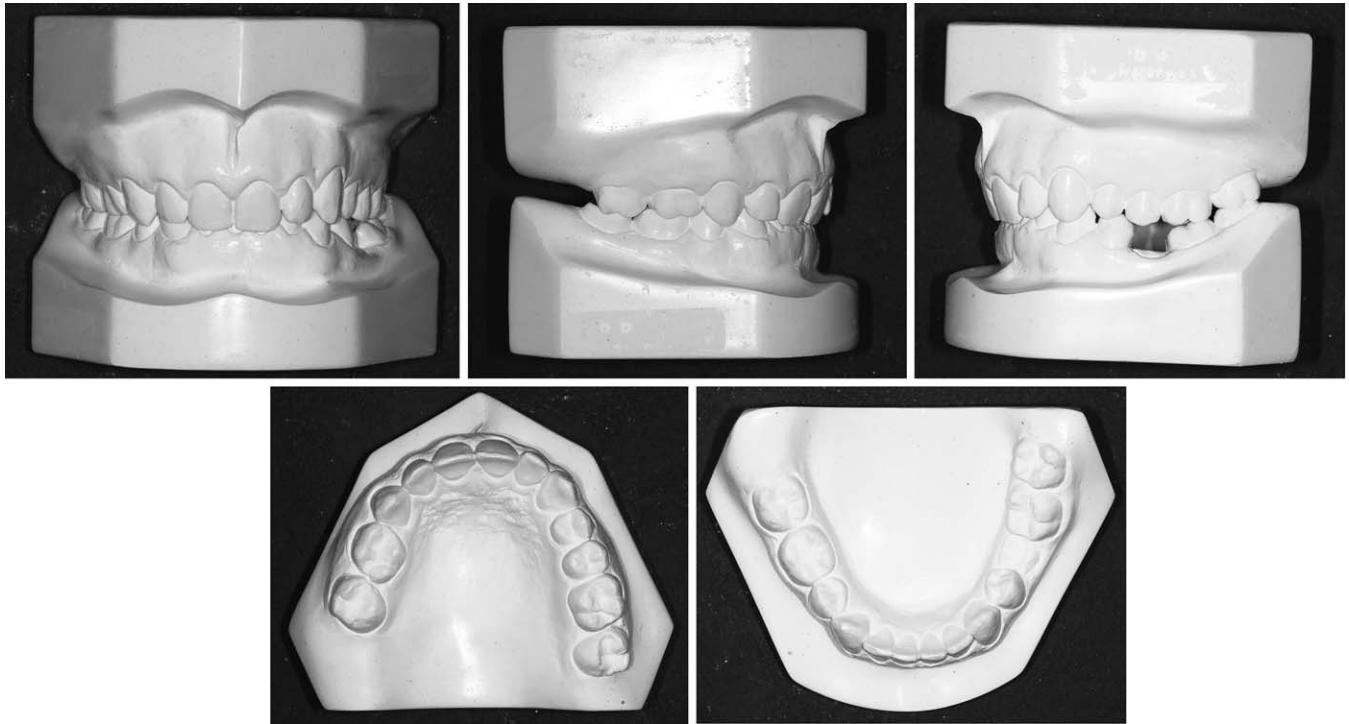


Figure 3. Initial dental casts.

space to allow an implant-prosthetic restoration. The cant of the occlusal plane would be corrected with a miniplate as described in the first option.

Treatment Progress

Fixed 0.022 × 0.028-inch MBT prescription brackets (3M/Abzil, São Paulo, Brazil) were bonded on the upper arch, and the alignment and leveling were performed using 0.014-inch nickel-titanium to 0.020-

inch stainless-steel archwires. After that, a mini-implant was inserted between the upper left premolars and was used as an anchorage to move the upper right dentition posteriorly into a Class I relationship (Figure 6a–c). A mini-implant would have been used as anchorage to correct the cant of the occlusal plane; however, it showed certain mobility and would not have been able to tolerate the necessary load. Instead, a miniplate was inserted on the left side of the maxilla to be used as an anchorage unit to intrude the upper

