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Case Report

Severe trauma in the primary dentition – diagnosis and treatment of sequelae in permanent dentition

Arenas M, Barbería E, Lucavechi T, Maroto M. Severe trauma in the primary dentition – diagnosis and treatment of sequelae in permanent dentition. © Blackwell Munksgaard, 2006.

Abstract – A 2-year 6-month male presented after an intrusive injury sustained at 15 months of age. Intra-oral radiographs showed coronal dilaceration of the germ of the permanent central incisor and the presence of a calcified tissue mass in the area of the trauma which was identified after surgical removal as the permanent upper left lateral incisor. Immediate treatment and long-term options are discussed.

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Key words: tooth injury; intruded primary incisor; traumatic dental injury

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Orofacial trauma is an important problem for orodental and general health as it may have medical, esthetic and psychological consequences for children and often also for their parents (1–3).

The teeth most commonly affected are the upper incisors, and the average age for the highest incidence of trauma is between 1 and 3 years. The type of trauma is generally related to the age of the patient. In the primary dentition, small coronal fractures may be observed in primary teeth but luxations are more common. This is because of the pliability of the facial skeleton and of the periodontal ligament, the large volume of teeth in relation to the bone in primary and mixed dentition and finally, the shorter roots of primary teeth (1).

The aim of diagnosis and treatment of traumatic injuries to primary teeth is to deal with pain and to prevent sequelae for the developing permanent tooth germ (4–6).

The consequences of trauma in primary dentition include color change, pulp necrosis, obliteration of the pulp canal, gingiva retraction, displacement of the primary tooth, pathological root resorption, alterations in the process of physiological root resorption or premature loss of the primary tooth (7, 8).

Sequelae for permanent dentition after a trauma to primary dentition are usually related to intrusive injuries (4, 5). An intrusive injury is the consequence of impact by a force in an axial direction that results in displacement of the tooth within the socket. Intrusive injury to primary dentition often results in anomalous development of the permanent teeth, with a frequency of between 18 and 69% (4, 6). The consequences for permanent dentition of a trauma in the primary dentition may affect the coronal or root region or the whole of the permanent tooth germ.

Many sequelae can be found in the coronal region, such as structural alterations associated with enamel hypoplasia, crown dilaceration and white, yellow or brown discoloration.

Sequelae affecting the root region include root duplication, root dilaceration and partial or complete arrest of root formation.

When the entire permanent tooth germ is affected, the following may be noted: alterations to the process of eruption of the permanent tooth, retention of the permanent tooth or malformation of the permanent germ giving the appearance of an odontoma.

Malformation of the permanent tooth germ may be the result of severe intrusion by the primary tooth and invasion of the developing germ during the earliest phases of odontogenesis, when the child is aged between 1 and 3 (2, 6). This is when the medial and incisal thirds of the enamel matrix of the permanent tooth take place. Displacement of the primary tooth root may affect development of the permanent tooth by altering the secretory phase of the ameloblasts (5) or, in subsequent stages, changing the root formation process. The tooth is visible radiographically as an opaque mass, it does not usually erupt and surgical treatment is required (6).

The purpose of this article is to present a case of orofacial trauma in the primary dentition and its consequences on the formation of developing permanent germs.

Clinical case

A male patient (aged 2 years, 6 months) having suffered a trauma in the upper anterior region at the age of 15 months, was admitted to Madrid Complutense University. The parents stated that the child received emergency treatment in a hospital, involving suture of the lip and treatment with antibiotics. Medical records and examination did not reveal any general medical pathology or medical history of any importance.

The presence of a supernumerary incisor was noted clinically between the upper primary central and lateral incisors. The central and supernumerary incisors showed severe intrusion and rarefaction of the surrounding mucous membrane. The possibility of total or partial re-eruption was considered and it was decided to delay extraction of the traumatized teeth because of the high risk of further traumatizing the germs during extraction.

During follow-up, the upper occlusal radiograph carried out at the age of 2 years 6 months showed apical displacement of the primary central incisor and supernumerary tooth. The germ of the permanent central incisor was slightly displaced and the image was compatible with coronal dilaceration (Fig. 1).

In the panoramic radiograph taken at the age of 2 years 10 months, a mass of calcified tissue was identified in the area of the trauma which was diagnosed as an odontoma. Elimination was postponed (Fig. 2). Intra-oral radiographs confirmed coronal dilaceration of the germ of the central permanent incisor and the odontoma, but the germ of the permanent upper left lateral incisor was not visible. At the age of 3, the central and supernumerary primary upper incisors were extracted.

In a further panoramic radiograph taken at the age of 5 years 10 months, the absence of the germ of tooth 22 was confirmed and the image was compatible with an odontoma. In addition, the germ of the central left incisor presented coronal dilaceration and altered position. At the age of 7 years 2 months, the calcified tissue mass was surgically extracted (Fig. 3).

