Camouflage Treatment for Class III Malocclusion Combined With Traction of an Impacted Maxillary Central Incisor

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ABSTRACT

This case report describes the treatment of a patient with an unerupted maxillary left central incisor, class III malocclusion with crossbite of the maxillary posterior teeth and lateral open bite. Treatment consisted of rapid maxillary expansion followed by anterior space opening, maxillary protraction and traction of the unerupted teeth with a light force system. Favorable results were obtained in terms of correcting incisor position and class III malocclusion. The results achieved remained stable throughout a 4-year retention period.

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Class III malocclusion is the least common type of occlusal relationship, affecting less than 5% of the population.[1] Early identification of this skeletal discrepancy relies on detailed observations of a series of facial, occlusal, and cephalometric characteristics, indicating a tendency toward Class III.[2] Treatment while at an early age is intended to correct transverse discrepancy, overbite, and overjet and reduce crowding. Depending on the Class III severity, especially in cases where there is mandibular prognathism, orthodontic treatment followed by orthognathic surgery will be necessary. Nevertheless, in borderline cases, when patients are still growing, compensatory treatment may be a valid alternative for successful treatment.[1,3-5]

Certain factors, such as the absence of an anterior tooth, can worsen the prognosis of Class III patients by reducing the anterior support of the maxilla, which is normally deficient anyway.[6] Trauma to anterior primary teeth may result in their permanent successors developing abnormally and can result in impaction or ectopic eruption. Altered position, root dilaceration or mineralization disorders are some of the sequelae of early traumas.[7,8]

The prevalence of injuries to primary teeth varies from 15% to 30%. Although several different types of injuries can occur, luxation is the most common, due to the greater elasticity of the alveolar bone and the short roots of primary teeth. Furthermore, due to the proximity between the roots of the primary teeth and the tooth buds of the permanent ones, any type of trauma to the primary teeth is of greater importance.[8,9]

In case where two thirds of the root of a tooth have already been formed, and the teeth has not emerged at the normal time of eruption, the likelihood that this tooth will erupt spontaneously is reduced.[10]

DIAGNOSIS

A 10-year, 8-month-old female patient presented for evaluation and orthodontic treatment at the Orthodontics

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Department of the Faculty of Dentistry at Lutheran University of Brazil, Canoas, Rio Grande do Sul, Brazil. The major chief complaint of the patient was the absence of an anterior tooth. Parents also reported a history of mandibular prominence in the family. During the extraoral evaluation, a concave profile was observed with a mildly increased lower third of the face, deficiency in the infraorbital area, a low and asymmetrical smile line, obtuse nasolabial angle, and retruded upper lip (Figure 1).

Intraoral evaluation detected an Angle Class III molar relationship, bilateral posterior crossbite, negative overjet, anterior and posterior left side open bite, agenesis of the permanent maxillary left first molar, mesial displacement of the permanent mandibular left first molar, and absence of the permanent maxillary left central incisor in the arch (Figure 2).

ETIOLOGY

Cephalometric analysis suggested Class III due to maxillary retrusion and excessive mandible length (SNA=76°; SNB=79°; Co-Gn=144.6 mm; Co-A=104.3 mm; Witts= -10.7 mm) and a mildly vertical growth tendency (Sn.GoGn=38.4°; Figure 3, Table 1). Model analysis identified a discrepancy of – 5 mm for the maxillary arch and – 2 mm for the mandibular arch. (Table 1)

Panoramic and periapical radiographs revealed that the maxillary left central incisor was unerupted and that there was agenesis of the permanent maxillary left first molar and a periapical lesion of the permanent mandibular left first molar. Parents reported trauma with intrusion of the primary maxillary left central incisor when the child was around age 3. Despite the patient's age, a hand and wrist radiograph suggested that the pubertal growth spurt had already occurred and that the patient had little residual growth left (Figure 4).

TREATMENT OBJECTIVES

The treatment proposed was endodontic treatment of the permanent mandibular left first molar. This was followed by: rapid maxillary expansion to increase the circumference of the arch and loosen the facial sutures for subsequent maxillary protraction; positioning of the impacted permanent maxillary left central incisor in the dental

Figure 1. Pretreatment extraoral photographs.

Figure 2. Pretreatment intraoral photographs.

