Case Report

Maxillary canine–first premolar bilateral transposition in a Class III patient: *A case report*

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ABSTRACT

Tooth transposition is a rare dental anomaly that often represents a challenge for the clinician. The case of a girl with skeletal Class III malocclusion and concomitant maxillary canine–first premolar bilateral transposition, followed from 7 to 17 years of age, is presented. After a first phase of treatment aimed at resolving the Class III malocclusion, the transposition was maintained and the case finalized with a multibracket appliance. (*Angle Orthod.* 2016;86:509–519.)

KEY WORDS: Ectopic tooth eruption; Transposition; Mx.C.P1; Interceptive orthodontics; Angle Class III

INTRODUCTION

Dental transposition is the positional interchange of two adjacent teeth, or the development or eruption of a tooth in a position normally occupied by a non-adjacent tooth.[1] The prevalence of this anomaly varies according to the sample studied, but it remains under 1% in most of the reports provided by the literature.[2–4]

Dental transposition can affect the maxillary or mandibular arch, but it has never been reported in both jaws simultaneously. Maxillary transpositions are more frequent, while the prevalence of mandibular transposition, which affects only the canine and lateral incisor, has been reported to be around 0.03%.[5] Dental transposition has never been reported in the deciduous dentition.

Dental transpositions are observed unilaterally more frequently than bilaterally (12:1) and affect mainly the left side (2:1).[6] When the anomaly is bilateral, the same teeth are affected on both sides; asymmetrical transposition is a very rare phenomenon.[7] Many authors found no gender predilection,[6] while others reported a higher frequency in females.[1,8,9]

Peck and Peck[8] classified maxillary transposition into five categories, ordered by incidence:

- Canine–first premolar (Mx.C.P1);
- Canine–lateral incisor (Mx.C.I2);
- Canine to first molar site (Mx.C to M1);
- Lateral incisor–central incisor (Mx.I2.I1); and
- Canine to central incisor site (Mx.C to I1).

Dental transposition can be also classified into complete or incomplete types. In complete transposition, both the crown and the entire roots of the involved teeth are found in their transposed position, while in incomplete transpositions only the crown is transposed, but the root apex remains in its relative normal position.

Mx.C.P1 is the most frequent type of dental transposition, accounting for nearly 71% of all cases, followed by Mx.C.I2 transposition, representing 20% of cases.[8]

Regarding the etiology of this anomaly, many theories have been proposed, including positional interchange of tooth buds,[1,9] altered eruption paths,[10] the presence of retained primary teeth,[11] and trauma.[12] Recent evidence suggests that dental transposition represents a multifactorial condition in which both genetic and environmental factors seem to be involved, and the relationships are complex.[13] The Mx.C.P1 transposition has been determined to be influenced by genetic factors within a multifactorial inheritance model;[1] the findings of frequent association with other dental anomalies, common bilateral occurrence, familial occurrence, and difference in male to

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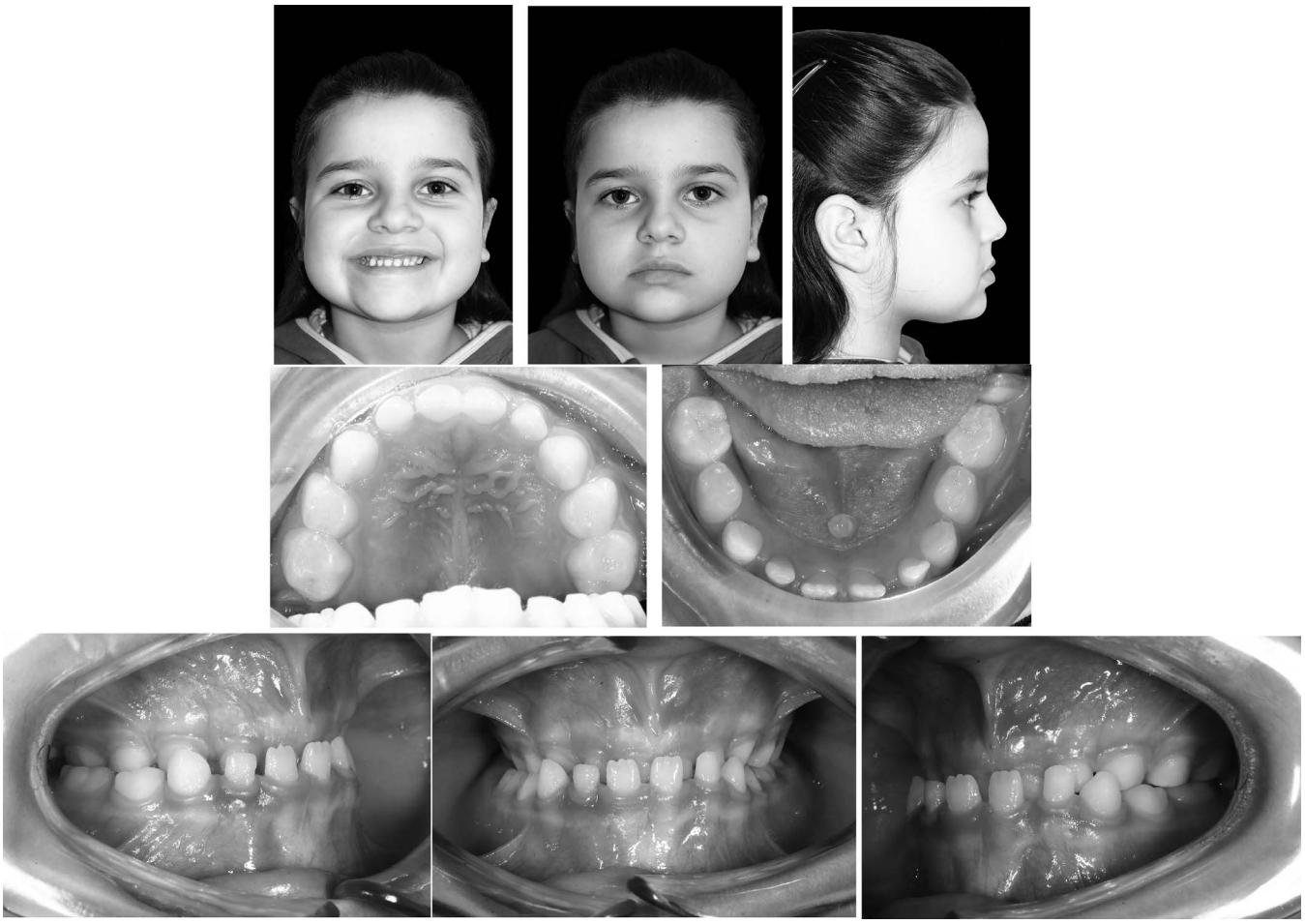