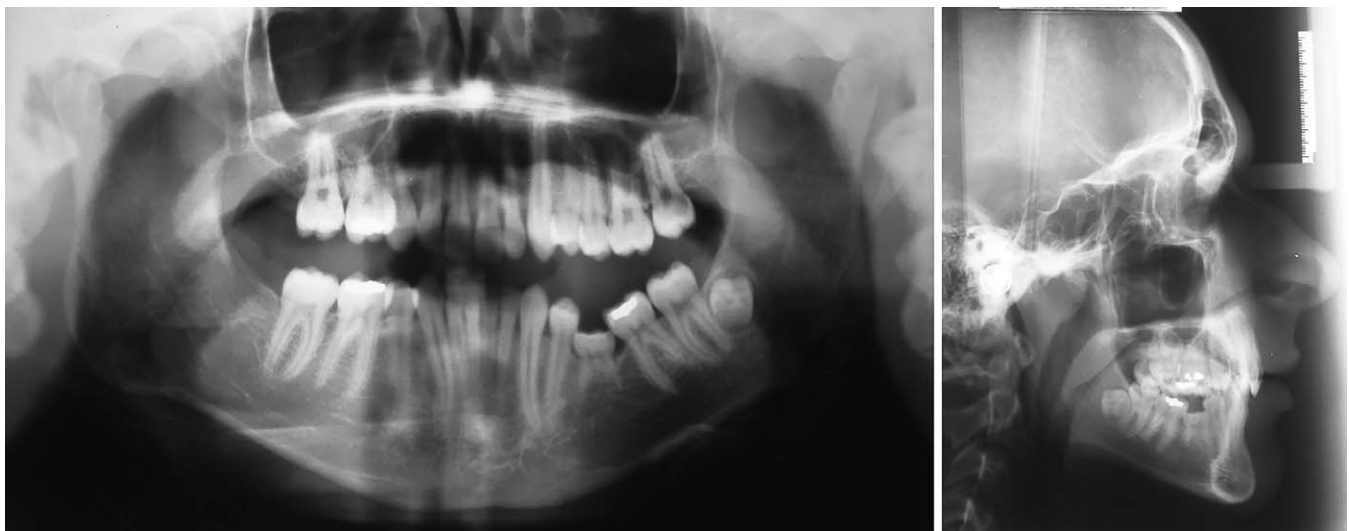


Figure 4. Initial panoramic radiography and telerradiography.



Figure 5. Intraoral condition, panoramic radiography, and teleradiography 4 years after first treatment.

left teeth with two cantilevers made with 0.018×0.025 -inch titanium-molybdenum wire, connected to two tubes on the miniplate and tied on the archwire. In addition, a transpalatal bar connecting the upper first molars was used to avoid buccal inclination on the left side (Figure 6d,e). On the lower arch, the same brackets were bonded, and partial arch anchorage was used from the lower right second molar to the canine and from the lower left second molar to the first molar. A 0.018×0.025 -inch stainless-steel intrusion archwire was inserted in an auxiliary tube and used until the lower arch was leveled. Following this, a continuous archwire was used to finish the alignment and leveling. After the maxillary occlusal plane was corrected, intermaxillary elastics were used on the left side, from the miniplate to the lower arch, to extrude the lower left side.

At the end of treatment, the facial pattern was symmetrically similar (Figure 7). The upper dental midline was coincident with the facial midline, the lower midline was 0.5 mm to the left, and the occlusal plane was corrected. Likewise, excellent intercuspation was obtained, with normal overbite and overjet, and a 7-mm space was left for implant replacement of the lower left premolar (Figures 8 and 9). Panoramic radiography revealed good parallelism among the roots and absence of resorptions; moreover, a good space for implant-prosthetic rehabilitation was obtained in the region of the lower left second premolar. Cephalogram and cephalometric superimpositions revealed an accentuated change on upper and lower incisor inclination and in the anteroposterior and vertical position as well (Figures 10 and 11; Table 1).

