Orthodontic-Surgical-Endodontic Management of Unerupted Maxillary Central Incisor With Distoangular Root Dilaceration

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Abstract

Introduction: Root dilaceration refers to a dental anomaly characterized by an abrupt deviation in the longitudinal axis of the tooth. It can be localized in the crown, between the crown and the root, or, most frequently, in the root. This report describes a horizontally unerupted maxillary central incisor with distoangular root dilacerations most likely caused by a traumatic dental injury to its primary predecessor. **Methods:** Surgical-orthodontic traction was applied after the redistribution of the space in the anterior maxillary region. **Results:** Root dilaceration of the tractioned tooth was evident and did not allow the alignment of the tooth into proper position in the dental arch. Root canal filling and apicoectomy were performed. This procedure restored the normal appearance of the anterior maxillary teeth. **Conclusion:** Long-term follow-up (8 years) by periapical radiography indicated stable periodontal health without the presence of root resorption. *(J Endod 2010;36:755–759)*

Key Words

Apicoectomy, orthodontic traction, root dilaceration, root resorption, tooth impaction

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Eruptive disturbances are changes of normal tooth eruption, including accelerated, delayed, failed, or deviated in the direction of tooth eruption, related to general and/or local etiologic factors (1, 2). General (systemic) factors refer to the presence of multiple compromised dental disturbances and are associated with clinical signs and symptoms that point to a determined disease or syndrome (1, 2). Local factors involve a single tooth or adjacent teeth, with no other systemic association (1). From the clinical point of view, local eruptive disturbances display an asymmetric eruption of more than 6 months in relation to its homologue (3) and change the sequence and chronology of normal eruption (1). Local factors are usually a routine challenge at an orthodontic clinic, whereas general factors are uncommon. In maxillary incisors, a disturbance in eruption is relevant because of the esthetics and related emotional involvement for the child (1).

Local etiologic factors related to eruptive disturbances in the anteromaxillary region of the arch can be identified as (i) obstructive factors (1–4) such as supernumerary tooth, negative tooth-bone discrepancy, gingival fibrosis, ankylosis, retained primary tooth, caries or early loss of the deciduous tooth with space closure, tumor, supernumerary root, macrodontia, change in tooth eruptive sequence, cyst, and odontoma; (ii) genetic or developmental factors (5); (iii) traumatic factors (1, 2, 5–8); and (iv) idiopathic factors (1, 2).

Dilaceration can be a sequela of trauma and is associated with maxillary central incisor eruption failure (1, 2, 5–10). The term *dilaceration* was first described by John Tomes in 1848, when he reported a central incisor with an angulated root. Currently, tooth dilaceration refers to a dental anomaly characterized by an abrupt deviation in the longitudinal axis of the tooth. It can be localized in the crown, between the crown and the root, or, most frequently, in the root. It can affect any part of a tooth and also in different directions (6). When the root dilaceration is in labial direction, it is called a scorpion tooth. If a tooth is doubly affected, it is called a bayonet dilaceration. According to severity, dilaceration can be mild, moderate, or severe. A dilacerated tooth can lose its eruptive pathway, becoming ectopic and even unerupted, because root direction is not in accordance with crown direction. The further apical and milder the dilaceration is, the greater the chance is for spontaneous eruption (8).

The purpose of the present article was to report a clinical case of a horizontally unerupted maxillary central incisor with a severe distoangular dilacerated root involving an adjacent tooth by means of a multidisciplinary approach including an orthodontic, surgical, and endodontic team.

Case Report

A 7-year-old male patient was brought by his mother to the Orthodontic Clinic of the Faculty of Dentistry, Federal University of Goiás. The main complaint was the unerupted left maxillary central incisor. The child was physically healthy and had no history of disease, but there was a history of anterior dental trauma at age 6 to its primary predecessor. The patient had a balanced facial pattern, with a Class I skeletal relationship. Intraoral examination revealed reasonable oral hygiene and early mixed dentition with a dental Class II relationship on the left side only. The clinical absence of the left maxillary central incisor resulted in an inadequate space distribution with midline deviation (Fig. 1*A*). The tooth had delayed root development compared with its homologue and was horizontally positioned in the periapical radiograph (Fig. 1*B*), with the tip of the crown directed to the anterior nasal spine in the lateral radiograph. There was no evidence of root dilaceration at that time.

