Transposition of a canine to the extraction site of a dilacerated maxillary central incisor

Antônio Carlos de Oliveira Ruellas, a Aluísio Martins de Oliveira, b and Matheus Melo Pithon c
Rio de Janeiro, Brazil

This article describes the treatment of a girl in whom anterior trauma during the deciduous dentition had caused a dilacerated maxillary central incisor in the mixed dentition. The dilacerated central incisor was extracted, and a canine was transposed to the extraction site. Canine transposition was performed so that the lateral incisor could be maintained in its normal position. This article discusses the clinical implications of dental dilacerations on orthodontic treatment and the treatment possibilities. (Am J Orthod Dentofacial Orthop 2009;135:S133-9)

Trauma of the anterior teeth is relatively common, occurring in a third of children during the deciduous dentition.1 Because of the close relationship between the apex of a deciduous tooth and the permanent tooth germ, trauma of the former can cause abnormalities in the formation of permanent teeth, either by a direct blow or by periapical inflammation from dental trauma.2

The most common root orientation in patients with dilacerated maxillary central incisors is a crown that is directed labially and superiorly.3 Treatment depends on the degree of dilaceration, the position of the tooth, and the patient’s motivation.3

Among the treatment options reported in the literature are (1) alignment or traction with removable1,4 or fixed3,5 appliances, with apicoectomy after traction6; (2) extraction of the central incisor and transposition of the lateral incisor; and (3) extraction of the central incisor combined with canine transposition into the central incisor site.7

In this article, we describe a clinical situation in which a patient had an impacted maxillary left central incisor with extensive root dilaceration, treated by removing the dilacerated tooth, transposing the canine, and transforming the canine into a central incisor.

DIAGNOSIS AND ETIOLOGY

A healthy 10-year-old girl was brought to the orthodontic clinic at Poços de Caldas, MG Brazil, by her parents because she had a space between the maxillary and mandibular teeth during occlusion, and the maxillary left central incisor was not yet erupted. Her parents reported that she had suffered anterior dental trauma when she was 4 years old. At the initial orthodontic evaluation, she was in the mixed dentition, with an Angle Class I malocclusion, an anterior open bite of about 3 mm, a mouth-breathing habit, and a maxillary dental midline deviation because of the missing central incisor (Figs 1-4). The maxilla was constricted slightly with no crossbite, and there was a mandibular arch-length discrepancy of 6 mm. The lateral cephalometric evaluation showed a Class II skeletal malocclusion (ANB, 6°), vertical facial growth (SnGoGn, 42°; y-axis–SN, 74°), retroclined (1.NA, 16°) and lingually inclined (1-NA, 3 mm) maxillary incisors, and facially inclined mandibular incisors (1.NB, 29°, 1-NB, 5 mm, respectively), despite being well embedded in the mandible (IMPA, 89°). The facial profile was slightly convex (S-LS, +1 mm; S-LI, +1 mm).

Radiographs showed that the maxillary central incisor was impacted and inverted with a dilacerated root. The angle between the root and the crown of the central incisor was about 90°.

The patient had a previous thumb-sucking habit that produced the anterior open bite that was perpetuated by her tongue.
TREATMENT OBJECTIVES
The treatment objectives for this patient were to close the anterior open bite, correct the Class II relationship, retract the maxillary teeth, correct the mandibular arch-length discrepancy, eliminate the dilacerated and impacted incisor, and restore the normal appearance of the maxillary anterior teeth.

TREATMENT ALTERNATIVES
1. Extract the dilacerated maxillary incisor and restore with a fixed prosthesis or an implant.
2. Extract the dilacerated central incisor and close the space with mesial movement of the lateral incisor, which would then be recontoured into a central incisor.
3. Surgically expose and erupt the dilacerated central incisor into the proper position.
4. Extract the dilacerated central incisor and transpose the canine into the central incisor position.

TREATMENT PROGRESS

Comprehensive treatment was proposed, consisting of extraction of the dilacerated maxillary central incisor and canine-lateral incisor transposition, which would require tooth recontouring, along with extraction of the maxillary right lateral incisor and the mandibular left and right first premolars. In addition, the patient was referred to an otorhinolaryngologist for evaluation.

After extracting the dilacerated maxillary central incisor (Fig 5), a Haas-type modified appliance with a tongue crib was placed to expand the maxillary arch and guide the tongue into a more posterior position. After this, the appliance was stabilized for 6 months, until consolidation of the midlateral suture was completed.

After the stabilization period, the expansion appliance was removed, and an appliance measuring 0.022 × 0.030 in was bonded to align the teeth in both arches. In addition, an extraoral traction appliance was adapted to correct the Class II skeletal malocclusion and for vertical control. Additionally, the maxillary right first premolar and the mandibular left and right first premolars were removed after placement of the traction appliance, so that the teeth could be better aligned over their osseous base. Surgical bonding of the maxillary left canine was performed after extraction.

Initially, 0.16-in and 0.18-in archwires were used for alignment and levelling as well as for canine retraction. After that phase, an 0.018 × 0.025-in stainless steel wire was placed to enable greater rigidity and less deformation during retraction of the canines and closure of the extraction spaces (maxillary right canine, mandibular left and right first premolars), movement of the maxillary left canine, and the canine-lateral incisor transposition into the central incisor site. Lingual torque was applied to the maxillary left lateral incisor so that its root could be palatally positioned, thus facilitating the migration of the canine. The canine was transposed.
at the same time as the extraction spaces were closed (Fig 6, A). Once the maxillary canine was transposed, a 0.14-in nickel-titanium archwire was tied to the 0.018 × 0.025-in archwire to level the tooth in relation to the adjacent teeth (Fig 6, B and C).