Table 1. Cephalometric Summary

Measurement	Pretreatment records (A)	Post treatment records (B)	Difference between A and B
SNA (°)	76	80.8	4.8
SNB (°)	79	80.1	1.1
ANB (°)	-3	0.7	2.3
Occlusal plane to SN (°)	18.7	14.3	-4.4
Pog-NB (mm)	0.5	2.2	1.7
MP-SN (°)	38.4	36.2	-2.2
FMA (MP-FH) (°)	32.2	29.6	-2.6
Mandibular length (Co-Gn) (mm)	144.6	151.8	7.2
Maxillary/mandibular difference (Co-Gn - Co-A) (mm)	104.3	110.8	6.5
Maxillary skeletal (A-Na perpendicular) (mm)	-10.8	-3.3	14.1
U1-SN (°)	104.9	112.9	8
U1-NA (mm)	10.3	9.6	-0.7
U1-NA (°)	29.0	32.1	3.1
L1-NB (mm)	4.2	8.0	3.8
L1-NB (°)	19.8	25.5	5.7
IMPA (L1-MP) (°)	82.7	89.1	6.4
Lower lip tp E-plane (mm)	-2.7	-4.0	-1.3
Upper lip to E-plane (mm)	-9.7	-10.9	-1.2
Witts appraisal (mm)	-10.7	-2.9	8.8

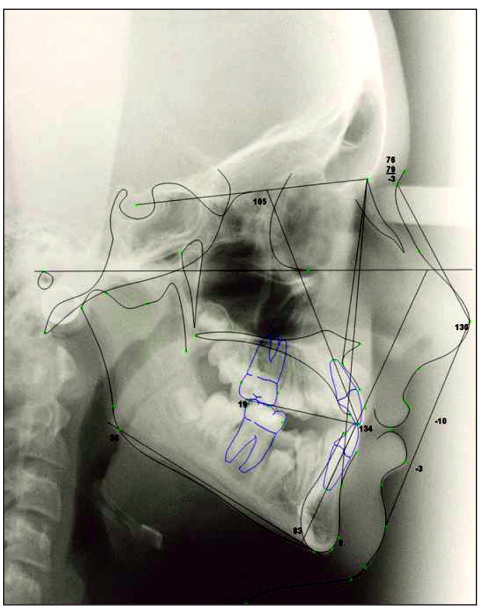

Figure 3. Pretreatment cephalometric tracing.

arch; redirection of mandibular growth using a face mask; dental compensation to skeletal Class III with proclination of maxillary incisors; and retroclination of the mandibular incisors to improve facial harmony.

TREATMENT ALTERNATIVES

One of the treatment options considered for correction of the Class III was extraction of a mandibular incisor, to correct the overjet. The atresic maxillary arch could be corrected using surgically assisted expansion if conventional rapid maxillary expansion resulted unsuccessful.[11,12]

If the impacted central incisor were found to be ankylosed or particularly dilacerated, making it impossible for traction, then extraction would be indicated. In such a case, one option to be considered would be opening space for a maxillary left central incisor to allow an adhesive prosthesis to be fitted while the patient finished growing. Later, an implant could be fitted followed by a prosthesis.

TREATMENT PROGRESS

Based on the data available, the following treatment was proposed:

1. maxillary distraction using a modified Hyrax RPE (Rapid maxillary expander) with springs on the anterior teeth to make space for the maxillary left central incisor (Figure 5a, c);
2. surgical exposure of the impacted tooth for fixation of a device to enable traction using light-strength intraoral elastics;
3. initial elastic traction of the upper left central incisor toward the front-modified spring soldered to the expansion device (Figure 5b, d);
4. installation of Petit facemask for maxillary protraction: 550 g of force per side (Figure 5e);
5. the maxillary and mandibular teeth were bonded with a 0.022-in preadjusted bracket system—Roth prescription (3M Unitek, Monrovia, CA)
6. stripping of anterior mandibular teeth for retroclination and midline correction;
7. use of Class III elastics and elastics for intercuspidation; and
8. a wrap around removable retainer for the maxillary arch and a canine to canine bonded round wire for the mandibular arch.

RESULTS

The impacted permanent maxillary left central incisor was successfully positioned into proper alignment by exposing the crown and applying elastic traction. Good

occlusion with a Class I molar and canine relationship, ideal overbite, and overjet were achieved in addition to a significant improvement in facial esthetics (Figures 6 and 7). Radiographically, the newly positioned incisor exhibits an intact and straight root and no visible root resorption. Cephalometry demonstrated a forward movement of point A and a slight clockwise rotation of the mandible. (Figure 8 and Table 1). The patient presented with a stable result 4 years post treatment.

