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Premature loss of maxillary primary incisor and delayed eruption of its successor: report of a case

ABSTRACT

Background Traumatic injuries to primary teeth represent one of the most common aetiological factors of time-related eruption disturbances of permanent teeth. These include premature eruption, delayed eruption or impactions.

Case report A case of a 7.5-year-old male with delayed eruption of the maxillary permanent left incisor is presented. The case history revealed a trauma around the age of 3 involving its primary tooth predecessor, and its extraction by a dentist about one year later, due to frequent abscesses. The clinical examination showed an early mixed dentition and the single presence of tooth 11 in the dental arch, with an obvious aesthetic problem that affected the child's self image. The periapical x-ray ruled out any dimorphism on the impacted tooth, and it showed a root developed by two thirds. About 2 months after the examination, a simple gingivectomy was carried out, and the tooth could erupt completely 3 months later without any need for orthodontic traction. One year after surgery, a complete root development could be observed, as well as the presence of the lateral incisors with a moderate crowding.

Keywords: Primary teeth; Dental trauma; Traumatic injuries; Tooth extraction; Developmental disturbances; Delayed eruption; Permanent teeth.

Introduction

In children up to 6 years of age, prevalence of traumatic injuries varies between 11 and 30% [Flores, 2002]: between 18 and 30 months the incidence can be two times higher [Glendor, 2000] given the children's limited motor coordination [Sennhenn-Kirchner and Jacobs, 2006; Torriani et al., 2008] and the inability to evaluate the potential risks of their actions [Flores et al., 2007]. A further cause of tooth injuries is represented by child

physical abuse [Welbury, 2007].

The teeth that are more frequently prone to suffering trauma are the upper central incisors, because of their position in the dental arch and their subsequent higher exposure [Sennhenn-Kirchner and Jacobs, 2006]. Since the alveolar bone is not completely mineralised in children, and it is characterised by a higher degree of flexibility, the trauma generally causes damage to the supporting tissue [Sennhenn-Kirchner and Jacobs, 2006; von Arx, 1993; Christophersen et al., 2005] and the lateral dislocations are among the most common injuries [Borum and Andreasen, 1998]. Moreover, the tight relationship between the radicular apices of the primary teeth and the germs of the corresponding permanent teeth represents a risk for the latter in regard to developmental disturbances [von Arx, 1993] both of a morphological type (white or yellow-brown enamel discoloration, white or yellow-brown discoloration of enamel with circular enamel hypoplasia, crown dilaceration, odontoma-like malformations, root duplication, vestibular root angulation, lateral root angulation or dilaceration, partial or complete arrest of root formation and sequestration of permanent tooth germs-dentigerous cyst), as well as for position and time of eruption [Andreasen and Flores, 2007]. The prevalence reported is between 12% [Zellner, 1956] and 69% [Selliseth, 1970]. The premature loss of a primary incisor can occur directly following the trauma in 12% of the cases, with a percentage bound to increase up to 46%, since often extraction may represent the only therapy in the immediate post-trauma phase or during follow-up [Borum and Andreasen, 1998], and it can lead to loss of space in the dental arch, premature or delayed eruption and/or malposition of the permanent successor [Huber et al., 2008].

Case report

A healthy 7.5 years old male came for an examination at the Department of Paediatric Dentistry of the University of Milan, Italy, for a mainly aesthetic problem, given the presence of only tooth 11 in the dental arch, a fact which made the lack of tooth 21 even more noticeable. The parents reported a trauma which occurred about the age of 3 years involving tooth 61, and the decision made at the time by the dentist to wait, since the primary incisor was not dyschromic. After several abscesses, considering also the mobility of tooth 61, one year after the trauma the primary incisor was extracted. The parents had kept the periapical x-ray taken at the time, which showed a dislocation of tooth 61 and a wide radiolucent area (Fig. 1).



FIG. 1 - Periapical radiograph at the time of traumatic injury, before the extraction of tooth 61 (a diffused radiolucency around the root of the tooth was observed).

