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Crown-root fracture in deciduous dentition with late treatment: clinical case report

Fratura coronorradicular na dentição decídua com tratamento tardio: relato de caso clínico

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ABSTRACT

Traumatic dental-injuries are a common dental emergency, being the crown-root fracture a rare kind of trauma, which represents only 2.5% of all dental traumas. In the deciduous dentition, the prevalence of dental trauma is 22.7%. This clinical case report describes a three-year-old child who came to the Pediatric Dentistry Clinic with crown-root fracture in tooth 61 that had been untreated for two years. Clinically, the absence of the crown of tooth 61 and the presence of a pulp polyp with a blood clot on its surface were observed. Radiographic examination was performed only two years after the initial trauma, revealing extensive, non-physiological root resorption and an inability to achieve fixed esthetic-functional rehabilitation, indicating the need for root fragment extraction. The fragment was extracted, and post-intervention follow-up was conducted. Although the patient did not present significant clinical changes in the permanent tooth, dental trauma should be diagnosed and treated immediately, as it is known that a favorable prognosis is directly related to the time between the occurrence of the trauma and dental intervention.

Keywords: Deciduous tooth. Late treatment. Tooth injuries.

RESUMO

As lesões dentárias traumáticas são uma urgência odontológica comum, sendo a fratura coronorradicular considerada relativamente rara, representando 2,5% dos casos de traumatismos dentários. Na dentição decídua, a prevalência do traumatismo dental é de 22,7%. O presente caso clínico relata o caso de uma criança de três anos de idade que compareceu à Clínica de Odontopediatria com fratura coronorradicular no dente 61 ausente de tratamento por dois anos. Clinicamente, observa-se a falta da coroa do dente 61 e a presença de um pólipo pulpar com coágulo sanguíneo em sua superfície. O exame radiográfico foi realizado apenas dois anos após o primeiro trauma, foi constatada a presença de reabsorção radicular extensa, não fisiológica e a impossibilidade de reabilitação estético-funcional fixa, indicando a necessidade de extração do fragmento radicular. Realizou-se a extração do fragmento e acompanhamento após a intervenção. Apesar da paciente apresentar inexistência de alterações clínicas no dente permanente, o trauma dentário deve ser diagnosticado e tratado de forma imediata, pois sabe-se que um bom prognóstico está diretamente relacionado com o tempo entre a ocorrência do trauma e a intervenção odontológica.

Palavras-chave: Dentes decíduos. Traumatismo dentário. Tratamento tardio.

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INTRODUCTION

Traumatic injuries in the oral region are frequent and comprise 5% of all injuries for which people seek treatment (Levin et al., 2020). In the deciduous dentition phase, these lesions have an overall prevalence of 22.7%, being the most common emergency in dental offices (Lenzi, Alexandria, Ferreira & Maia, 2015; Petti, Glendor & Andersson, 2018; Tewari, Bansal & Mathur, 2019). About 30% of children up to seven years of age have suffered some type of trauma to the deciduous dentition (Caeiro-Villasení et al., 2022). This can be explained by the high rate of falls that occur at this age due to the period of development of the child's reflexes and their skills, such as motor coordination and spatial awareness, in addition to having a disproportion between the size of the head and body (Tewari et al., 2019; Bulut & Güçlü, 2022).

Crown-root fractures are the most common traumatic injuries, although these data may be underestimated, as some injuries go unnoticed, for example, in cases of concussion and subluxation (Zaleckiene, Peciuliene, Brukiene & Drukteinis, 2014; Lam, 2016). Crown-root fractures are those that involve mineralized tissues, the alveolar process, and eventually the pulp. In the deciduous dentition, they have prevalence of 2% to 2.5%, occurring more frequently in the anterior region due to the incidence of direct forces against the tooth (Emerich & Wyszkowski, 2010; Gungor, 2014).

Due to the anatomical proximity between the apex of deciduous teeth and the germs of successor permanent teeth, sequelae secondary to trauma may occur (Caeiro-Villasení et al., 2022). The age of the child, the degree of rhizolysis of the deciduous, and the stage of development of the permanent germ are factors directly related to the possibility of serious complications in the permanent dentition (Lam, 2016; Caeiro-Villasení et al., 2022).