DISCUSSION

Skeletal Class III malocclusion is believed to be the result of excessive growth of the mandible with respect to the maxilla and/or cranial base. Clinicians recognize that a protrusive mandible is usually accompanied by retrusion of the mid third of the face. In the past, Class III skeletal malocclusion with maxillary retrusion and mandibular protrusion was treated by moving only the teeth. Severe cases were often treated with orthognathic surgery after growth had completed, since it was believed that mandibular protrusion could not be modified while patients were still growing.[13] Orthognathic surgery, however, particularly mandibular osteotomy, is not always considered the best solution for skeletal disharmony since the lack of maxillary growth goes untreated and the mandible is adjusted to this retruded maxilla.[14-16]

Early treatment of Class III malocclusion by means of maxillary protraction can reduce the number of dental compensations. Even if an a case is severe which requires orthognathic surgery, orthodontic treatment by means of maxillary protraction prior to surgery offers the opportunity to maximize growth of the maxilla and reduces the chances of relapse due to residual growth of the mandible.[1,3] It has been suggested that the most effective and efficient timing for maxillary protraction is during early mixed dentition, before the patient is 8-years-old, or before the age of 10.[17-19] In the present case, even though the patient had already reached the age of 10 years, 8 months and had already passed her growth spurt, transverse maxillary expansion followed by protraction achieved good results. Dentoalveolar changes improved the soft tissue profile, with protrusion of the upper lip and slight retrusion of the lower lip. This usually is to be expected in camouflage treatment[4] (Figure 6, Figure 9a-b).

Transverse maxillomandibular discrepancies are a major component of several Class III malocclusions. Orthopedic and orthodontic forces are routinely used to correct maxillary transverse deficiencies (**MTD**) in young patients. Were rapid maxillary expansion proves unsuccessful, surgically assisted expansion could have been tried next.[11,12]

Figure 4. Pretreatment periapical, panoramic, and hand and wrist radiographs.

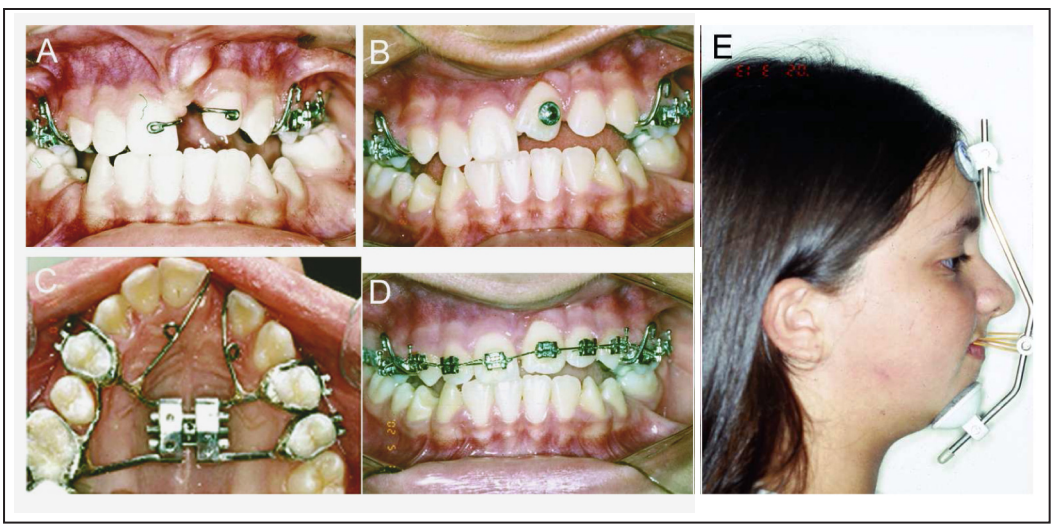

Figure 5. Treatment progress photographs.

Many different reasons have been considered to limit orthopedic distraction in adult patients. Correction of MTD in a skeletally mature patient is more challenging because of changes in the osseous articulations of the maxilla with the adjoining bones.[11] In clinical practice, orthopedic correction of transverse discrepancies is successful up to an age of approximately 14 to 15 years, depending on the patient's sex. After this age, orthodontic expansion becomes virtually impossible and painful.[12]

When anterior teeth fail to erupt, the result can impact facial esthetics. Clinicians should be able to locate the impacted tooth on radiographs and be able to apply traction forces to bring the tooth into an occlusive position without injuring soft or hard tissues. The technique

Figure 6. Post treatment extraoral photographs.

Figure 7. Post treatment intraoral photographs.

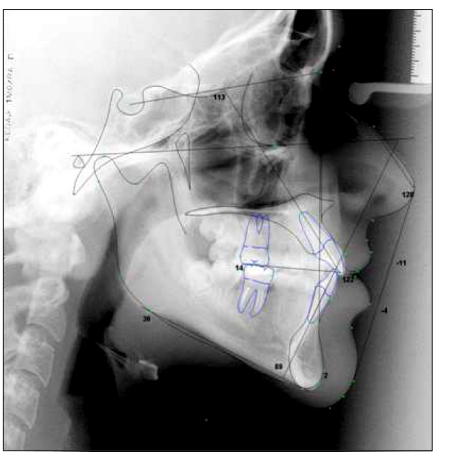

Figure 8. Post treatment panoramic and cephalometric radiographs.