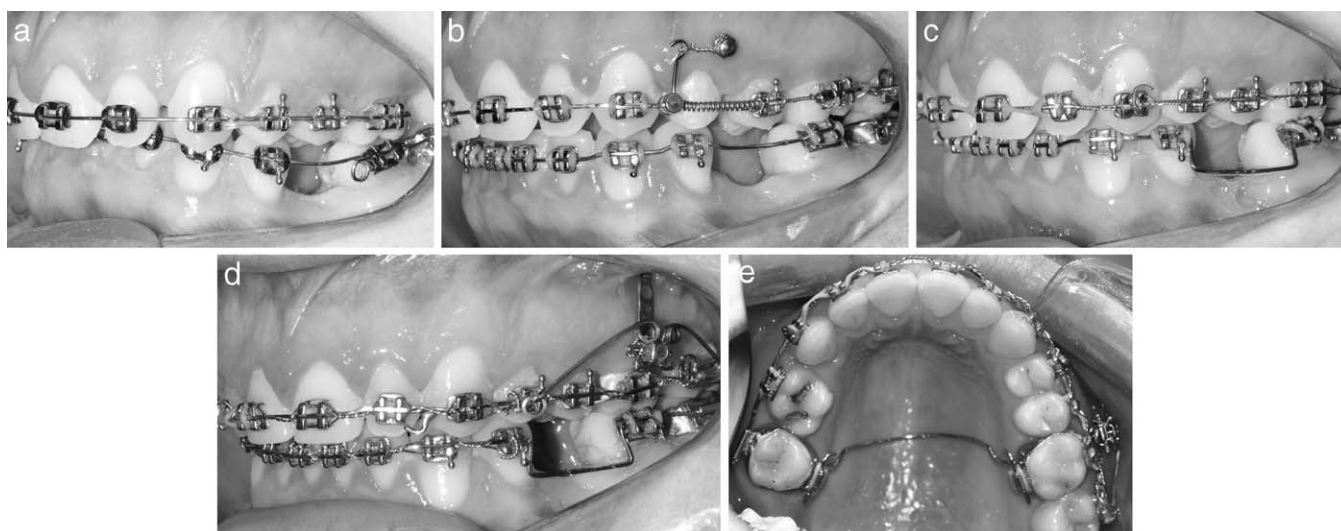


Figure 6. Intraoral mechanic sequence. (a) Distalization of molars. (b) Distalization of second premolar. (c) End of the distalization. (d) Miniplate and cantilevers to correct the cant of the occlusal plane. (e) Transpalatal bar to avoid buccal inclination of the upper left teeth during the intrusion.



Figure 7. Posttreatment facial photographs.

DISCUSSION

Absence of two adjacent premolars has been reported only few times in the literature (other than in situations of severe hypodontia or oligodontia) and may be associated with a failure of *MSX1* gene expression.² In this case, there were four missing premolars, two of which were missing from the same quadrant; moreover, this patient had ankylosis of a deciduous molar, because of which this case was even more unusual.

The timing of extracting an ankylosed deciduous molar is critical and must be well defined by the orthodontist. Improper timing of the extraction may

result in the alveolar bone being reduced in height and width mainly on the buccal surface, thereby jeopardizing implant restoration.^{3,12,13} According to Ostler and Kokich¹³ and Kokich and Kokich,³ in the first 4 years after an extraction, there is 25% bone loss and more than 5% loss per year every year thereafter in an adolescent. However, if the patient has some growth expected, the ankylosed tooth should be extracted as soon as possible to avoid greater bone defects. In this case, the lower deciduous molar was ankylosed for a long time and therefore had a remarkable infraocclusion, with accentuated inclination of the adjacent teeth



Figure 8. Posttreatment intraoral photographs.



Figure 9. Posttreatment dental casts.

toward it and extrusion of the upper teeth, thus canting the occlusal plane.

As the patient had previously undergone 4 years of orthodontic treatment, we proposed the use of skeletal anchorage to reduce the time of retreatment and avoid conventional mechanics to correct Class II malocclusion and cant of the occlusal plane. Accordingly, we planned to use a mini-implant inserted between the first and second upper left premolars, to distalize the upper left molars and second premolar. With the Class

I relationship reached, the mini-implant was used as an anchorage to intrude the upper left posterior teeth to correct the cant of the plane. However, as the mini-implant showed some mobility after the distalization, it was considered inefficient for use as an anchorage to intrude a group of teeth. Instead of using another mini-implant, a miniplate was chosen owing to the higher stability obtained with this device.^{16,17} The mini-implant was the first choice because it is easier to insert and remove in comparison with the miniplate, requiring a