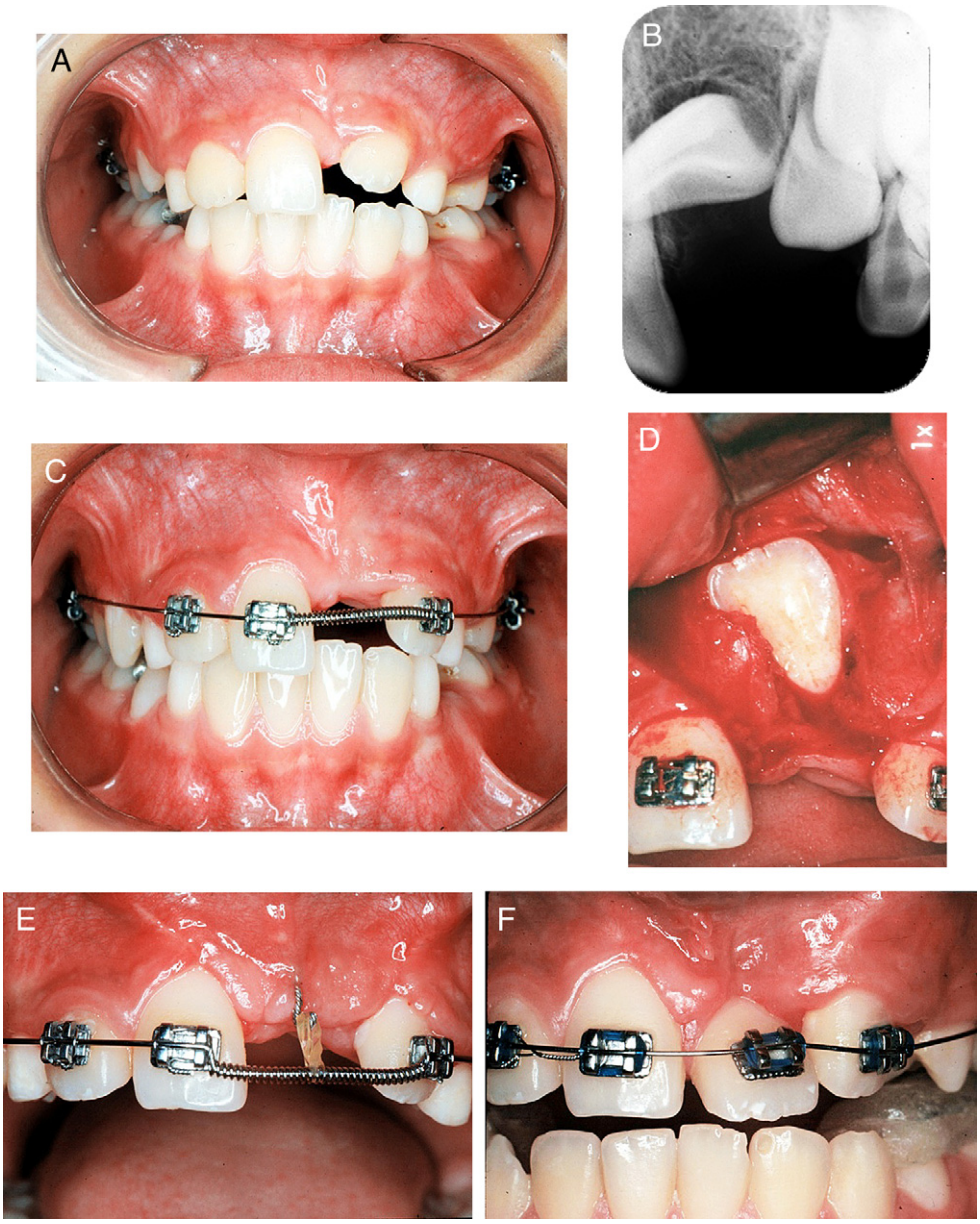

Figure 1. (*A*) Frontal view showing clinical absence of left maxillary central incisor with space closure and midline deviation; (*B*) pretreatment periapical radiograph; (*C*) compressed open-coil spring to open enough space for unerupted tooth; (*D*) surgical crown exposure showing its palatal surface; (*E*) elastic attached to alignment wire and hook end for initial movement; (*F*) left maxillary central incisor engaged in continuous arch wire showing improper tooth alignment due to divergent long axis.

