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Partial replacement of the dentin–pulp complex by periodontal supporting tissues in a traumatically intruded primary maxillary incisor

CASE REPORT

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Abstract – This paper describes a case of a 9-year-old patient who presented a completely intruded primary maxillary incisor because of a traumatic injury sustained at the age of 3 years. After tooth extraction, histological analysis revealed that the dentin–pulp complex was partially replaced by cementum, periodontal ligament and alveolar bone. No signs of ankylosis were noticed. It is suggested that the lack of spontaneous re-eruption of the traumatized primary tooth after 6 years could be due to the development of functional periodontal supporting tissues in the pulp chamber secondary to the traumatism.

Traumatic injuries in children and adolescents are a common problem. Several studies have reported that the prevalence of these injuries increased during the past few decades. The prevalence of traumatic injuries in the primary teeth is between 12% and 35.5% (1–4) and luxation is the most frequent type of trauma affecting the primary dentition (5–8).

Several alterations in the permanent teeth have been reported as a consequence of injuries to their primary predecessors. These developmental injuries may be simple or complex, extensive or local, affecting the crown, root or the entire dental germ. Enamel hypoplasia is the most commonly observed developmental anomaly of permanent dentition, although enamel hypomineralization, coronal or radicular dilaceration and root duplication may also occur. Rare anomalies include total or partial interruption of root formation, sequestration of the permanent tooth germ and odontoma-like malformations (5, 9, 10). Additionally, traumatic injuries frequently promote alterations in the traumatized primary tooth itself, which include coronal discoloration, obliteration of the pulp chamber and/or canal, pulpal necrosis, pathologic root resorption and lack of re-eruption because of ankylosis (8, 9).

This paper reports the presence of periodontal supporting tissues partially replacing the dentin–pulp complex of a primary maxillary incisor that remained completely intruded for 6 years after a severe traumatic injury.

Case report

A 9-year-old Caucasian female patient was brought to the Pediatric Dentistry Clinic of the Faculty of Dentistry of Ribeirão Preto, University of São Paulo (Brazil) for general dental care. Past medical history was reviewed and a signed, written informed consent form was obtained from the patient's guardian. During the clinical interview, the occurrence of a severe dental traumatism at the region of the maxillary anterior primary teeth at the age of 3 years was reported. Intra-oral examination revealed that the permanent maxillary central and lateral