Figure 1. Pretreatment facial and intraoral photographs.

female prevalence support this hypothesis. The other four types of transposition seems to be mainly related to environmental factors; very little evidence suggests a possible genetic influence in some cases of Mx.C.I2 transpositions.[8]

In this case report, a maxillary bilateral canine–first premolar (Mx.C.P1) transposition in a Class III patient is presented. Since the treatment of this case was articulated into two phases, each phase will be shown and discussed separately.

CASE REPORT

First Phase of Treatment

Diagnosis. The patient was a 7-year-old female with a chief complaint of anterior crossbite. Facial photographs revealed a prognathic profile, a poor zygomatic projection, and a facial asymmetry (Figure 1). The lateral cephalogram analysis showed a Class III, low-angle skeletal pattern with a maxillary retrusion (Figure 2; Table 1). Dental casts and intraoral photograph analysis revealed a transverse maxillary deficiency with an anterior crossbite, while clinical examination revealed a functional mandibular lateral deviation and a lower tongue posture (Figures 1 and 3). The jaw relation was recorded in the most retruded mandibular position, confirming the presence of a true skeletal Class III malocclusion. Evaluating the panoramic radiograph, a slightly altered position of the permanent tooth buds was found, which led us to consider a possible initial Mx.C.P1 bilateral transposition (Figure 4).

Treatment objectives. The treatment objectives were to establish a correct transverse skeletal relationship, to protract the maxilla to solve the anterior crossbite, and to check the occlusion to eliminate the functional mandibular lateral deviation. After that, there was the need to monitor the eruption of permanent teeth.

Treatment alternatives. An alternative to the treatment proposed would have been to await the end of growth and a full permanent dentition and to treat the patient in only one phase, perhaps even taking into

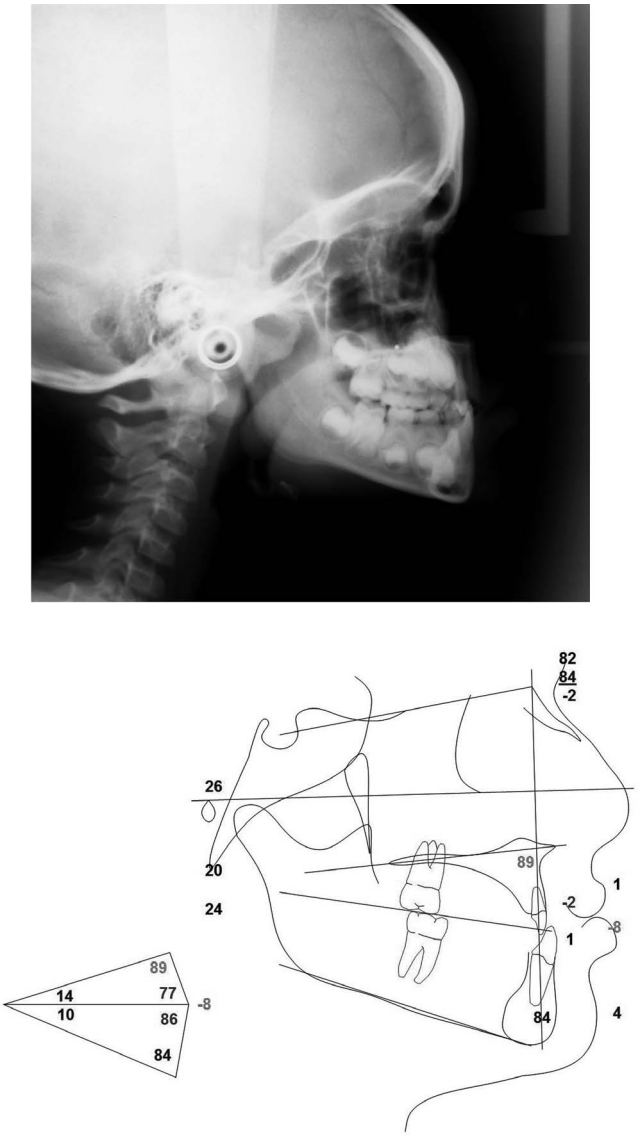

Figure 2. Pretreatment lateral cephalogram and tracing.