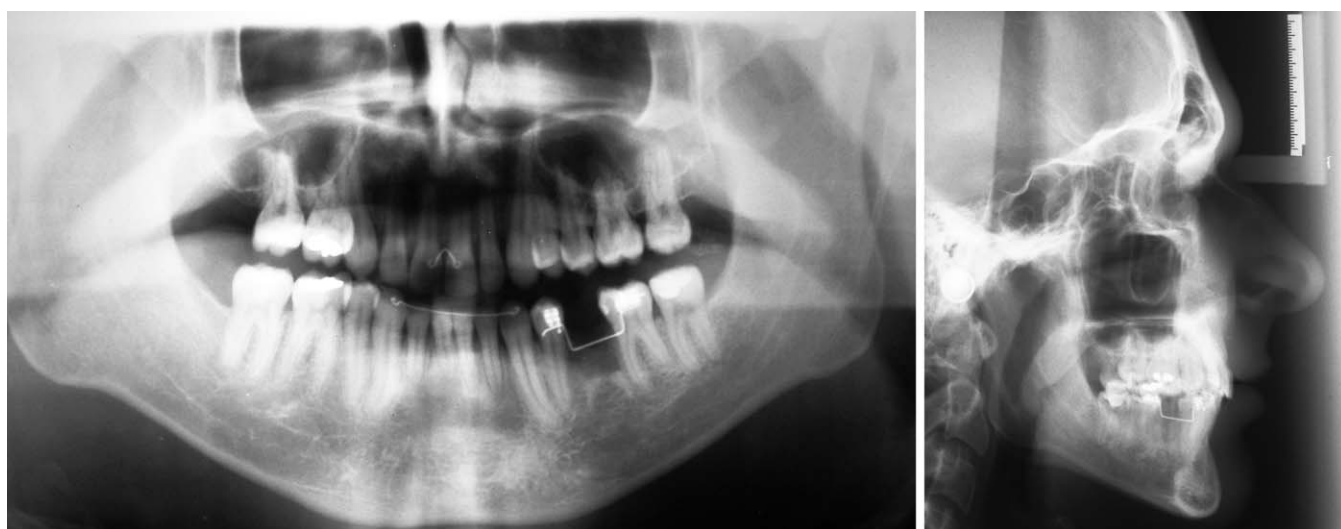


Figure 10. Posttreatment panoramic radiography and telerradiography.

