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Case Report

Dental trauma in primary dentition, its effect on permanent successors and on Oral Health-Related Quality of Life: a 4-year follow-up case report

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Abstract: Traumatic dental injury (TDI) in deciduous teeth can affect itself and subsequent dentition due to its close anatomical relationship with the permanent germ. Besides, it can have psychologically undesirable effects on children and their parents and impact their Oral Health-Related Quality of Life (OHRQoL). In this case report, we aimed to describe a TDI in primary dentition that presented sequel on primary and on permanent dentition as well to describe the impact on OHRQoL after 4 years of follow-up. A 4-year-old boy was referred to the Dental Trauma Care Program (DTCP) six months after an accident at school that resulted in TDI. In deciduous dentition, the tooth 51 presented periapical lesion due to lateral luxation and tooth 61 presented pulp canal obliteration due to a concussion. The teeth received appropriate treatment. After 4 years of follow-up, in the permanent dentition, tooth 11 presented mild disturbance (demarcated opacity) as sequel of TDI in deciduous dentition. The patient's OHRQoL was evaluated throughout this process until the eruption of the permanent tooth. TDI and the sequelae on permanent tooth had a negative impact on the patient's OHRQoL. TDI treatment improved the patient's OHRQoL. This case report reinforces the importance of regular follow-up of traumatized teeth as it can affect both dentitions with a negative impact on OHRQoL.

Keywords: Tooth injuries, deciduous teeth, dental trauma, quality of life

Introduction

Traumatic dental injuries (TDI) in the primary dentition are highly prevalent and affect appro ximately one-third of preschool children worldwide [1]. TDI can involve different forms of tooth damage [2]. Among the types of injury sustained by the primary dentition, luxation injuries constitute 21% to 81% of all TDIs [3]. Moderate injuries, such as concussion and subluxation, are usually associated with minor symptoms [4].

Oral health has been described as a multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex [5]. Individuals with poor oral conditions have difficulty carrying out their daily activities [6]. TDI plays an important role in Oral Health-Related Quality of Life (OHRQoL) since it occurs mainly in the anterior teeth, and their appearance and position may have serious esthetic and psychological consequences on children, adults, and their families [2, 7].

The consequences of TDI in the primary dentition include periapical lesions, root resorption, pulp canal obliteration, pulp necrosis, and ankylosis [8]. Treatment should be performed as soon as possible after the injury to restore function and relieve pain [9]. The discoloration of enamel, hypoplasia, and defects of the enamel surface is the most frequent sequelae

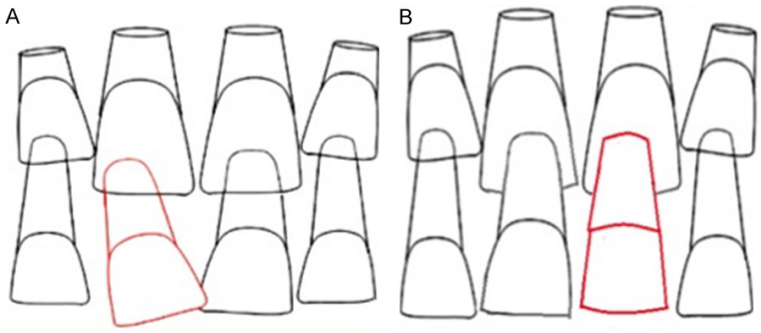

Figure 1. Schematic illustration: Lateral luxation (tooth 51) is defined as displacement of the tooth other than axially (A); Concussion (tooth 61) is defined as an injury to the tooth-supporting structures without increased mobility or displacement of the tooth, but with pain to percussion and without gingival bleeding (B).

Figure 2. Clinical and radiograph 6 months after TDI (tooth 51 and 61).

in permanent teeth due to injuries on deciduous teeth [10].

As the roots of the primary and permanent tooth germ lie close to each other, some complications may also damage permanent dentition [4]. Clinical and radiographic follow-up of traumatized teeth is important to reduce the risk of possible complications [11]. The efficacy of the management of TDI on primary dentition depends on accurate diagnosis, followed by an appropriate treatment to improve the prognosis [12].

There are some authors that had analyzed sequelae in permanent teeth after TDI in primary dentition [13, 14]. However, it is still necessary a case report to analyses the impact of TDI, its treatment and follow up until permanent dentition to determine the complete concept of health according to FDI World Dental Federation [5]. Therefore, this case report aimed to describe a TDI in primary dentition that presented sequel on primary and on permanent dentition as well to describe the impact on OHRQoL after 4 years of follow-up.

Case report

A 4-year-old boy was referred to the Dental Trauma Care Program (DTCP) in a Brazilian Public University, six months after an accident at school that resulted in TDI. This program was approved by the ethics committee of the Fluminense Federal University, CAAE nº 70872117.8.0000.5626/protocol nº 2.320.329. After registration at the DTCP, a signed, written informed consent form was obtained from the patient's caregiver.