consideration a combined surgical-orthodontic treatment. According to the literature, the debate about one-phase or two-phase treatment is still open. Since it is difficult to predict mandibular growth, many authors suggest that a one-phase treatment can save the patient time and money while assuring the same quality of treatment results. On the other hand, an early treatment can prevent gingival recession, improve occlusal function, provide more favorable conditions for future growth, prevent excessive dental compensation, simplify the second phase of treatment, and provide more pleasant facial esthetic, thus improving the psychosocial development of the patient.[14–16]

However, considering the presence of a functional mandibular latero-deviation and of a severe anterior crossbite with deep bite, there was an indication for early intervention.

Treatment progress. The treatment began with a bonded rapid maxillary expander (RME) with acrylic pads, provided with hooks for a face mask (Figure 5A). The RME was activated twice a day for 7 days; then the screw was blocked with composite.

When a correct palatal expansion was achieved, the patient started wearing the face mask with 16-oz elastics, with a 25° downward angulation. After 6 months, when a complete correction of the anterior crossbite was achieved, the face mask and RME were removed (Figure 5B). Then the patient was instructed to wear a removable bionator III appliance at night for retention purposes and also for tongue posture rehabilitation (Figure 5C).

The bionator III appliance was discontinued after about 3 years; then the patient was put under a periodic control protocol.

Treatment results. At the end of the first phase of treatment, a good transversal proportion between upper and lower jaws was achieved, the anterior crossbite and the deep-bite were resolved, and the molar relationship was overcorrected. A better profile and improved facial esthetics were obtained, along with the absence of mandibular lateral deviation (Figure 6).

Table 1. Cephalometric Analysis[a]

	Norm				
Measurement	Mean	SD	Pretreatment	Posttreatment	Difference
SNA, °	82.0	3.5	81.6	84.3	2.7
SNB, °	80.0	3.0	83.6	84.1	0.5
ANB, °	2.0	2.4	−2.0	0.2	2.2
Wits appraisal, mm	0.0	1.0	−7.7	−2.9	4.8
FMA, °	26.0	5.0	19.6	17.0	−2.6
U1-APo, mm	6.0	2.2	−1.7	2.5	4.2
L1-Apo, mm	2.0	2.3	1.5	−0.4	−1.9
U1-PP, °	110.0	5.0	89.3	112.3	23.0
IMPA, °	95.0	7.0	84.4	81.6	−2.8

[a] SD indicates standard deviation.