Four treatment alternatives were developed: (1) extraction of the unerupted central incisor and restoration with a bridge or an implant later when growth had ceased; (2) extraction of the unerupted central incisor and orthodontic closure of the space, substituting the lateral incisor for the central incisor with subsequent esthetic restoration improvement; (3) nonextraction of the unerupted central incisor with autotransplantation after orthodontic space opening; and (4) nonextraction of the unerupted central incisor with orthodontic space opening, traction the involved tooth, and align in proper position.

The chosen option was to conduct the treatment without extraction. The objective in the treatment was to open the space in the maxillary anterior region, surgical exposure, and traction the involved tooth into proper position.

The prognosis was considered doubtful because there were chances of failure as a result of ankylosis, loss of attachment with root exposure, root anomaly, and external root resorption.

Initial treatment used an asymmetrical Klöehn-type headgear to correct the left side Class II and gain some space. Concomitantly, brackets (Edgewise, 0.022 × 0.025 inch slot; Dental Morelli, São Paulo, Brazil) were placed on the 3 maxillary permanent incisors, and a 3 × 2 segmented alignment with open coil spring was performed to redistribute space in the arch, with special emphasis to the left central incisor region (Fig. 1*C*). Once adequate space was achieved, a surgical-orthodontic traction was programmed. Surgery was performed to expose the unerupted incisor and attach an accessory (lingual button type) with a 0.010-inch ligature wire on it. Local anesthesia was given, and 2 mucoperiosteal incisions were performed to access the tooth, one