Coronal or root laceration and changes in the positioning of the tooth germ are among the possible complications that can affect permanent dentition, which, in the future, can result in impacted tooth and alterations during the tooth eruption process (Flores & Onetto, 2019). After a period of time following dentoalveolar trauma, it is possible to identify histopathological reactions in the traumatized tooth through signs that may be present on clinical and radiographic examination. Some manifestations, such as changes in the crown color, are usually only evident 10 to 14 days after trauma, which can limit the professional in the evaluation and diagnosis of the inflammatory state of the pulp tissue (Holan, 2019).

In this sense, the prognosis of trauma is directly related to some factors that must be taken into account, such as the age of the patient at the time of the trauma, the stage of development of the successor germ, the direction and strength that the traumatized tooth suffered (Losso, Tavares, Bertoli & Baratto-Filho, 2011; Tewari et al., 2019). Thereby, immediate care of the patient is recommended, so that diagnosis and treatment can be carried out, as it is known that the prognosis will depend on the time elapsed between the occurrence of the trauma and the execution of the treatment (Bulut & Güçlü, 2022).

In most cases of crown-root fractures in deciduous teeth, the best treatment option is tooth extraction, which is mainly justified by the occurrence of external root resorption (Emerich & Wyszkowski, 2010; Gungor, 2014). After tooth extraction, it is necessary to carry out an evaluation of the space that will be generated, since the early loss of the tooth can cause consequences for the child.

When these situations occur, it is common to experience loss of tooth space, extrusion of antagonist teeth, inclination of adjacent teeth, and atypical swallowing, also affecting masticatory and phonetic functions. The lack of a tooth can directly impact the child's psychosocial characteristics, which are reflected in behavioral changes, so the importance of functional esthetic rehabilitation is emphasized (Sánchez, Valls, Ramos, Quevedo & Esplanger, 2016).

Thus, if indicated, the placement of a functional space maintainer should be part of the planning, alleviating esthetic, functional and emotional problems. It is important to emphasize that children are in the growth phase and, therefore, monitoring is necessary in order to prevent the maintainer from hindering the growth of the jaws (Nobrega, Barbosa & Brum, 2018; Volpato, Crivelli, Oliveira, Nobreza & Rosa, 2021; Spodzieja & Olczak-Kowalczyk, 2022). In this sense, it is possible to perceive that traumatic dental injuries can affect stomatognathic balance, as well as psychosocial balance, recognized as an important oral health problem (Katge, Patil, Khakhar Poojari & Koticha, 2021; Spodzieja & Olczak-Kowalczyk, 2022).

The aim of this study is to report the clinical case of a three-year-old child who received late dental care for a crown-root fracture in tooth 61 that occurred approximately two years earlier. The clinical approach adopted for this case, as well as the prognosis, will be reported.

CASE REPORT

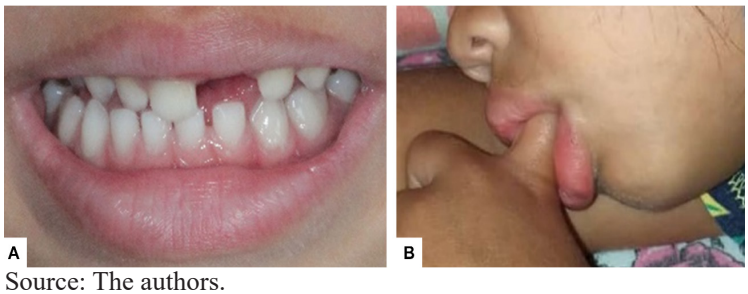
A three-year-old female patient came to the School of Dentistry of Ribeirão Preto (FORP/USP) in search of care. After anamnesis, it was found that the entire length of the clinical crown of element 61 was lost due to a trauma that had occurred about two years earlier. After signing a free, informed consent form approved by the Human Research Ethics Committees of FORP/USP (process number 4.060.916), the mother agreed to the scientific disclosure of the clinical case.

The mother reported that the patient had been previously treated at the Basic Health Unit (UBS) a few

days after the trauma, when she noticed a darkening of the traumatized tooth. However, the mother was not able to provide precise information about what was done in this first consultation.