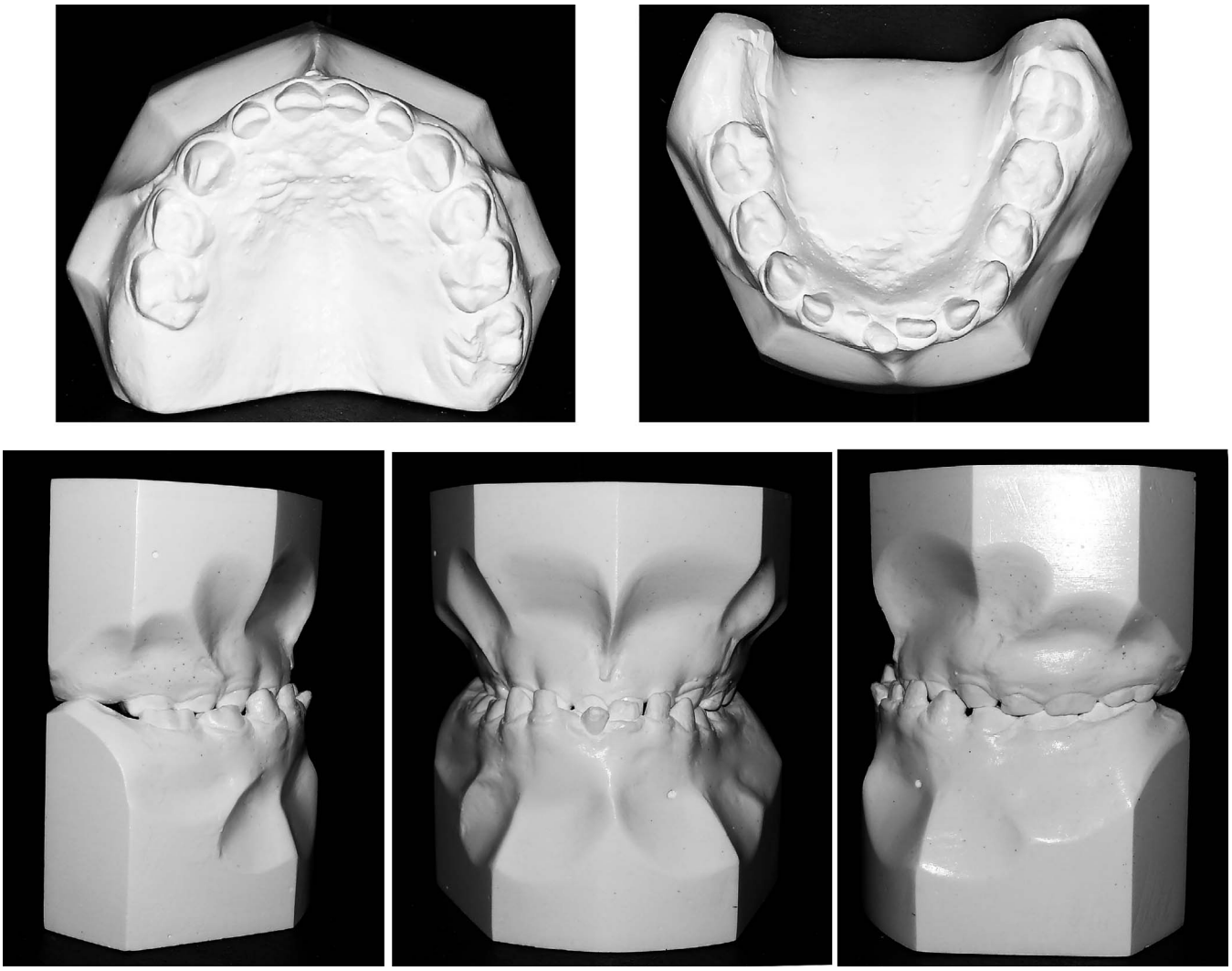

Figure 3. Pretreatment dental casts.

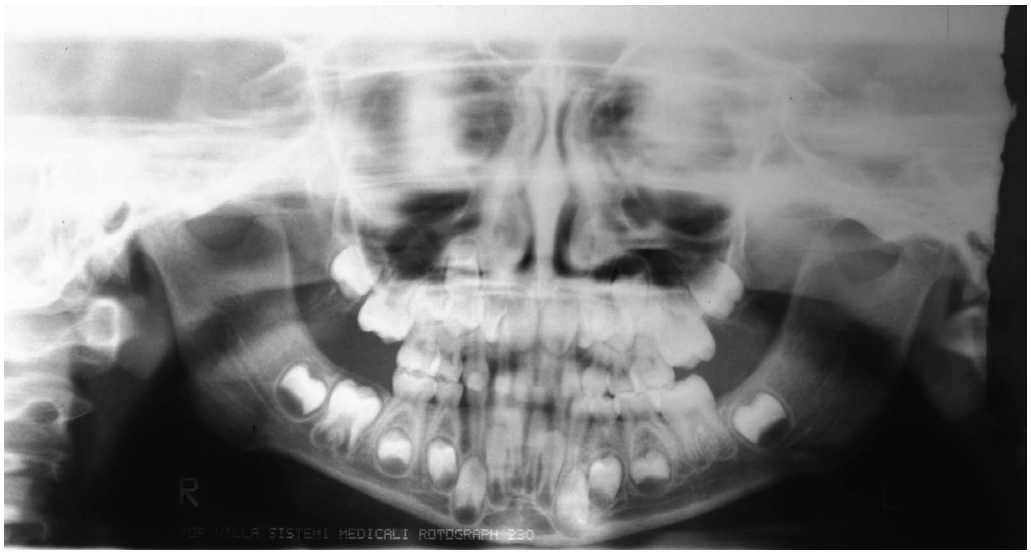

Figure 4. Pretreatment panoramic radiograph.