According to the child's caregiver, the child was evaluated by medical and dental staff at an emergency unit of a local hospital 30 minutes after the TDI. No neurological damage or medical complications were detected. The TDI diagnostic was lateral luxation in the primary maxillary right incisor (51) (**Figure 1**), and concussion of the primary maxillary left incisor (61) (**Figure 1**).

At DTCP, the child was clinically and radiographically evaluated (**Figure 2**). A periapical radiographic examination showed a radiolucent area suggestive of a periapical lesion on 51 and pulp canal obliteration on 61.

At the first appointment in DTCP, the patient's OHRQoL was evaluated. The questionnaire used was the Brazilian version of the Early Childhood Oral Health Impact Scale (ECOHIS) (B-ECOHIS) for preschool children (2-5 years old) and their families to assess the impact of oral health conditions on children's quality of life [15]. The ECOHIS contains 13 questions divided into the child subscale (9 questions) and family subscale (4 questions). Each answer receives a score from 0 to 4 according to the

Table 1. ECOHIS questionnaire after the child was insert in the DTCP

Child impacts How often has your child....because of dental problems or dental treatments?	Never (0)	Hardly ever (1)	Ocasionally (2)	Often (3)	Very often (4)
had difficulty drinking hot or cold beverages				X	
had difficulty eating some foods				X	
had difficulty pronouncing any words				X	
missed preschool, daycare or school	X				
had trouble sleeping been irritable or frustrated	X				
avoided smiling or laughing		X			
avoided talking		X			
Family impacts **How often have you or another family member.....because of your child's dental problems or treatments?**	**Never (0)**	**Hardly ever (1)**	**Ocasionally (2)**	**Often (3)**	**Very often (4)**
been upset		X			
felt guilty		X			
taken time off from work		X			

Figure 3. Clinical and radiograph after pulpectomy and direct composite restorations in dental caries (tooth 51).

answer: "Never", "Almost never", "Sometimes/ from time to time", "Often", and "Very often", were equivalent to 0, 1, 2, 3 and 4, respectively. The scores of each question were summed to obtain a total score that could range from 0 to 52. The higher the value, the greater the impact oral health was deemed to have on the child's quality of life. In the current case, the TDI was found to have a high impact on the child and his family's daily lives (**Table 1**).

Based on the protocols proposed by the International Association of Dental Traumatology (IADT) [16, 17], the tooth with lateral luxation was treated by pulpectomy and the tooth with concussion was only followed-up (**Figure 3**). Follow-up appointments were scheduled at 3 and 6 months, followed by yearly follow-up until the eruption of the permanent teeth. After the treatment had been completed, an evaluation of the OHRQoL using the same questionnaire as at the first appointment was performed. This showed that the child was very satisfied with the results (**Table 2**).

After 4 years, when the child was 8 years old, the permanent successor erupted with mild disturbance (demarcated opacity) in the vestibular surface (**Figure 4**). The radiograph did not show any change in the root development of the successors (**Figure 4**). At this stage, we re-evaluated OHRQoL. The Child Perceptions Questionnaire (CPQ) which is used to assess the impact of oral health conditions on the quality of life of children aged 11 to 14 years, also effective in those aged between 8 to 14 years (CPQ 11-14) was used [18]. This instrument has 16 items divided into 4 subscales: oral symptoms, functional limitations, emotional well-being, and social well-being. Each answer receives a score from 0 to 4 according to the answer: The options "never, 1 or 2 times, sometimes, very often, everyday" were equivalent to 0, 1, 2, 3 and 4, respectively. The scores of each question were summed to obtain a total score that could range from 0 to 64. The higher the value, the greater the impact oral health was deemed to have on the child's quality of life. After the eruption of the permanent teeth, the sequel of TDI had a negative influence on the OHRQoL (**Table 3**).

Discussion

TDI can have a great influence on OHRQoL perceived by children and adolescents [7, 19-21]. As in the present case, in which the child arrived at the DTCP with lateral luxation and concussion on the deciduous teeth and it had a negative impact on OHRQoL.

The main objectives of the diagnosis and treatment of TDI in children with primary dentition are to prevent possible damage to the developing permanent germ, pain management, and minimize the possibilities of sequelae [4]. The literature report cases evaluating sequelaes on permanent dentition after TDI involving support tissue on the primary dentition (**Table 4**) as the present report. The most critical period for the development of disorders in central incisors ranges from 4 months to 4 years of age (**Table 4**). The early age of the child at the time of trauma is important because it influences the treatment [22]. Thus, primary dentition should be monitored radiographically and clinically to detect alterations [23-25].