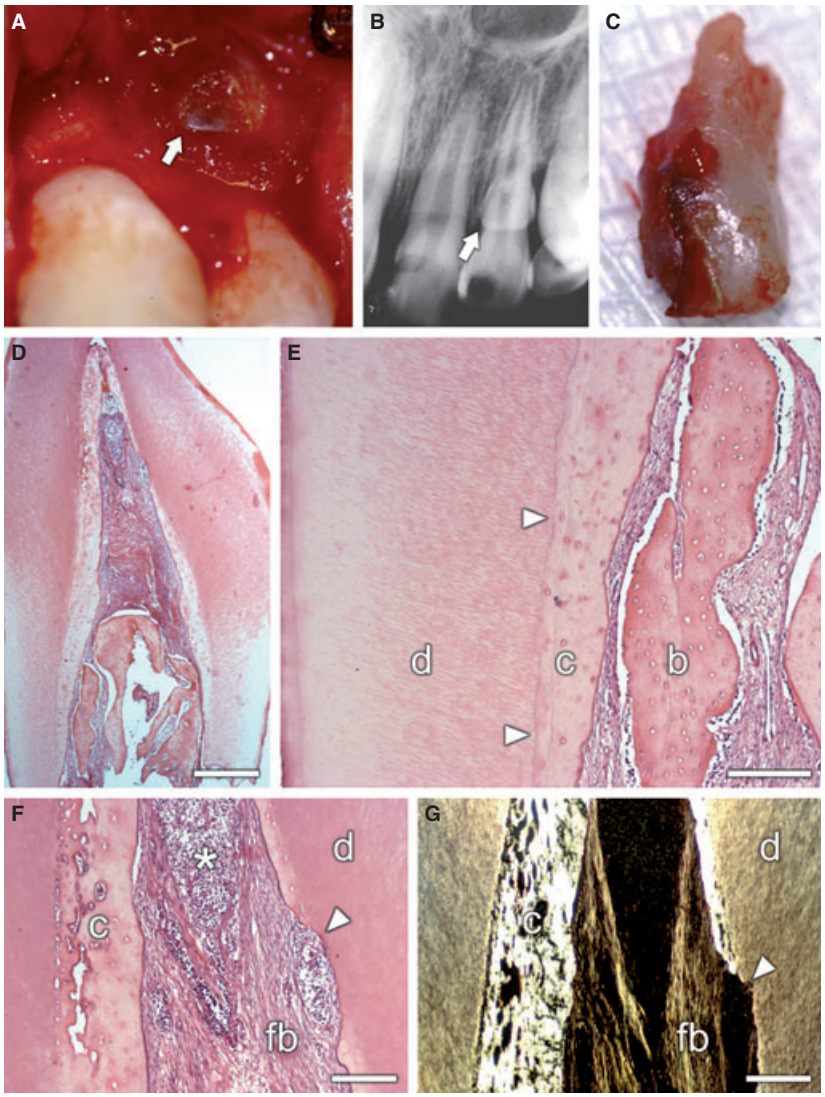

Fig. 1. (A) Clinical aspect of the completely intruded maxillary primary incisor during surgical exposure of the crown (arrow). (B) Radiographic aspect of the maxillary left permanent central and lateral incisors shows the presence of the intruded primary incisor (arrow). (C) Macroscopic image of the primary incisor reveals the advanced stage of root resorption. (D) Light microscopy of decalcified bucco-lingual section at low magnification shows reduced dimensions of the pulp chamber by the development of mineralized tissues. (E) Higher magnification reveals the deposition of a cellular cementum-like tissue (c) onto a previously resorbed dentin surface (arrowheads) and the formation of bone tissue (b) lined by osteoblasts. Conventional (F) and polarized (G) light microscopy of the pulp chamber shows the presence of a fibrous connective tissue with bundles of collagen fibers (fb), and focal areas of chronic inflammatory infiltrate (*) and internal resorption (arrowhead). (D–G) Hematoxylin and eosin stain. Bars: D = 800 μm; E–G = 200 μm.

incisors had erupted in the normal position (Fig. 1A). In addition, a focal area of the alveolar mucosa exhibited signs of inflammatory process. The radiographic examination revealed a completely intruded maxillary primary incisor, which had remained intra-osseous for 6 years (Fig. 1B). In view of the time elapsed without spontaneous re-eruption, surgical extraction of the intruded primary incisor was the treatment of choice. Incision was performed, a vestibular flap (Fig. 1A) was elevated with coronal exposition and the tooth was extracted with elevators and dental forceps. The stage of physiological root resorption was advanced (Fig. 1C).

The tooth was submitted to histological processing. Briefly, it was fixed in 10% buffered formalin for 72 h at room temperature and decalcified in an EDTA-based solution activated in a microwave oven (Sharp Carousel, São Paulo, SP, Brazil). After demineralization, the tooth was neutralized in 5% sodium sulfate (JT Baker, Xalostoc, Mexico), washed in running water for 24 h, dehydrated in ascending ethanol grades, cleared in xylol and embedded in paraffin. The blocks were serially sectioned and 6-μm-thick longitudinal cuts were obtained and stained with hematoxylin and eosin for histological analysis under conventional and polarized light microscopy. Sections were analyzed in a Leica DMLB light microscope (Leica, Bensheim, Germany), outfitted with a Leica DC 300F digital camera. The acquired digital images were processed with Adobe Photoshop software (version 7.0.1, Adobe Systems, San Jose, CA, USA).