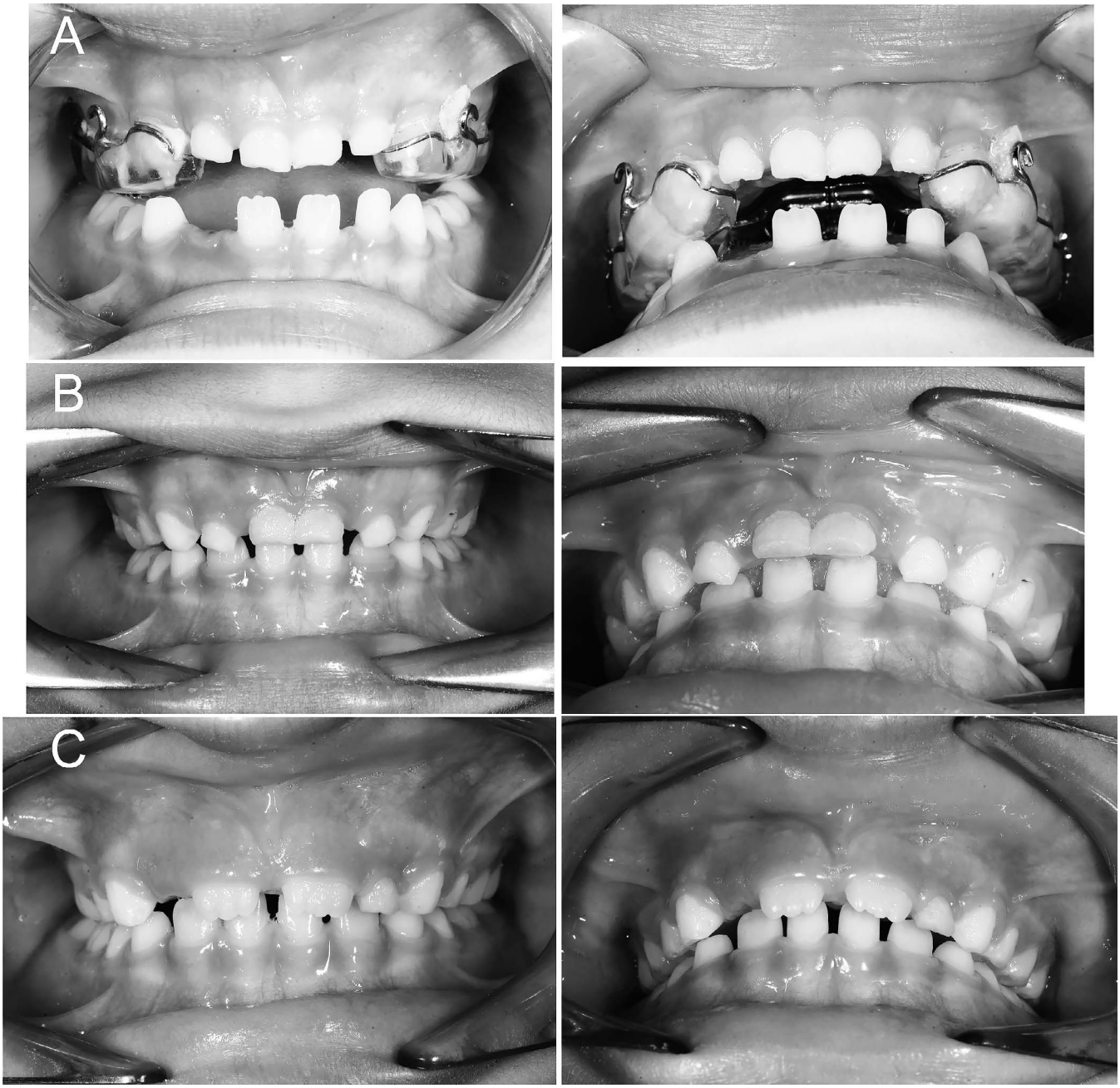

Figure 5. Palatal expansion by means of a rapid maxillary expander (RME) with acrylic pads (A); (B) removal of the RME device; (C) use of a bionator III appliance.

Second Phase of Treatment

Diagnosis. The patient discontinued the periodic controls and returned for observation after 2 years. At that time she presented with a fully developed transposition (in which both the crown and the root of the two teeth were transposed), impacted maxillary canines, and retained deciduous canines. New diagnostic records were taken, which revealed a good skeletal relationship, an end-on molar relationship, and a lower midline that was slightly off (Figures 7 and 8).

Treatment objectives. The treatment objectives for this second phase were to level and align both arches and to maintain the transposition bilaterally. This option was chosen considering canine and premolar morphology, crown and root position of the transposed teeth, and the crowding in the arches.

Treatment alternatives. When approaching a complete MxC.P1 transposition, the treatment options are to correct the transposition, moving each tooth orthodontically into their correct position; to accept the transposition and keep the canine and the premolar in

Figure 6. Photographs taken at the end of the first phase of treatment.

their transposed positions; or to extract one of the teeth.[17] Since there was no space deficiency or need for a sagittal correction, extractions were not considered suitable for this case.

An alternative would have been to correct the transposition.[18] While making this decision, several pros and cons were taken into account. From an occlusal and functional point of view, having the canine and the premolar in their correct positions is the best option.[6] However, moving two teeth into the alveolar process to switch their positions is difficult, risky, and time consuming.[6,17,19] In fact, the risk of root resorption and periodontal recession is quite high,[6,17] since in most of the cases there isn't enough space in the

Figure 7. Intraoral photographs at the beginning of the second phase of treatment.

Figure 8. Panoramic radiograph showing a complete Mx.C.P1 bilateral transposition.

alveolar process to contain two teeth moving in opposite directions, and this must be balanced with the possible benefits of such treatment. Keeping the transposition is an option widely approved by many authors[6,8,17,20,21] and was chosen for this case because of the fewer contraindications and side effects associated with this choice, the minor treatment time, and the simpler and more predictable mechanics.