About nine months after the trauma, the child bit his father while playing a game and, as a result, the dental crown came off completely (Figure 1A). On this occasion, there was significant bleeding, but, according to the mother's report, it was stopped with ice.

Figure 1
Initial intraoral clinical aspect and register of the sucking habit.



Source: The authors.
Note. A: Absence of the crown of tooth 61 on initial clinical examination. B: Image courtesy of the mother, showing the habit of thumb sucking during sleep.

After the new occurrence, the guardians returned with the child to the UBS and it was suggested the tooth extraction, however, the mother reports that it was not possible to perform the extraction due to the child's uncooperative behavior. Since then, tooth 61 has had no spontaneous pain and has had recurrent bleeding as a result of the trauma. Due to the lack of tooth 61, the patient developed a habit of thumb sucking, with the habit of positioning the index finger in the space resulting from the crown-root fracture (Figure 1B).

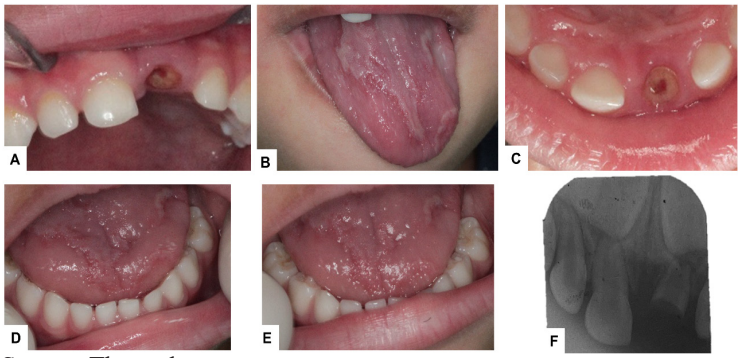
On clinical examination, it was observed that the patient had generalized diastemas throughout the dental arch, classified as a Baume type I arch, the presence of biofilm in the cervical region, more visible in elements 51, 52, 61, 62, 63, 64 (Figure 2A), and geographic tongue (Figure 2B). In the trauma region, there was the absence of a clinical crown of tooth 61, the presence of a blood clot (Figure 2C) and a report of pain when the region was touched with an exploratory probe (n.º 5).

In the other dental elements, there was a normal condition, with absence of mobility, edema or fractures, both in the upper and lower arches (Figures 2D and 2E).

The extra-oral clinical examination revealed normal soft tissues, no foreign body as a result of the trauma, no edema, no pain and no bone trauma. The guardians reported that the child grinded the teeth when sleeping.

For the radiographic evaluation, the modified occlusal technique with periapical film was performed in the anterior region of the maxilla. On the X-ray, it was possible to observe the permanent germ at an early stage and the presence of a radiolucent area in the apical region of tooth 61, indicative of external root resorption (Figure 2F).

Figure 2
Intraoral aspect of the patient's oral cavity.



Source: The authors.
Note. A: presence of biofilm in the cervical anterior teeth. B: geographic language. C: tooth 61, with the presence of a blood clot. D: lower arch. E: mandibular arch with visualization of the molars. F: X-ray of the root fragment of tooth 61.

Due to the clinical and radiographic findings, the treatment plan for this case was the extraction of the residual root of tooth 61 with periodic returns until the eruption of the permanent successor to assess possible complications. Subsequently, a space maintainer was made.

Because of the difficulty in the behavioral management of the patient during the first consultation, non-restrictive behavior management techniques, such as talking-showing-doing, were adopted to assist in the adaptation of the care. It was also necessary to use protective stabilization during surgery, prior to the permission and signing of the term of permission for restriction of movement by the child's guardian. The mother assisted in the restraint of the child, restricting his physical movements in order to prevent injuries to the patient during the procedure.

Topical anesthesia was performed with 20% benzocaine (Benzotop®, DFL, Rio de Janeiro, RJ, Brazil) under the region of dry tooth 61, and then infiltrative anesthesia was performed with a tube of 1% mepivacaine with epinephrine (Mepiadre, DFL, Rio de Janeiro, RJ, Brazil) in the sulcus bottom region and on the papillae. The extraction of the residual root was initially performed with spatula 7 (SSWhite Duflex Instruments, Juiz de Fora, MG, Brazil) for detachment, followed by careful dislocation with vestibulolingual movements, using number 69 infant forceps (Golgran Industry and Dental Instruments Trade, Sao Caetano do Sul, SP, Brazil).