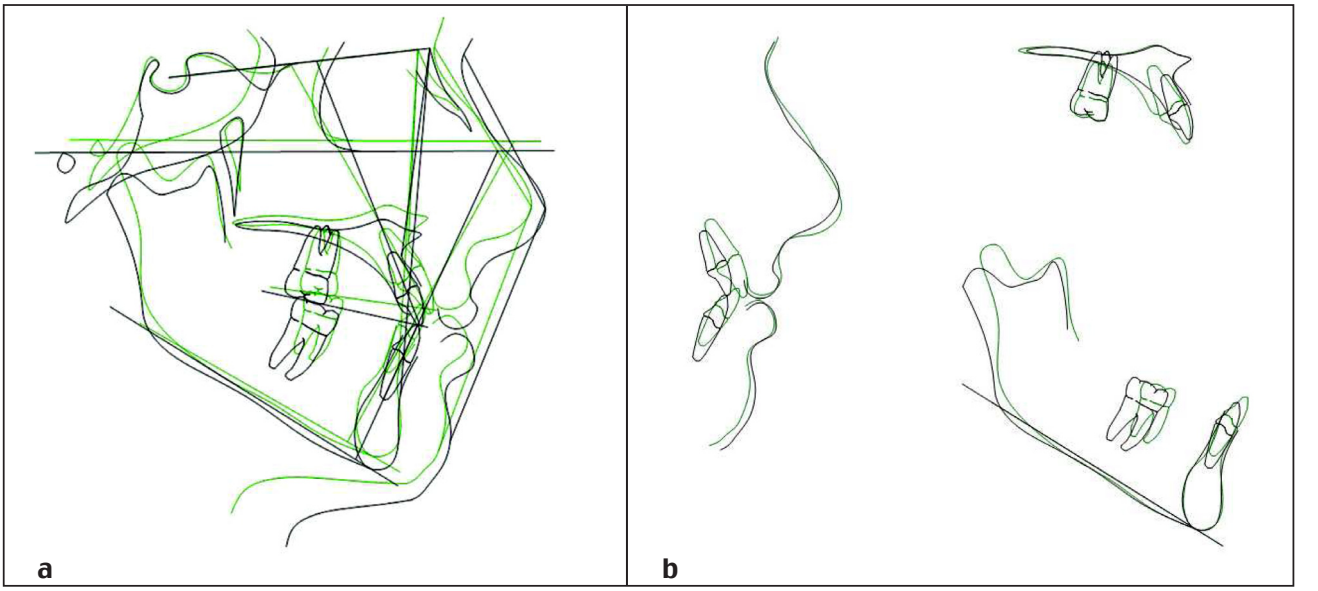

Figure 9. (a) Pretreatment and post treatment superimposition at SN (Sella – Nasion line); (b) Pretreatment and post treatment superimposition in the maxilla, mandible, and profile.

used to surgically expose the impacted tooth and the direction of traction is important to avoid periodontal tissue damage.[20,21]

Crowding and root dilaceration are often described in incisors that have been traumatized while in their initial phases of development. It has been reported that impacted incisors should be adequately positioned, with care given to the orthodontic traction's direction. Nevertheless, this method causes a dilemma as a result of the possibility of failure due to ankylosis, resorption, and root exposure.[5]

The fact that the maxillary central incisor did not erupt spontaneously and remained impacted was probably the result of the trauma to the primary tooth. The possibility that it would still not erupt even with tractioning was taken into consideration, and extraction and/or implantation would have been necessary were this to have happened.[5] Careful observation, verifying the absence of root dilaceration and areas of severe ankylosis, was an important factor in attempting orthodontic tractioning.

CONCLUSIONS

The orthodontic treatment was completed successfully with the impacted maxillary central incisor in position and after the patient had passed the active growth phase. Therefore, good stability could be expected. This case illustrates how we may be able to correct dental and skeletal malocclusion if able to intercept it at an opportune point. Were treatment is delayed to an age at which the patient is not growing at all, the case could only have been resolved using surgical and orthodontic treatment. The chance of dental compensation depends on the point of development at which treatment is started, appliance type, and severity of the malocclusion. Taking into account the various difficulties seen in this case, the final result was extremely satisfactory, resulting in an accentuated improvement in both esthetics and function in addition to the professional satisfaction of the multidisciplinary team involved.

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