Treatment progress. The treatment started with the extraction of the retained deciduous maxillary canines, the bonding of the upper arch with a multibracket straightwire appliance with MBT prescription, and the insertion of a 0.014-inch nickel-titanium (NiTi) wire. When was possible to put a 0.016-inch NiTi wire in the upper arch, the lower arch was bonded (Figure 9A). Open coil springs were applied between the upper

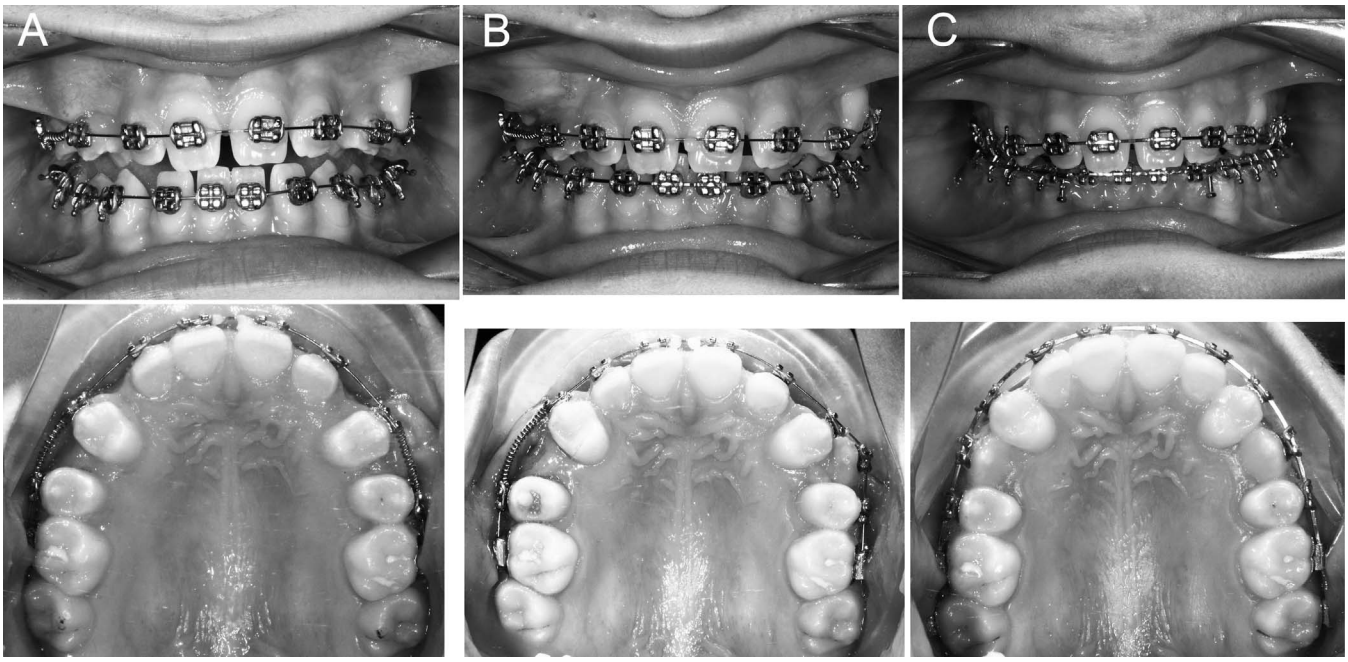

Figure 9. (A, B, C) Intraoral photographs showing the progress of the multibracket appliance treatment.