At low magnification, light microscopy revealed a bucco-lingual section of an incisor tooth with advanced root resorption (Fig. 1D). Higher magnification showed that the dentin–pulp complex was partly replaced by periodontal support-like tissues (Fig. 1E). Indeed, no odontoblast layer was noticed all along the periphery of the pulp chamber. The interface between dentin and cellular cementum-like mineralized matrix showed typical signs of previous (earlier) dentin resorption (Fig. 1E, arrowheads). The pulp chamber and the root canal were filled with a periodontal ligament-like, fibrous connective tissue with bundles of collagen fibers (Fig. 1F,G), exhibiting a mineralized bone tissue lined by osteoblast-like cells in the root canal (Fig. 1E). The collagen fiber bundles were inserted in both cementum and bone

matrices as Sharpey fibers. A moderate chronic inflammatory infiltrate and internal resorption were also observed in focal areas (Fig. 1F, asterisk and arrowhead, respectively). No signs of ankylosis were detected.

Discussion

Different types of traumatic injuries affect the primary dentition. However, primary incisors are highly liable to luxation injuries, which constitute 21–81% of traumas to these teeth (5, 10, 11). The patient of this case report had a complete intrusive luxation secondary to a severe traumatism at an early age, which remained untreated for a long period.

Immediate care after dental traumatisms shows important predisposing factors that increase treatment success and decrease the risk of complication (8). Although in the present case report the succeeding permanent teeth were not affected, the traumatized primary tooth remained intruded for 6 years. The institution of preventive educational programs has been advocated in order to inform the parents about what to do in orofacial trauma cases as well as emphasize the importance of immediate attendance for dental care (7).

Several complications have been described as a consequence of traumatic injuries in the primary dentition, including coronal discoloration, obliteration of the pulp canal, pulpal necrosis, pathologic root resorption and ankylosis (8, 9). It has been reported that approximately 22% of traumatically intruded primary teeth fail to re-erupt completely or do not re-erupt in perfect alignment, especially when the intrusion is associated with alveolar bone fracture and the tooth may become ankylosed (9). In this case report, the histological analysis showed the absence of ankylosis, which therefore should not be considered the cause for the lack of spontaneous re-eruption of the intruded primary incisor. It may be speculated that the retention of the primary tooth inside the maxillary bone was most likely due to the partial replacement of the dentin–pulp complex by functional periodontal support tissues secondary to the traumatic injury.

Conclusion

The replacement of dentin–pulp complex by periodontal supporting tissues should also be considered an additional complication of dental traumatism that might prevent re-eruption of traumatically intruded primary teeth.

References

1. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample. Int J Oral Surg 1972;1:235–9.
2. Forsberg CM, Tedestam G. Traumatic injuries to teeth in Swedish children living in an urban area. Swed Dent J 1990;14:115–22.
3. Hargreaves JA, Cleaton-Jones PE, Roberts GJ, Williams S, Matejka JM. Trauma to primary teeth of South African preschool children. Endod Dent Traumatol 1999;15:73–6.
4. Kramer PF, Zembruski C, Ferreira SH, Feldens CA. Traumatic dental injuries in Brazilian preschool children. Dent Traumatol 2003;19:299–303.
5. Andreasen JO. Injuries to developing teeth. In: Andreasen JO, Andreasen FM, editors. Textbook and colour atlas of traumatic injuries to the teeth, 3rd edn. Copenhagen: Munksgaard; 1994. p. 457–94.
6. Skaare AB, Jacobsen I. Primary tooth injuries in Norwegian children (1–8 years). Dent Traumatol 2005;21:315–9.
7. Kirzioglu Z, Karayilmaz H, Erturk MS, Koseler Sentut T. Epidemiology of traumatized primary teeth in the west-Mediterranean region of Turkey. Int Dent J 2005;55:329–33.
8. Sandalli N, Cildir S, Guler N. Clinical investigation of traumatic injuries in Yeditepe University, Turkey during the last 3 years. Dent Traumatol 2005;21:188–94.
9. Diab M, elBadrawy HE. Intrusion injuries of primary incisors. Part III: Effects on the permanent successors. Quintessence Int 2000;31:377–84.
10. Nelson-Filho P, Silva RA, Faria G, Freitas AC. Odontoma-like malformation in a permanent maxillary central incisor subsequent to trauma to the incisor predecessor. Dent Traumatol 2005;21:309–12.
11. Garcia-Godoy F, Garcia-Godoy F, Garcia-Godoy FM. Primary teeth traumatic injuries at a private pediatric dental center. Endod Dent Traumatol 1987;3:126–9.