The clinical examination revealed an early mixed dentition, compatible with the patient's age:

16 55 54 53 - 11 - - 63 64 65 26
46 85 84 83 - 41 31 72 73 74 75 36

(FDI two-digit numbering system) characterised by the lack of tooth 21, whose crown and incisal edge could be felt through palpation of the vestibule (Fig. 2).

The parents had already requested an examination at a private dental office, where an orthopantomogram of the dental arches ruled out a dislocation and any severe dimorphism of the impacted tooth, as well as any impediments concerning its eruption, such as the presence, for example, of a mesiodens. An orthodontic treatment was suggested in order to guide the eruption of the impacted tooth.

A periapical x-ray was taken in order to better evaluate the degree of root formation, which appeared developed by 2/3 (Fig. 3).

Ten weeks after the first examination, with the parents' consent, a local anesthetic (articaine plus 1:100.000 adrenalin) was administered and then a gingivectomy was carried out by means of a surgical knife with a Bard-Parker blade N. 12, in order to expose 2/3 of the crown of tooth 21. The patient was scheduled for follow-up.

Three months later the spontaneous eruption of tooth 21 could be observed, as well as a symmetry of the incisor margins of teeth 11 and 21 and a satisfying periodontal

healing process. The crown of tooth 21 did not show any disturbances in the enamel mineralization, as already observed during the gingivectomy (Fig. 4).

Twelve months after surgery, the clinical examination showed the eruption of the permanent lateral incisors with a moderate crowding (Fig. 5), while a new periapical x-ray allowed evaluation of the root development (Fig. 6).



FIG. 2 - The intraoral examination revealed a delayed eruption of tooth 21, probably caused only by a mucosal barrier.



FIG. 3 - Periapical radiograph evidenced the development of about 2/3 of dental root and the absence of other aetiologic factors of tooth 21 impaction.



FIG. 4 - Three months after gingivectomy tooth 21 was completely erupted and no morphological developmental disturbances were observed.



FIG. 5 - Intraoral examination 12 months after gingivectomy showing a moderate crowding.



FIG. 6 - The periapical radiograph shows a little asymmetry in root development of the two central permanent incisors, with a better root formation of tooth 21.

Discussion

The germs of permanent teeth are separated by the root apices of the corresponding deciduous teeth through a barrier of about 3 mm, usually of hard tissue, but that can also be made simply of fibrous connective tissue. This relationship of primary apex/germ of permanent tooth remains active during the whole development phase [Torriani et al., 2008]. The factors that need to be taken into consideration in order to assess the possible kind of damage are given by the direction (indirect blunt force will more often cause damage to the periodontium), by the intensity of the acting force [Sennhenn-Kirchner and Jacobs, 2006] and by the patient's age at the time of the trauma. The younger the child, the higher is the risk that the trauma to the primary teeth could cause developmental disturbances to the corresponding permanent teeth [Torriani et al., 2008; Christophersen et al., 2005; Ishikawa et al., 1990; Ravn, 1975].

In this case report the trauma took place at the age of 3 years, an age in which the crown of the permanent tooth is forming, and also a time when one can more often detect alterations in enamel formation.

The periapical x-ray the parents had kept was not taken at the time of the trauma, but only at a later stage: a sure diagnosis was not possible with regards to the type of the trauma itself (like a lateral luxation), also because neither a clinical photograph nor a written medical report were available. However, the presence of a vast area of radiolucency led to the diagnosis of pulp necrosis.

Parents are usually concerned about the possibility of injuries to the corresponding permanent tooth.

The periapical x-ray we took ruled out any severe dimorphism and white or yellow brown discoloration of enamel with detectable defects in the enamel surface, as there were no obvious radiolucent transverse lines at the level of indentation, neither were there radiolucent areas related to defects in the enamel in the coronal area [Andreasen and Ravn, 1971] which might occur also following damage caused by dislocation towards the palatal area of the root of the primary incisor during extraction [Christophersen et al., 2005]. It was on the other hand not possible to rule out if not after surgical exposure of the crown, white or yellow brown discoloration of the enamel as this would not be diagnosed on an x-ray level [Andreasen and Ravn, 1971].