Macroscopic observation of the extracted tooth showed the shape of a permanent lateral incisor but with malformation, color change and dilaceration of the crown and root (Fig. 4). A removable upper space maintainer was fitted, and removed 1 year later to allow eruption of tooth 21.

During follow-up of the case, it was possible to observe dilaceration of the crown of 21 radiographically. This led to a delay in eruption of the tooth. Tooth 21 eventually erupted with dilaceration of the

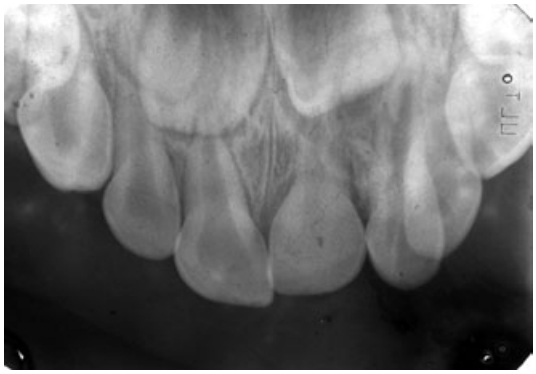

Fig. 1. Upper occlusal radiograph showing apical displacement of the upper central incisor and primary supernumerary incisors.

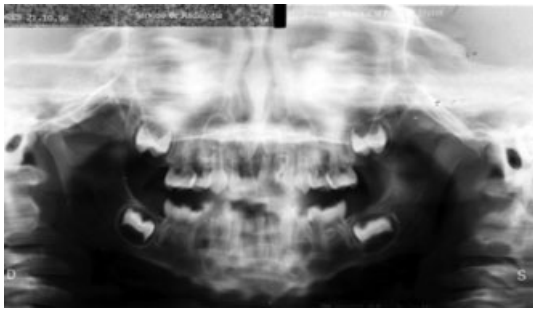

Fig. 2. Panoramic radiograph at the age of 2 years 10 months. Presence of a calcified tissue mass in the traumatized area.

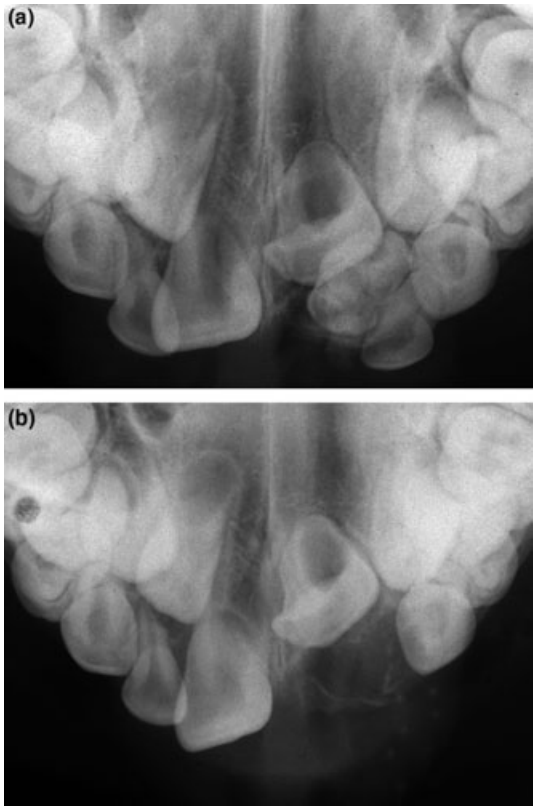

Fig. 3. Radiographic image of the traumatized area before (a) and after surgical removal of the permanent lateral incisor (b).

Fig. 4. Permanent lateral incisor after extraction showing malformation, color change and dilaceration of the crown and root.

crown, color change and enamel hypoplasia (Fig. 5). The initial treatment was to apply a compound filling on the vestibular face. The parents were informed about the unclear prognosis for tooth 21. It was explained that it was necessary to keep the tooth in the mouth as long as possible in order to maintain the space and allow growth of the alveolar bone, also that it would be necessary to institute

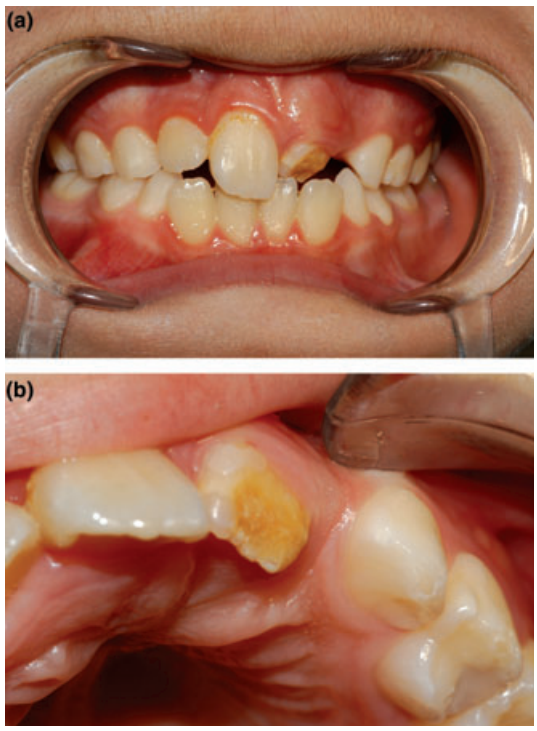

Fig. 5. Clinical image of 21 in the arch (a), showing dilaceration of the crown of 21, color change and enamel hypoplasia (b).