The prognosis for TDI is difficult to predict. As a result, it has obvious cost and quality of life implications, both of which should be considered when choosing treatment options [26]. One of the most frequently observed sequel in primary dentition is pulp canal obliteration (PCO) [27]. It is reported to develop more often in teeth following concussion and subluxation injuries [28]. The child, in the present case,

Table 2. ECOHIS questionnaire after the child received the treatment

Child impacts How often has your child....because of dental problems or dental treatments?	Never (0)	Hardly ever (1)	Ocasionally (2)	Often (3)	Very often (4)
had difficulty drinking hot or cold beverages	X				
had difficulty eating some foods	X				
had difficulty pronouncing any words	X				
missed preschool, daycare or school	X				
had trouble sleeping been irritable or frustrated	X				
avoided smiling or laughing	X				
avoided talking	X				
Family impacts How often have you or another family member.....because of your child's dental problems or treatments?	Never (0)	Hardly ever (1)	Ocasionally (2)	Often (3)	Very often (4)
been upset	X				
felt guilty	X				
taken time off from work	X				

Figure 4. Final aspect after 4-year follow-up. It was clinically observed demarcated opacity and no radiographic sequel on root in the element 11.

experienced PCO after a concussion. It is characterized by the deposition of hard tissue within the root canal space and yellow discoloration of the clinical crown [29]. The prognosis of teeth that present this condition is favorable [30]. In this case, we followed the protocols proposed by the IADT [17, 31], in which the patient underwent minimally invasive treatment for tooth 61 and was only followed-up regularly. When a periapical lesion occurs as a consequence of TDI, as observed o tooth 51 in the present case, pulpectomy can be useful to maintain and preserve the health of the teeth that would have otherwise been extracted [32]. This treatment aims to preserve normal periradicular tissue, prevent the progression of infection, and restore the tooth to its function in the dental arch [33, 34]. It was observed that treatment improved the OHRQoL of the child, as observed in other articles [19, 35, 36].

The severity of sequel in the permanent successor caused by trauma depends on factors such as the type of trauma to the primary tooth, the age of the child, the treatment that was done, and the direction of tooth displacement [13]. In this case, we observed demarcated opacity in the permanent teeth as a consequence of lateral luxation for mesial in the deciduous teeth. Opacities may also occur when there is a minor disturbance of the surrounding soft or hard tissue due to an injury [37]. In the present report, despite a mild disturbance (demarcated opacity), the esthetic impairment resulting from trauma in the deciduous dentition negatively impacted on the OHRQoL with oral limitations in the emotional well-being, and social well-being section, as reported by previous studies [7, 38, 39].

Compared to other enamel defects, demarcated opacity may have a low predisposition to the development of dental caries [40]. In this era of minimal intervention, when treatment is indicated either by esthetics or to prevent dental caries, enamel microabrasion could be a good option that can help to improve the appearance of the affected teeth and provide longevity [41, 42]. However, in this case, even though the impact on OHRQoL occurred because of demarcated opacity due to the patient's low age, we opted not to undertake any treatment until the boy was older and could decide if treatment was necessary.

It is difficult to completely prevent accidents that might result in dental injuries. However, the complications from such accidents can be avoided with timely and adequate treatment and follow-up. In the present case, the correct diagnosis and treatment were crucial for the successful management and preservation of the traumatized teeth. Finally, it should be highlighted that TDI in primary teeth has to be taken seriously because it may result in damage to the developing permanent successors. This case reinforces the importance of holistc view of the patient and the conduction of regular follow-ups of traumatized teeth.

Conclusion

This case report reinforces the importance of regular follow-up of traumatized teeth as it can affect both dentitions with negative impact on OHRQoL.

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Disclosure of conflict of interest

None.

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Table 3. CPQ 11-14 questionnaire after the eruption of the permanent teeth with sequel

In the past 3 months, how often have you had	Never (0)	Once or twice (1)	Sometimes (2)	Often (3)	Everyday (4)
pain in your teeth, lips, jaws or mouth?	X				
sores in your mouth?	X				
bad breath?	X				
food stuck in or between your teeth?	X				
taken longer than others to eat a meal?					X
difficult to bite or chew food like apples, corn on the cob or steak?					X
difficult to say any words?				X	
difficult to drink or eat hot or cold foods?			X		
felt irritable or frustrade?					X
felt shy?					X
been upset?					X
been concerned what other people think about your teeth, mouth or jaws?					X
avoid smiling or laughing when around other children?					X
argued with other children or your family?			X		
other children teased or called names because of your teeth, lips, jaws or mouth?			X		
other children asked you questions about your teeth, lips, jaws or moth?			X		

Table 4. Cases reports evaluating sequelaes on permanent dentition after TDI involving support tissue on the primary dentition

Author, year	Age at the TDI	Teeth/Type of TDI in deciduous dentition	Teeth/Type of sequelae in the permanent	Follow up
Mello-Moura et al., 2009 [11]	1.6 years	61-Avulsion	21-Ectopic eruption and enamel hypoplasy	6 year
Karatas et al., 2013 [14]	4 years	61-Lateral luxation/	21-hyperplasia, hypoplastic enamel and root dilaceration	-
Arenas et al., 2006 [24]	15 months	61 and primary supernumerary incisors-Intrusion	21-dilaceration of the crown, color change and enamel hypoplasia 22-with malformation, color change and dilaceration of the crown and root	5 year

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