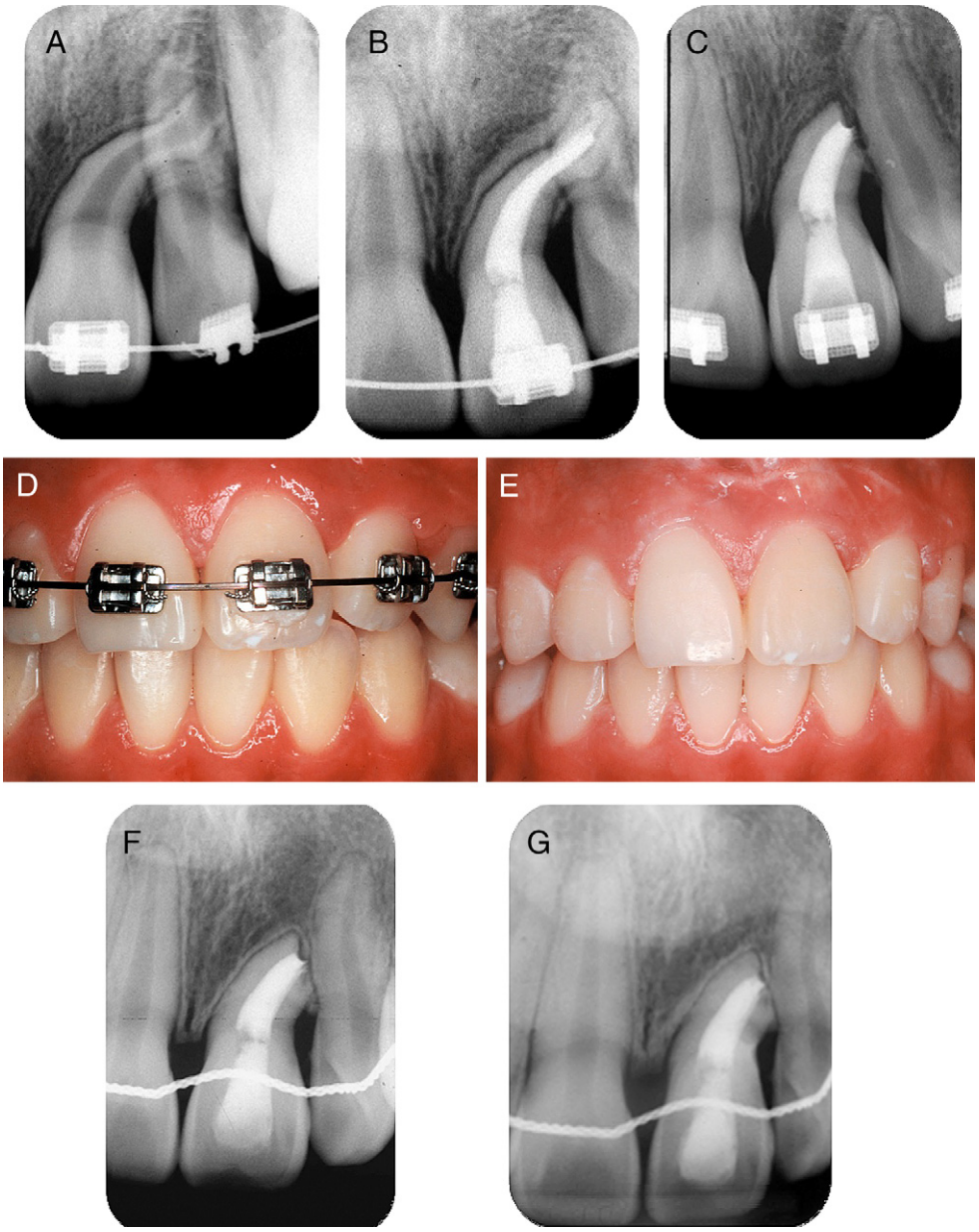

Figure 2. (*A*) Periapical radiograph of the root dilaceration; (*B*) after root canal filling; (*C*) and after apicoectomy. (*D*) Proper alignment of left maxillary central incisor after removal of interference and completion of torquing; and (*E*) final clinical aspect. (*F*) Follow-up after 3 years and (*G*) 8 years.

horizontal incision on the alveolar ridge and the other vertically and distally to the neighboring erupted tooth. A minimal osteotomy was then performed with a thin fissure bur (701 type) to permit crown exposure. Direct contact with the tooth during surgery showed that it was rotated, with its palatal surface turned to the anterior (Fig. 1*D*). Bonding was done on its surface, and a ligature wire was exposed with a hooked end. The flap was closed and sutured.

Orthodontic traction started 10 days later. The aim was to bring the tooth into proper position by a change in its eruption direction. Biomechanical control was performed with the aid of transpalatal arch. An extrusion force of approximately 50–60*g* was applied by an elastic band (1/8 inch) attached in the alignment wire (Fig. 1*E*). After crown exposure to the oral environment, the lingual button was removed, and a standard bracket for maxillary central incisor was bonded on the labial surface of the crown. A 4 × 2 alignment was then performed (Fig. 1*F*).

As the tooth moved downward, it became obstructed and quit erupting. A dilaceration was noted radiographically, and it was noted in the middle third, distally directioned at approximately 80 degrees with the long axis of the tooth (Fig. 2*A*). In addition, the incorrect position of the tooth developed a traumatic occlusion, with greater mobility and loose distal alveolar bone support as a result of bacterial plaque. A mandibular occlusal splint was indicated to minimize occlusal contact. Although the tooth was asymptomatic and vital, the only strategic alternative was to perform endodontic therapy (Fig. 2*B*) followed by an apicoectomy (Fig. 2*C*). By removing the dilacerated root-end, the obstructive factor was removed, allowing for the subsequent alignment of the tooth with a full orthodontic appliance (Fig. 2*D*).

This procedure restored normal appearance to the upper anterior teeth (Fig. 2*E*). The unerupted maxillary central incisor was aligned in proper position with an adequate gingival contour. After the removal of the appliance, a maxillary 3 × 3 fixed retainer was placed. At 3 and 8

years after treatment, there were preserved bone, normal probing depth, no apparent root resorption, and an acceptable gingival contour (Fig. 2*F, G*).

Discussion

The present case represents an orthodontic-surgical-endodontic approach to an unerupted maxillary central incisor with normal pulp vitality and a severely dilacerated root involving the neighboring tooth. Uematsu et al (11) described a similar case but with a labial-angular dilaceration, with the root apex projected just beneath the mobile mucosa of the labial sulcus. For both cases, endodontic treatment with an apicoectomy performed was the only feasible alternative that allowed the correct alignment of the tractioned tooth in the dental arch. The long-term follow-up supported this conduct, because there was no evidence of unfavorable biologic response.

Root dilaceration is an uncommon dental anomaly caused by traumatic dental injury to the primary predecessors (2, 5–8, 12) and can result in ectopic eruption (5, 12). It has also been proposed that it might be associated with some developmental syndromes (12).