After incisor retraction by using a 0.019 × 0.025-in archwire, new 0.019 × 0.025-in archwires were used to provide ideal torque to the teeth. Near the transposed canine, open-coil springs were placed mesially and distally to increase the space to esthetically transform the canine into a central incisor.

After active orthodontic treatment, the fixed appliance was removed, and a maxillary circumferential retainer and a mandibular lingual bonded canine-to-canine retainer were given to the patient.

TREATMENT RESULTS

The orthodontic treatment closed the open bite, improved the tongue posture, created a Class I skeletal relationship, improved the maxillary arch shape, and improved the occlusion. The maxillary left central incisor was extracted, and the canine was transposed into the space and restored as a central incisor.

These results show that it was possible to correct the malocclusion and also to position the teeth over their osseous bases sagitally, vertically, and anteroposteriorly (Figs 7-11).

DISCUSSION

About 54% of intrusive injuries to the anterior deciduous teeth can cause abnormalities in the developing permanent teeth.1 This includes anomalies such as root dilaceration, which is an abnormal curve between the crown and the root of a completely formed tooth.8,9 Dilacerations are seen most commonly in the maxillary anterior teeth,3 because this region is more likely to suffer dental trauma during infancy. These traumatic events occur in about 3% of the general population and are 6 times more common in girls than in boys.10

Treatment of severe root dilacerations is lengthy, complex, and expensive.8 Failures can be caused by ankylosis, loss of periodontal insertion,6 and external root resorption with root exposure after traction.5 A careful treatment plan should be designed when dilacerated and impacted teeth are involved. Although various treatment alternatives are found in the literature,11 the most common approach for this malformation is to extract the affected tooth12 and treat the resulting malocclusion orthodontically.13

Our objective in this article was to show a clinical case in which a viable treatment option was adopted for severe dilaceration of a maxillary central incisor. Extraction of the dilacerated incisor with transposition of the canine to the central incisor position was the treatment chosen.

Extraction of the central incisor was chosen because of the extensive root dilaceration and its close proximity to the crown; this affected both tooth movement and arch maintenance. If the central incisor had been uprighted, the dilacerated root would have projected out of the labial mucosa. The success of this treatment option depends on the degree of dilaceration, the position of the tooth, and the stage of tooth formation.5 Acute angulation between crown and root as well as complete root formation make the prognosis poor, thus leading to extraction of the tooth, as for our patient.

Once extraction was considered, the possibilities of postextraction treatments were reviewed: creating space for a prosthesis (fixed appliance or implant), space closure by mesial movement of the lateral incisor, canine-lateral incisor transposition, and transformation of the canine into a central incisor. The canine was favorably positioned and had better root support compared with the lateral incisor. All these factors contributed to achieving the satisfactory results presented here.

The canine movement in this patient was made easier, because the tooth was already positioned toward the mesial aspect, a phenomenon known as pseudo-transposition or incomplete transposition. This anomaly occurs in 41.3% of all transposition cases.14

The esthetic results of the canine transposition were satisfactory, and the canine shape was modified with restorative dentistry. By the end of this patient’s treatment, lack of cooperation led to appli-
Fig 7. Posttreatment photographs.

Fig 8. Posttreatment dental models.
ance removal before complete finishing. More satisfactory root positioning of the maxillary left canine could have been obtained with tip-back bends in the archwire.

Esthetically and functionally, it is generally preferable to move the transposed teeth back to their normal positions in the maxillary arch. But, in this patient, the transposed canine allowed esthetic transformation of the central incisor, without mesial movement of the lateral incisor and without a prosthesis.

What happens to the functional occlusion when the canine is placed in the central incisor position? In this patient, the lateral contact in functional occlusion was replaced by the maxillary premolar with no functional or esthetic compromises, as previously stated by Silva Filho et al.15

In this patient, the vertical skeletal pattern was maintained (SnGoGn, 40°; y-axis–SN, 73°) with tooth extractions and extraoral appliances so that extrusive forces could be avoided. In addition, the anteroposterior relationship of the osseous bases was improved by the extraoral appliance as the Class II skeletal malocclusion (ANB, 6°) was corrected to Class I (ANB, 2°).

The maxillary arch shape was also improved with both palatal expansion and tongue repositioning. The patient’s facial profile was slightly altered because of the dental retraction but without esthetic compromise.

The accentuated vertical facial pattern, the convex profile, and the mandibular arch-length discrepancy contributed to the need for tooth extractions. The extractions helped to prevent the open-bite relapse tendency.16 In addition, to minimize open-bite relapse, myofunctional therapy was recommended at the end of treatment. However, the long treatment time possibly led to cooperation problems, and the patient did not have this therapy. The patient has been followed for 2 years, and the esthetic and occlusal results have been maintained satisfactorily.

CONCLUSIONS

Because the esthetic and functional results were satisfactory in the clinical case described here, one can conclude that a maxillary central incisor with severe root dilaceration can be treated with incisor extraction and canine-lateral incisor transposition, if there are precise indications for that treatment.
REFERENCES
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