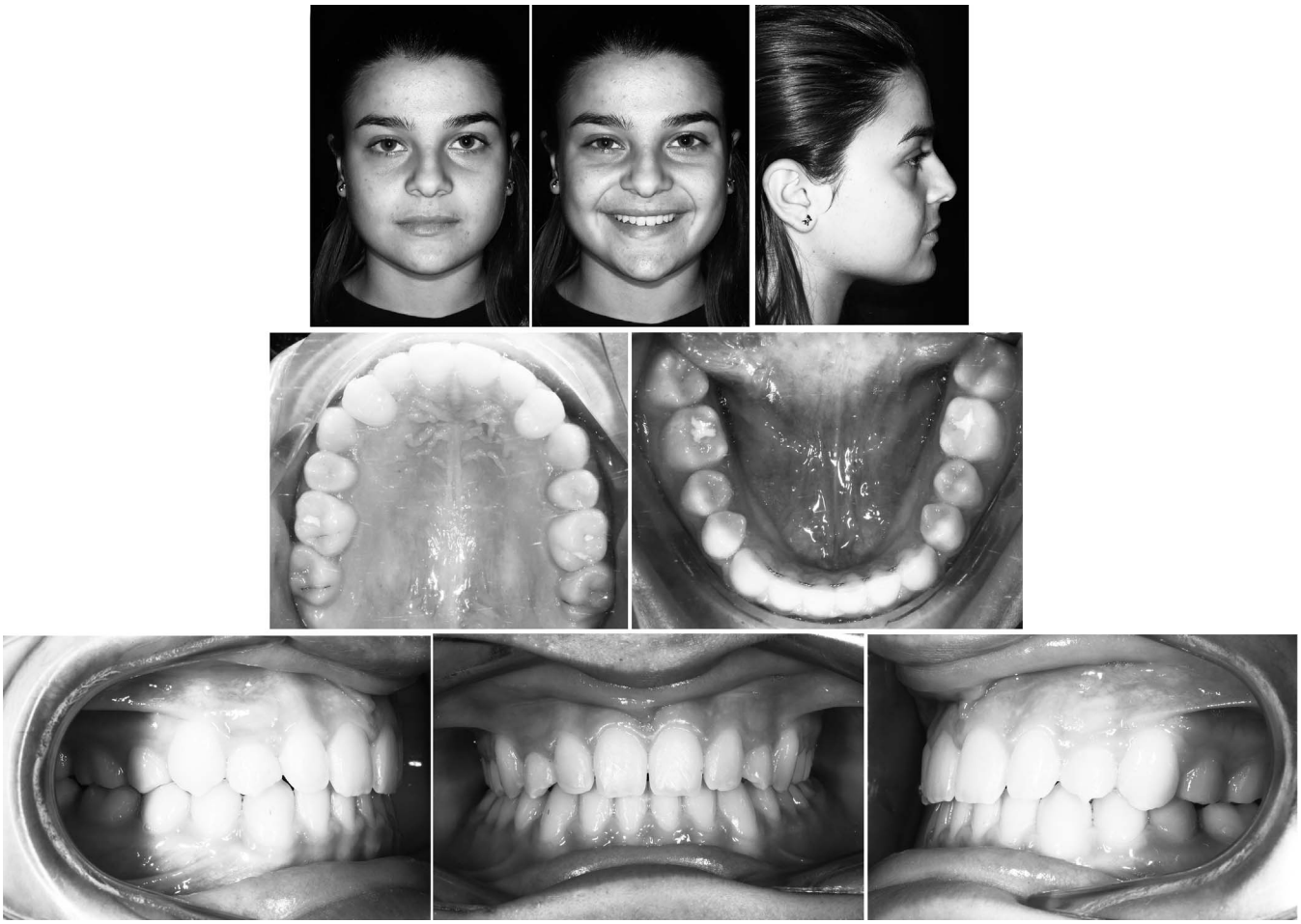

Figure 10. Posttreatment facial and intraoral photographs.

second molar and first premolar to mesialize the latter teeth. When enough space for the canines was obtained, they were bonded and included in the appliance. Tooth 23 erupted spontaneously, while tooth 13 required a surgical exposure of the crown (Figure 9B). For the canines brackets with 0° of torque were used, while for teeth 14 and 24 brackets with −7° of torque were maintained to eliminate the interference of the palatal cusps (Figure 9C). The archwire sequence used was 0.014-inch NiTi, 0.016-inch NiTi, 0.017 × 0.025-inch NiTi, 0.019 × 0.025-inch stainless steel (SS), and 0.019 × 0.025-inch SS posted with tie-backs for space closure in the upper arch and 0.016-inch NiTi, 0.017 × 0.025-inch NiTi, and 0.019 × 0.025-inch SS in the lower arch. Class II elastics were used in the last phase of treatment. Total treatment time was 29 months.

Treatment results. A Class I molar relationship with correct overjet and overbite was obtained, along with a pleasant facial esthetic. A satisfying result was achieved, from both a dental and a facial point of view (Figures 10 through 13). A coronal reshaping of the palatal cusp of the upper first premolar was necessary to avoid occlusal interferences and to achieve good canine function. The patient was fully satisfied with her smile esthetics. At the debonding, the patient was 15 years old, so it was decided, in accord with her parents, to delay prosthetics restoration to the end of growth, when the patient would be able to decide to proceed by herself.

DISCUSSION

Having the possibility of following a patient from the early stage of development offers many opportunities to intercept and correct some types of pathology at the right moment. In this case, an early intervention allowed us to reestablish a harmonic dentoskeletal pattern and form the basis for correct dentofacial development, as can be seen from the outcome of this treatment. However, regarding the transposition, the interceptive treatment was insufficient in correcting the eruptive path of the upper canines and premolars, since even in the earlier stage of development the tooth buds were in a completely transposed position.