After tooth extraction (Figure 3), digital pressure was applied to the alveolar ridge to reposition the bone plates. It was not necessary to perform sutures and, at the end of the consultation, postoperative guidance was given to the guardian and no medication was prescribed.

Figure 3
Residual root of the tooth 61.

Source: The authors.

The patient did not attend the consultation postoperative follow-up that would be performed seven days after the intervention, returning to the clinic only 20 days after the surgery. In this consultation, the surgical area was evaluated through clinical examination and photographic documentation (Figures 4A, 4B). The area healed well and there was no report of pain.

Figure 4
Post-surgery follow-up.

Source: The authors.
Note. A and B: intraoral appearance 20 days after residual root extraction

Three months after the extraction of the residual root of tooth 61, a periapical radiography was performed to evaluate and monitor the eruption stage of the tooth germ 21 (Figure 5). The radiograph showed that tooth 21 was in Nolla's stage 5 of eruption (Nolla, 1960), with rupture of the bone crypt. On clinical examination, the habit of tongue interposition and the continuity of the habit of thumb sucking of the index finger in the edentulous space were observed.

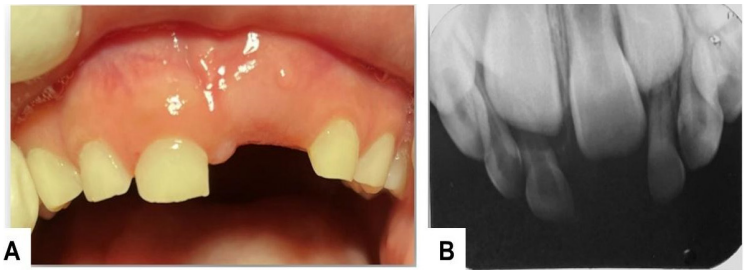
In the same session, both arches were molded with addition silicone, dense paste, (Futura AD®, DFL Industry and Trade S/A, Taquara, RJ, Brazil) for evaluation and preparation of a functional and esthetic space maintainer. However, it was not possible to obtain a quality impression due to the child's non-cooperative behavior, that showed a lot of resistance to the procedure, demonstrating discomfort, anxiety and retching reflexes.

For this reason, it was decided to perform a new molding in the next service session, which was not possible due to the suspension of services because of the COVID-19 pandemic. With the resumption of care, the patient's consultation was held in August 2022, two years after the last return. The patient, who was six years old at the time, was submitted to the clinical examination with a normal picture (Figure 6A). Radiographic examination showed the development of the dental germ of tooth 21, which was in Nolla's stage 7/8, showed no alterations (Figure 6B).

Figure 5
X-ray of the germ 21 in Nolla's stage 5, performed three months after surgery.

Source: The authors.

Figure 6
Clinical and radiographic follow-up.



Source: The authors.
Note. A: intraoral photograph taken 18 months after the last visit. B: radiographic examination of germ 21 at Nolla's stage 7/8.

It was decided to perform ulectomy in the region of tooth 21, since the gums in this region had a fibrous aspect. Finally, at the patient's last appointment, held in April 2023, photographic documentation was made (Figure 7), in which it can be seen that tooth 51 had exfoliated, and tooth 21 was present, with partial eruption, which had no clinically visible coronal alterations to date.

DISCUSSION

In the present case, the dental trauma occurred in a female child in her first year of age, resulting in a crown-root fracture of tooth 61. A recent study assessed the prevalence of dental trauma in children and teenagers, which found that the maxillary central incisors are the

most affected teeth, with males being more affected than females (Dantas, Alves & Scavuzzi, 2019). Other studies have also shown that dental trauma is more common in males (Malak, Chakar, Romanos & Rachidi, 2021; Bulut & Güçlü, 2022).

Figure 7
Intraoral photograph taken five months after ulectomy in the region of tooth 21, which presents partial eruption without coronal alterations.