In regard to the root morphology, the inspection of the periapical x-ray revealed a different maturation degree, since the root of tooth 11 was close to being completely formed and the root of the impacted tooth 21 developed by about 2/3.

The criteria that are usually considered in order to assess if there is a delay in dental eruption are: age of the patient and his/her clinically measurable dentition, presence or absence of factors that could hinder the dental development and the degree of root formation; normal biologic eruption time is given when the length of the root is about 2/3 of its final size [Suri et al., 2004]. In this case report, the age of 7.5 years is compatible with the presence of both maxillary central incisors (tooth 11 is completely erupted); since the delay in eruption involves only one tooth, given the lack of severe dimorphism, an

obstruction of physical nature can be suggested [Di Biase, 1971; Goho, 1987]; moreover, the root is formed by at least 2/3.

Even considering a hypothesis of a delay in eruption compared with the contralateral incisor due to delay in the root formation (no symmetry of development between the roots of the two central maxillary incisors was detected), and bearing in mind that the variations in eruption time between right and left side are minimal among most patients, based also on an intraoral examination including palpation which revealed an incisor positioned in the vestibule and limited in its eruption by the presence of a mucous barrier [Di Biase, 1971; Goho, 1987], an aetiological diagnosis was reached which led to the chosen treatment plan. In this case the primary tooth had been removed too early given the trauma it had suffered, that is before the physiological root resorption could take place. A tissue which has undergone a trauma or surgery shows differences in the submucosa compared to normal tissue [Di Biase, 1971]. Gingival hyperplasia can lead to abundance in thick connective tissue or acellular collagen [Katz et al., 2002]. A thick and fibrous gum that covers a permanent tooth can delay its eruption [Di Biase, 1971; Goho, 1987] up to 12-18 months, as observed in a case by Ishikawa et al. [1990].

The therapeutic options suggested for treatment of impacted teeth are: gingivectomy, apically positioned flap, flap/closed eruption and pre-orthodontic uncovering technique [Kokich and Mathews, 2001; Becker, 2002].

The choice fell on a simple gingivectomy because of the wide presence of attached gingiva, it was not necessary to remove any bone and it was possible to expose at least half of the crown, leaving about 3 mm of gingival collar.

Once exposed, the crown did not show any enamel alterations. It was decided that it would be best not to apply orthodontic traction to speed up and guide the eruption of the tooth, rather hoping for its spontaneous eruption: the infraocclusion was modest, the tooth was not dislocated, the dental sac had not been disturbed during surgery, and no significant space deficit had been detected in the dental arch.

At the 3 months checkup the complete eruption could be observed, while 12 months after surgery, apart from a moderate crowding of the incisors due to the eruption of the lateral incisors, the x-ray showed a more marked root maturation of tooth 21 when compared with tooth 11.

Conclusion

Given the age of the patient of about 3 years at the time the trauma, there was a high risk that the corresponding permanent tooth would show developmental disturbances of the crown enamel. This possibility could also be the consequence of the extraction of the primary tooth, for the possible involvement of the dental sac, given the angulation of the root apex of the primary tooth prior to the physiological root resorption and the palatal dislocation during the extraction.

In this case report, it was not possible to rule out a spontaneous although delayed eruption of the permanent incisor as a result of the premature loss of the

correspondent primary tooth, but the simple surgery performed allowed the tooth to complete its spontaneous eruption in a short period of time, thus solving the aesthetic problem and leading to both the child's and the parents' satisfaction.

The early loss of a primary incisor can interfere with the eruption stages and the correct positioning of the corresponding permanent tooth in the dental arch, therefore after a trauma to primary teeth periodic observation is the recommended course of action to perform an early evaluation of pathological conditions, in order to minimise the need for more complex surgical and orthodontic management.

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