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Arrest of root formation in a permanent maxillary central incisor subsequent to trauma and pulp necrosis to the primary predecessor

CASE REPORT

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Abstract – This paper reports a case in which a previous traumatic injury at the age of 2 and pulp necrosis to a primary incisor resulted in a rare injury to the permanent successor tooth. The radiographic examination at the age of 9 showed the arrest of root formation of the permanent maxillary right central incisor, which did not erupt. Tooth 11 was extracted and a functional removable space maintainer was prepared. At the age of 17, the patient received an anterior fixed prosthesis for re-establishment of the esthetics, phonetics and deglutition.

Traumatic injuries frequently cause alterations in the traumatized primary tooth, which include coronal discoloration, obliteration of the pulp chamber and/or canal, pulp necrosis, pathologic root resorption and lack of re-eruption because of ankylosis (1, 2).

Additionally, several alterations in the permanent teeth have been reported as a consequence of injuries to their primary predecessors. The extent of the disturbance of the developing tooth germ is related to the stage of germ development (the child's age at the time of injury), the type of trauma, the severity, and the direction of impact. These developmental injuries may be simple or complex, extensive or local, affecting the crown, root, or the entire germ. Developmental anomalies of the permanent dentition secondary to trauma to the primary teeth might include enamel hypoplasia, white, yellow or brown discoloration, coronal or root dilaceration, and root duplication. Rare anomalies include interruption of root formation, sequestration of the permanent tooth germ and odontoma-like malformations (1, 3, 4).

Although severe dental trauma may cause root alterations, such as duplication and dilacerations (1, 3) partial or complete arrest of root formation is extremely rare (3), with major esthetic and functional implications to the patient.

This paper reports a case in which a previous traumatic injury and pulp necrosis to a primary incisor resulted in arrest of root formation of the permanent successor tooth.

Case report

A 9-year-old female patient was referred to the Pediatric Dentistry Clinic of the School of Dentistry of Ribeirão Preto, University of São Paulo (Brazil), for general dental care. The past medical history was reviewed and a signed written informed consent form was obtained from the patient's guardian.

The intraoral examination showed the primary maxillary right central and lateral incisors with yellow-brown discoloration of the crown (Fig. 1), mobility, sensitivity to percussion and swelling of the area. During the clinical interview, the mother reported that, at the age of 2, the child had sustained a severe traumatic injury at the region of the primary maxillary anterior teeth.

The radiographic examination showed the existence of chronic pathological radiolucency associated with the primary anterior teeth and the arrest of root formation of the permanent maxillary right central incisor, which did not emerge (Fig. 2). After extraction of teeth 51 and 52 and curettage of the chronic lesion (Fig. 3), tooth 11 with arrested root formation was extracted and a functional removable space maintainer was prepared (Fig. 4) The patient attended clinical follow up visits

Fig. 1. Clinical aspect showing the primary maxillary right central and lateral incisors with yellow-brown discoloration of the crown.

Fig. 2. Radiographic aspect revealing a chronic hological radiolucency associated with the primary anterior teeth and the arrest of root formation of the permanent maxillary right central incisor.

every sixth month for professional control of dental hygiene and periodic replacement of the removable space maintainer. After 8 years at the age of 17, the patient received an anterior fixed prosthesis for re-establishment of esthetics, phonetics and deglutition (Fig. 5a,b).

Discussion

Dental trauma in very young children may not only result in alterations in the affected primary teeth, but also disturb the formation and maturation of the developing permanent tooth germs because of their intimate relationship with the apexes of their predecessors (1).

Fig. 3. Radiographic aspect after extraction of teeth 51 and 52 and curettage of the chronic lesion.

Fig. 4. Functional removable space maintainers (maxillary and mandibular) prepared after extraction of tooth 11 and premature loss of tooth 74.

The younger the child is at the time of traumatic injury to the primary teeth, the higher the risk of developmental disturbances in the permanent successors (5). In this case report, the dental trauma occurred when the child was 2 years old, resulting in pulp necrosis of the traumatized primary tooth and subsequent arrest of root formation of the germ of the permanent successor, which was in the initial stages of odontogenesis. According to the mother, the trauma sustained by the child was most likely an intrusive injury as described by the mother. It has been reported that intrusive injuries to the primary teeth are highly associated with developmental disturbances of the successor teeth (1).

Partial or complete arrest of root formation is a rare sequela occurring in only 2% of permanent teeth following trauma to the primary dentition (6–9). Normal root development can be compromised by direct injury to Hertwig's epithelial root sheath resulting in a calcio-traumatic line separating the hard tissue deposited before

Fig. 5. Clinical aspect after 8 years. Anterior fixed prosthesis: anterior (a) and lingual (b) view.

and after the injury. However, the premature loss of the primary tooth may result in scar tissue development, which interferes with normal root formation, but leaves no evidence of a traumatic episode in hard tissue deposition (10, 11). In either case, the damaged permanent tooth may erupt prior to adequate root development and lead to tooth loss (10, 11).

Clinical signs of arrested root formation are lack of eruption or mobility, the latter resulting from inadequate periodontal support. The treatment option for this type of disturbance should be based on the degree of root formation arrest. Management of erupted teeth is frequently limited to clinical and radiographic follow-up, whereas unerupted teeth with little root formation arrested root development should usually be extracted (3, 10, 12). In the case reported in this article, extraction of the permanent tooth was the best treatment option because it presented very little root development and did not emerge. In addition, the other permanent teeth were already in an advanced root development stage, thereby confirming the diagnosis of cessation of root formation.

Conclusion

Children should be scrupulously followed up clinically and radiographically after sustaining traumatic injuries to the primary dentition. This is important to monitor the development of sequelae in the traumatized primary teeth, which may evolve into alterations in the developing permanent successor teeth. Early diagnosis of such alterations may favor the establishment of adequate treatment at the right time. Treatment of teeth with partial arrest of root formation requires an interdisciplinary approach involving Pediatric Dentistry, Surgery and Prosthesis, among other specialties.

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