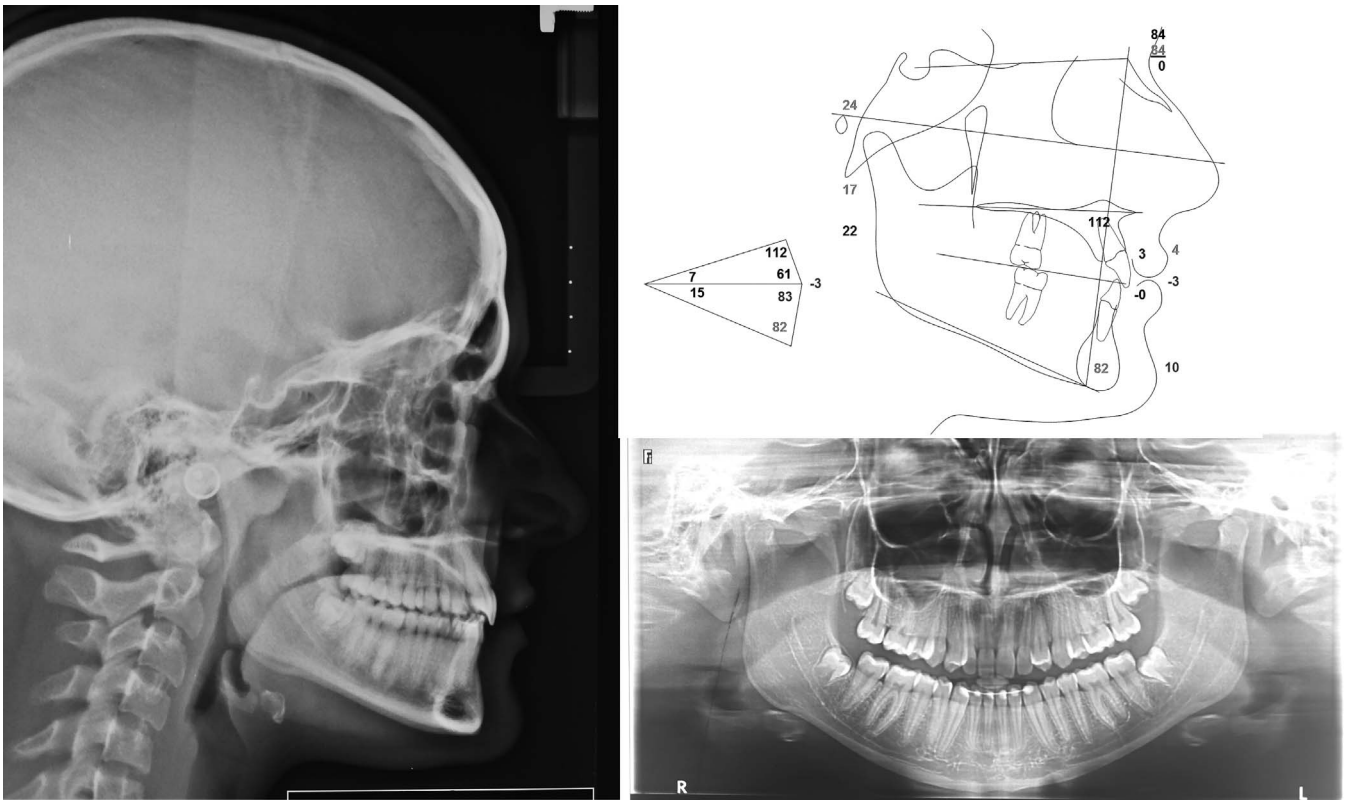

Figure 11. Posttreatment panoramic radiographs, lateral cephalogram, and tracings.

For this reason, a complete Mx.C.P1 in the permanent dentition during the second phase of treatment had to be managed. Among the different treatment strategies available to us, we decided to keep the transposition. Despite an easier mechanics and a reduced treatment time, this choice presents some challenges. In fact, in order to achieve an esthetic and functional result, it is important to control the torque of the canine to move the root palatally to hide the root prominence and the torque of the premolar to move the root buccally to

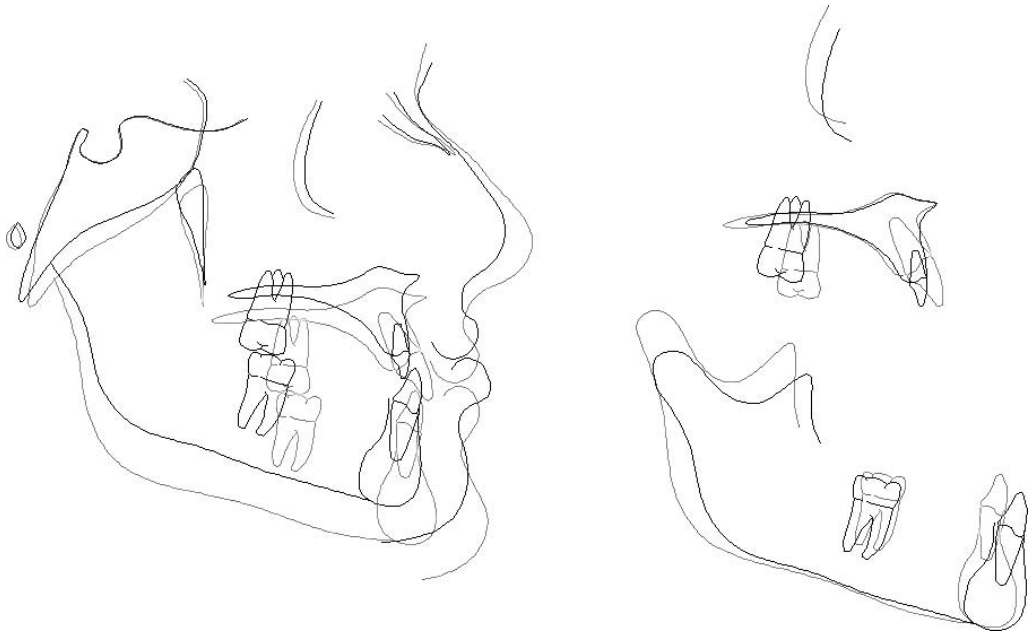

Figure 12. Pre- and posttreatment superimposition.

Figure 13. Posttreatment dental casts.

mimic the canine bulge and avoid functional interference of the palatal cusp. Typically an additional reshaping of the crown is sufficient to achieve group function and a proper occlusion. Both of these objectives were achieved in this case. In the future, an optional prosthetic restoration would assure an optimal esthetic.

CONCLUSIONS

- This skeletal Class III patient was followed from the age of 7 years.
- An early treatment was successful in reestablishing correct skeletal relationship and granting a harmonic facial development.
- The second phase of treatment with a multibracket appliance aimed at a correct occlusion, both from an esthetic and a functional point of view, while keeping the Mx.C.P1 transposition. A satisfactory result was obtained.

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