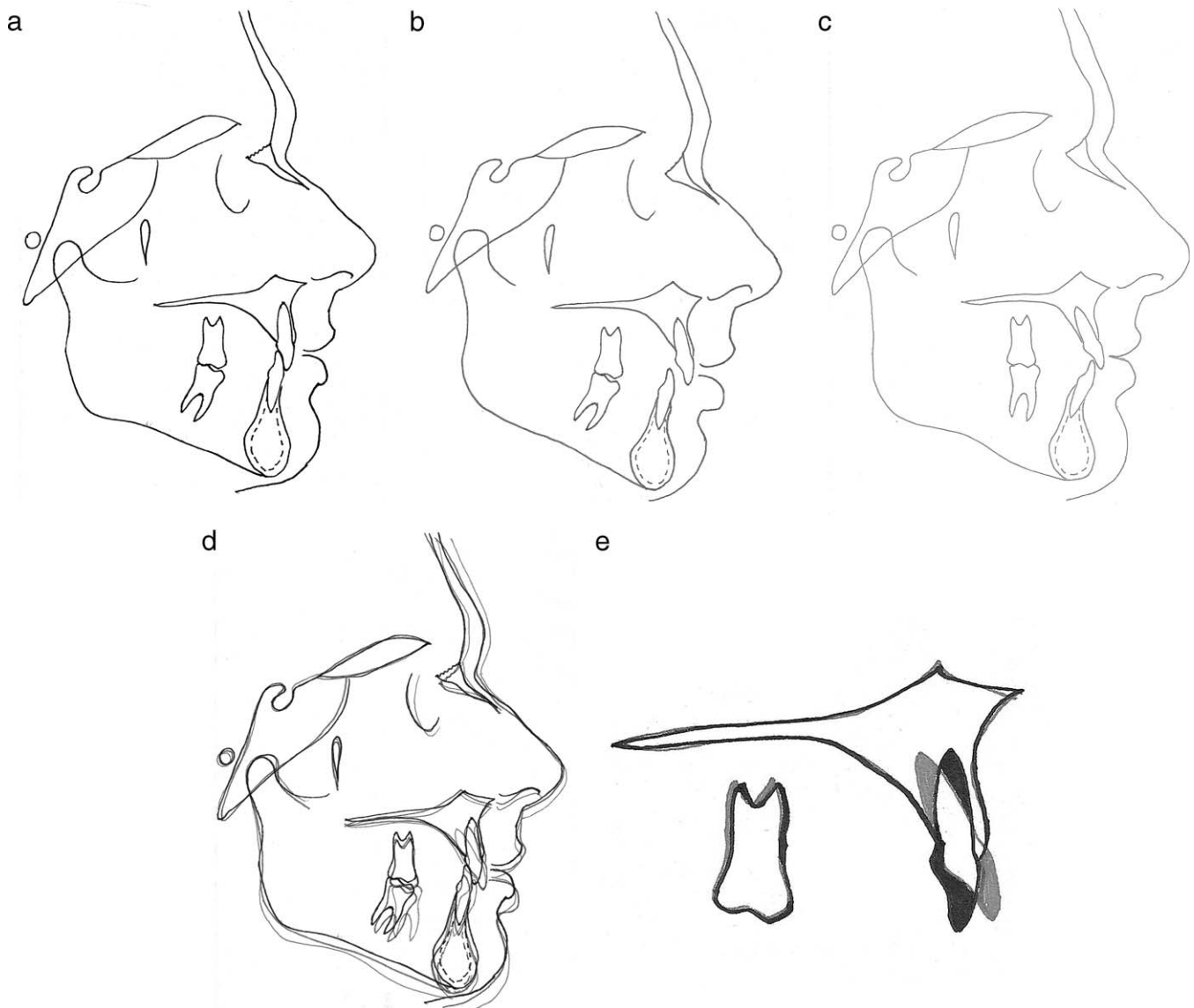


Figure 11. (a) Initial cephalometric tracing. (b) Retreatment cephalometric tracing. (c) Posttreatment cephalometric tracing. (d) Total superimposition registered in Sella (S). (e) Maxillary dental superimposition registered in the internal contour of the palate.

less complex surgical procedure. Others authors have already described successful corrections of occlusal-plane deviations with miniplates as being particularly advantageous with respect to anchorage reliability, reduced treatment time, and lack of requirement of patient compliance.^{18,19} We opt for titanium-molybdenum wire to made the cantilevers for intrusion instead of elastics connected to the miniplate because these cantilevers, made with helicoids, have a high resilience, delivering a constant force for a long period of time and consequently not needing to be activated frequently.

Sarver and Weissman²⁰ described the incisors' torque as an important element in the treatment of open bite and deep bite cases. Furthermore, they highlighted the importance of incisors' torque on gingival display. When incisors are detorqued, as in

the case described here, they seem extruded, and the gingival exposure (gummy smile) is increased. Therefore, because the patient's parents refused orthognathic surgery, he was treated by means of torque modification and slight intrusion of the upper incisors, which reduced the gingival exposure on the anterior region. This may be visualized through the smile photographs and cephalometric superimposition of the maxilla.

Some interdental fibers take at least 6 months to reorganize their insertions after orthodontic movement.²¹ After the intrusion of the upper left teeth with miniplates, the lower left teeth were extruded with intermaxillary elastics. When an ideal intercuspation was reached on the left side, the occlusion was stabilized for 6 months, prior to the debonding. A 3 × 3 lower retainer was bonded on the six anterior teeth,

Table 1. Cephalometric Measurements

Measurement	Norm (SD)	Initial	Retreatment	Posttreatment
SNA, °	82 (3)	85	84	83
SNB, °	80 (3)	80	79	79
ANB, °	2 (2)	5	5	4
Facial convexity (NA.APog), °	0 (2)	7	6	5
Facial angle (PoOr.NPog), °	87 (3)	88	88	88
Y-axis, °	59 (6)	58	57	58
SN.GoGn, °	32 (3)	32	33	33
1-NA, °	22	2	5	19
1-NA, mm	5	-3	-2	2
1-NB, °	25	12	15	22
1-NB, mm	5	2	3	4
Inter-incisal angle, °	131 (5)	162	156	134
UI-S line, mm	0 (2)	-1	1	-1
LI-S line, mm	0 (2)	0	2	0
IMPA, °	90 (4)	82	84	92
FMA, °	25 (3)	23	24	24
FMIA, °	65 (4)	75	72	64

and the patient received a wrap-around retainer on the upper arch with a bite block on the anterior region. He had regular occlusal contacts on the posterior region and anterior teeth contacted the bite block, avoiding the relapse of deep bite.