Source: The authors.

Correct diagnosis and immediate care are essential for a favorable prognosis, so trauma should be considered a situation of clinical urgency (Pereira, Boer, Correia, Lima & Cunha-Correia, 2015). To determine the prognosis in cases of dental trauma, some factors must be taken into account.

One example is the child's age at the time of the trauma, as this is an important variable, since the younger the child, the greater the risk of sequelae in the permanent successors. The formation phase of the successor germ is an important factor to be evaluated, because, according to the formation stage, different alterations can affect the successor teeth.

In addition, the direction and intensity of the force received by the traumatized teeth, as well as the treatment adopted by the professional, are determining variables for the prognosis of dental trauma (Losso et al., 2011; Wanderley, Weffort, Kimura & Carvalho, 2014).

Dental trauma to the deciduous dentition requires differentiated management due to the proximity between the apex of the deciduous tooth and the germ of the permanent successor, which can cause sequelae in the successor tooth (Caeiro-Villasení et al., 2022). Hence, it is important that care is provided soon after the trauma, ensuring better prognosis for the case and avoiding sequelae, such as pulp necrosis or early loss of the tooth element (Loiola, Daltro & Almeida, 2019).

The condition of the traumatized tooth element (with or without pulp exposure), its stage of development or rhizolysis, and the time elapsed until treatment (immediate or late) are factors that determine the type of treatment (Losso et al., 2011). Subgingival crown-root fractures 2 mm beyond the gingival limit are indicated for extraction (Losso et al., 2011).

The patient in this case report came to the Dental Trauma Service at FORP/USP with extensive crown loss, only a small portion of enamel remaining on the palatine, with the fracture line below the gingival margin, as well as major root resorption, which justified the extraction of the traumatized tooth as the treatment of choice (Bitencourt, Cunha, Oliveira & Jardim, 2015).

In cases in which extraction is necessary, follow-up is recommended at the following periods: one-week, clinical examination; six to eight weeks, clinical and radiographic examination; and, subsequently, annual follow-up and clinical and radiographic examination until the eruption of the permanent successor (Malmgren et al., 2012; Day et al., 2020).

Monitoring the permanent successor is necessary to assess possible sequelae. Among the main sequelae are enamel hypoplasia/hypomineralization, coronal laceration, root laceration (Caeiro-Villasení et al., 2022), odontoma-like malformation, partial or complete interruption of root formation, sequestration of the permanent tooth germ (Amorim, Estrela & Costa, 2011), eruption alterations (Caeiro-Villasení et al., 2022), and prolonged retention (Amorim, Estrela & Costa, 2011). According to the radiographs taken during the follow-up consultations in this case, the permanent successor is in normal condition, with no obvious sequelae.

Behavior management is essential during pediatric dental care and should be initiated from the first contact with the patient. In the case in question, non-restrictive behavioral management techniques were performed, such as saying-showing-doing, distraction and modeling, using language geared to the patient's age (Albuquerque, Gouvêa, Moraes, Barros & Couto, 2010).

The management techniques were adopted during the first dental appointment, when anamnesis, clinical and radiographic examinations were performed. As this was a situation that required rapid intervention, the surgical procedure was carried out on the second session, in which the patient still manifested a non-cooperative behavior.

As a result, it was necessary to perform a movement restriction technique, such as protective stabilization, so that tooth 61 extraction was possible. The use of movement restriction techniques should be adopted when non-invasive techniques are unsuccessful, such as voice control, distraction and positive reinforcement, as they help to condition the child for long-term dental treatment.

There are cases, however, in which it is necessary to use restrictive movement techniques for the treatment to be carried out. The use of protective stabilization will prevent unwanted movements, protecting the child, parent, dentist and assistant.

It is important to note that when using movement containment techniques, the dentist should talk to the child's guardians and clarify any questions. For ethical and legal reasons, a consent

form must be signed by the parents authorizing the use of movement restriction techniques, which must be attached to the patient's medical record (American Academy of Pediatric Dentistry [AAPD], 2020; Sant'anna, Silva, Silva & Almeida, 2020).