orthodontic treatment followed by implants and prosthesis.

Discussion

Treatment of intrusive injuries in primary dentition includes determination of the relationship between the primary and the permanent teeth (4, 9). In cases in which the apex of the intruded tooth is in contact with the permanent tooth germ, the primary tooth should be extracted as soon as possible. In the present case, the intrusive injury was treated first by postponing extraction because it was considered that the apices of the primary teeth were directed toward the vestibule and there was less risk if eruption was anticipated.

Holan et al. (4) carried out a study in which they established a set of steps to determine the relation between the intruded primary tooth and the permanent tooth germ. First, they describe the clinical examination, by digital palpation on the underlying tissue and the alveolar bone in the vestibular region, or through the upper lip when inflammation does not allow intraoral evaluation. In cases of incomplete intrusion, alignment with the adjacent tooth should be checked. Secondly, a periapical radiograph should be carried out in order to compare the image of the intruded tooth with the adjacent primary teeth and to determine alignment of the permanent tooth. Finally, an extra-oral

lateral radiograph should be taken in order to locate the apex of the intruded tooth, its proximity to the vestibular surface of the permanent tooth and the possible presence of a fracture in the alveolar bone. This type of radiograph is generally indicated for patients aged under 20 months (4).

Follow-up of the case allowed observation of the sequelae to the trauma which affected the permanent dentition. Clinically, these resulted in delayed eruption of tooth 21. The trauma and the alterations in the dental follicle, loss of the periodontal ligament with tooth ankylosis, systemic alterations and therapeutic radiation were some of the factors leading to delay in eruption of the permanent teeth (10). Dilaceration of the crown of tooth 21, a sequel of the trauma, delayed eruption and caused traumatic occlusion with the antagonistic teeth.

Moreover, the radiograph showed a calcified tissue mass in the area of the trauma. In view of the radiographic characteristics, it was considered that this might indicate an odontoma. Moreover, some theories on the etiology of odontomas include a history of prior trauma (11), and odontomas may be associated with delayed eruption of permanent teeth (12–14). This was observed in this clinical case with delayed eruption of tooth 21.

The presence of odontomas may be associated with a diagnosis of supernumerary teeth and agenesias, but displacement or malformation of the adjacent tooth is uncommon. Only in a few cases has root malformation been described. Hisatomi et al. reported malformation of teeth adjacent to a complex odontoma in three cases, in a study including 107 odontomas (12).

After surgically removing the calcified tissue mass, the possibility of its corresponding to the upper left lateral incisor and not an odontoma was considered because of its clinical appearance and the absence of 22 in the panoramic radiograph. The presence of alterations such as root and crown dilaceration, color change and enamel hypoplasia suggested that orofacial trauma was the most likely cause of malformation of this tooth. Trauma in primary dentition may result in dilaceration of the developing permanent tooth. The calcified portion of the permanent germ was displaced in such a way that the remaining part of the permanent germ became curved, forming an angle with the axis of the tooth (15).

Moreover, the age at which the trauma took place explains the sequelae noted in the permanent dentition. Formation of the germ of the permanent upper central incisor takes place at 20 weeks of gestation, and calcification begins at the age of 3–4 months. In the case of the permanent lateral incisor, germ formation also takes place at 20 weeks of gestation, but calcification begins between 10 and 12 months of age (16). Therefore, the orofacial trauma in this case, which took place at the age of 15 months, may have resulted in changing color and shape in 21, and complete malformation of the germ of 22, giving a radiographic image comparable to that of an odontoma. This clinical situation has been described before in the literature but very infrequently (2, 6).

Overall treatment of trauma in primary dentition, as well as long-term follow-up includes treatment of sequelae in the permanent dentition. In cases of dilaceration of the crown, treatment may be complex and may include work on the affected crown. In some cases of severe dilaceration, the affected part of the crown should be removed, and a provisional prosthesis can be placed until definitive rehabilitation is possible (6).

Any alterations in occlusion noted in such children should be carefully evaluated when deciding on treatment, either recovering the space for the absent tooth and replacing it prosthetically or achieving correct articulation of the existing teeth orthodontically.

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