Traumatic dental injury to a primary tooth and/or a bone fracture has the potential to damage the underlying permanent tooth germ, which might disturb its development. The effect of trauma to the Hertwig's epithelial root sheath can promote deflection or displacement of the permanent bud (6). Zilberman et al (6) reported that the severity of the trauma to the primary incisors is related to the effect on their permanent successors. A prevalence of 4.7% of root dilaceration in the permanent incisors was noted after traumatic dental injury to their primary predecessors (6). In the present clinical case, the traumatic injury is most likely the cause of dilaceration. After orthodontic traction and root formation, dilaceration became clearly evident.

The best time for treatment of eruptive disturbances is in the early stages (1–3). The objective of early treatment is to minimize emotional involvement of the child as a result of functional and esthetic problems caused by the failure of maxillary anterior tooth eruption.

A severely dilacerated root of maxillary incisor is a clinical challenge. Various therapeutic alternatives are described in the literature (1–3, 9–11, 13, 14). Even though surgical extraction is reported for severely dilacerated roots (3, 10, 13, 14), a modified technique is also cited, with the utilization of the crown of the extracted tooth as its own space maintainer or as an adhesive bridge construction while facial growth is active (13). The definitive restoration with a bridge or an osseointegrated implant would be recommended later when facial growth is complete. Another treatment alternative considering the extraction of the unerupted central incisor would be the orthodontic closure of the space, substituting the lateral incisor for the central incisor with subsequent resin restoration. However, more recent case reports have shown that unerupted teeth could be properly positioned with the aid of surgical-orthodontic traction (1, 2, 9–11, 15–18) and autotransplantation or intra-alveolar surgical uprighting (19–21). If the root dilaceration is severely labially directioned, endodontic treatment and apicoectomy have been suggested (11) instead of extraction. In the present case, the choice of orthodontic-surgical traction associated with endodontic treatment and apicectomy was considered a feasible alternative.

The surgical-orthodontic approach to unerupted teeth is commonly directed to surgical exposure of the crown and the bonding of a bracket for traction by light mechanical forces (1–2, 9, 10, 22). Other methods with a magnet system have been described with good results (23). The strategy adopted for the surgical exposure was minimal bone removal and closed eruption after placing an attachment on the unerupted tooth. Kohavi et al (24) reported that the more bone removed during surgical exposure of impacted canines, the greater the bone loss after orthodontic treatment. The closed-eruption technique is considered a good surgical choice for unerupted teeth, considering the long-term esthetic-periodontal status (25, 26). Other alternatives such as the simple surgical crown exposure without mechanical forces (4) or the apically positioned flap technique have led to negative esthetics (25, 26).

Removable appliances are considered better than fixed ones in terms of anchorage control of the tooth extrusion, but they are limited to patient compliance, proper root movement, and the application of continuous force. Thus, fixed appliances are preferable, because adequate bacterial plaque control and proper biomechanical control can be used.

Root dilaceration was not an impediment to movement, but rather its spacial relationship with the neighboring tooth was. The decision for endodontic therapy with apicoectomy was doubtful because of its prognosis: first, because of the distal looseness of alveolar bone support; second, because of the unfavorable crown/root proportion; and third, because of the external root resorption after associated apicoectomy and orthodontic movement. In the present case, the radiograph control 3 and 8 years after treatment showed no progression of root resorption, probably as a result of cementum repair (27).

In the current case report, the outcome was based on radiographic aspects associated with clinical conditions. The 8-year recall showed the radiographic appearance of normal. With the introduction of cone beam computed tomography scans it is well-determined that these imaging exams might change diagnostic hypotheses and treatment plans and might affect the prognosis of certain clinical conditions. New methods to evaluate apical periodontitis and root resorption were recently suggested by using cone beam computed tomography (28, 29), and certainly this advanced imaging technology will be considered in future studies.

The orthodontic treatment of a child with unerupted left maxillary central incisor with a severe root dilaceration and neighboring tooth involvement was successfully performed by uncovering the crown, closed eruption of the tooth, followed by root canal filling and apicoectomy. These procedures released the obstructive factor, favoring the subsequent orthodontic alignment of the tooth. The long-term follow-up showed periodontal stability without the presence of root resorption.

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