At the end of the treatment, the implant insertion had not yet been performed; therefore, the brackets were placed on the labial surfaces of the lower left first premolar and first molar, with a segment of rectangular wire to preserve the space for restoration. The patient was referred to another professional for an implant-prosthetic rehabilitation.

REFERENCES

- Polder BJ, Van't Hof MA, Van der Linden FP, Kuijpers-Jagtman AM. A meta-analysis of the prevalence of dental agenesis of permanent teeth. *Community Dent Oral Epidemiol.* 2004;32:217–226.
- Kim JW, Simmer JP, Lin BP, Hu JC. Novel MSX1 frameshift causes autosomal-dominant oligodontia. *J Dent Res.* 2006;85:267–271.
- Kokich VG, Kokich VO. Congenitally missing mandibular second premolars: clinical options. *Am J Orthod Dentofacial Orthop.* 2006;130:437–444.
- Kokich VO Jr. Congenitally missing teeth: orthodontic management in the adolescent patient. *Am J Orthod Dentofacial Orthop.* 2002;121:594–595.
- Farret MM, Farret AM. Strategies to finish orthodontic treatment with a Class III molar relationship: three patient reports. *World J Orthod.* 2009;10:323–333.
- Fines CD, Rebellato J, Saiar M. Congenitally missing mandibular second premolar: treatment outcome with orthodontic space closure. *Am J Orthod Dentofacial Orthop.* 2003;123:676–682.
- Ith-Hansen K, Kjaer I. Persistence of deciduous molars in subjects with agenesis of the second premolars. *Eur J Orthod.* 2000;22:239–243.
- Northway W. Hemisection: one large step toward management of congenitally missing lower second premolars. *Angle Orthod.* 2004;74:792–799.
- Mullally BH, Blakely D, Burden DJ. Ankylosis: an orthodontic problem with a restorative solution. *Br Dent J.* 1995;179:426–429.
- Kurol J, Olson L. Ankylosis of primary molars—a future periodontal threat to the first permanent molars? *Eur J Orthod.* 1991;13:404–409.
- Sidhu HK, Ali A. Hypodontia, ankylosis and infraocclusion: report of a case restored with a fibre-reinforced ceramic bridge. *Br Dent J.* 2001;191:613–616.
- Loriato LB, Machado AW, Souki BQ, Pereira TJ. Late diagnosis of dentoalveolar ankylosis: impact on effectiveness and efficiency of orthodontic treatment. *Am J Orthod Dentofacial Orthop.* 2009;135:799–808.
- Ostler MS, Kokich VG. Alveolar ridge changes in patients congenitally missing mandibular second premolars. *J Prosthet Dent.* 1994;71:144–149.
- Kurol J. Impacted and ankylosed teeth: why, when, and how to intervene. *Am J Orthod Dentofacial Orthop.* 2006;129:S86–S90.
- Sherwood KH, Burch J, Thompson W. Intrusion of super-erupted molars with titanium miniplate anchorage. *Angle Orthod.* 2003;73:597–601.
- De Clerck EEB, Swennen GRJ. Success rate of miniplate anchorage for bone anchored maxillary procrastino. *Angle Orthod.* 2011;81:1010–1013.
- Sugawara J, Baik UB, Umemori M, et al. Treatment and posttreatment dentoalveolar changes following intrusion of mandibular molars with application of a skeletal anchorage system (SAS) for open bite correction. *Int J Adult Orthodon Orthognath Surg.* 2002;17:243–253.
- Umemori M, Sugawara J, Mitani H, Nagasaka H, Kawamura H. Skeletal anchorage system for open-bite correction. *Am J Orthod Dentofacial Orthop.* 1999;115:166–174.
- Lino S, Sakoda S, Miyawaki S. An adult bimaxillary protrusion treated with corticotomy-facilitated orthodontics and titanium miniplates. *Angle Orthod.* 2006;76:1074–1082.
- Sarver DM, Weissman SM. Nonsurgical treatment of open bite in nongrowing patients. *Am J Orthod Dentofacial Orthop.* 1995;108:651–659.
- Melrose C, Millett DT. Toward a perspective on orthodontic retention? *Am J Orthod Dentofacial Orthop.* 1998;113:507–514.