The early loss of the deciduous central incisor has esthetic and functional implications perceived by the child, which can directly affect self-esteem and social relationships that begin in childhood (Holan & Needleman, 2014). In addition to the psychosocial implications, it is essential that functional factors are considered as an important step in treatment planning.

In the present case, the patient lost the maxillary central incisor early, but there were no implications such as loss of space, since the eruption of the permanent tooth occurred normally. At the time of the clinical examination in the first consultation, the presence of generalized diastemas was observed in the deciduous dentition, characterizing the dental arch as Baume type I. Thus, it is possible to note how the presence of generalized spaces in the deciduous dentition as a favorable point for the eruption of permanent teeth (Baume, 1950; Nadelman et al, 2020).

The lack of space in the arch caused by early loss can contribute to the establishment of malocclusions or increase its severity, causing dental problems such as crowding, ectopic eruption, and alterations in the stomatognathic system (Nobrega et al., 2018). Frequently, in the anterior-superior region, this loss does not affect the intercanine distance, however, if the loss occurs before the permanent incisors develop enough to maintain the arch dimensions, more specifically, before the age of four, it can lead to a loss of space (Almeida, Almeida-Pedrin & Almeida, 2003). The presence of the edentulous space favors the creation of deleterious habits (Almeida et al., 2003; Reis, Kelmer, Santin & Franzin, 2018), as in the case presented.

Therefore, in this clinical case, in which the patient presented tooth 61 loss before the age of four years in view of the deleterious habits of digital sucking and tongue interposition, the creation of a functional space maintainer was indicated. Due to the interruption in treatment because of the Covid-19 pandemic, the patient was only followed up a year and a half after her last visit, so the manufacture of a retainer appliance was unnecessary, since the patient was already six years old, the average age of eruption of the upper central incisors, contraindicating its use at this stage of life (Almeida et al., 2003; Terto, 2019). In many cases, early tooth loss can lead to changes in the eruption process of permanent successors.

Factors such as periapical injury, inflammatory resorptions, and dental trauma can cause disturbances in the eruption process. In this case, the patient had a history of two dental traumas in the same region and the presence of external inflammatory resorption, as well as having undergone tooth 61 extraction early. These factors may be related to the acceleration of the eruption process of tooth 21 and its position closer to the oral environment when compared to tooth 11 (Holan & Needleman, 2013).

Another common consequence of early tooth loss is the presence of gingival fibrosis. In the present case, it was possible to clinically observe that the gingival tissue in the edentulous space had a fibrous aspect and, radiographically, the permanent successor was in Nolla's stage 7/8, with the absence of bone barrier. Gingival fibrosis can occur due to constant friction of the edentulous region as a result of chewing during feeding (Souza, Martins & Fravetto, 2021).

In addition, the patient developed the habit of sucking and interposition of the finger in the edentulous space, which may have contributed to gingival fibrosis, thus hindering the eruption of the permanent successor. Ulectomy is the procedure of choice for cases in which there is thickening of the gingival tissue. It consists of the surgical removal of the gingival tissue, helping the path of eruption of the permanent tooth. It is a safe procedure with favorable results (Paula-Silva, Queiroz, Stuani, Nelson-Filho, Díaz-Serrano, 2008).

CONCLUSION

Dental traumas are highly prevalent injuries worldwide and should be treated as dental emergency. In view of the implications of late treatment in coronorradicular trauma in deciduous teeth, its correct diagnosis and treatment are extremely important, since the prognosis is directly related to the time elapsed until the intervention and the patient's age at the time of the trauma. For this reason, it is essential to follow up the clinical case until the eruption of the permanent successor and to preserve the space in a way that prevents possible functional and psychosocial impairments in the child.

COMPETING INTERESTS

The authors declare that there are no conflicts of interest.

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AUTHOR CONTRIBUTIONS

Conceptualization: F. W. G. P. S. *Investigation*: C. R. G. D. *Methodology*: F. W. G. P. S., G. C. C. L. *Project administration*: F. W. G. P. S. *Supervision*: F. W. G. P. S., G. C. C. L. *Writing the initial draft*: C. R. G. D., J. L. G. *Revision and editing of writing*: J. L. G., G. C. C. L., F. K. C., A. M. Q., M. F. M. A.

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