Brazilian Dental Science
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UNIVERSIDADE ESTADUAL PAULISTA "JÚLIO DE MESQUITA FILHO"
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Campus de São José dos Campos



ORIGINAL ARTICLE

doi: 10.14295/bds.2017.v20i2.1350

# Sequelae in primary teeth after traumatic injury

Sequelas em dentes decíduos após injúrias traumáticas

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## ABSTRACT

**Objective:** Determine the prevalence of injuries due to dislocation in the primary dentition and the associated sequelae in children treated at Pediatric Dentistry Clinic of the School of Pharmacy, Dentistry and Nursing, Federal University of Ceará. **Material and Methods:** The research protocol was reviewed and approved by the Institutional Research Ethics Committee Medical School of the Federal University of Ceará, Fortaleza, Ceará, Brazil. It was conducted through a transversal retrospective observational investigation. Data were collected from the medical records from 2000 to 2014. We use the statistical analysis software SPSS (Statistical Packacge for the Social Sciences) 17.0 for Windows. **Results:** The sample consisted of 52 patients, totaling 75 traumatized primary teeth. The average age at injury was 37.6 months and the most affected gender was male (65.4 %). Most injuries occurred at home (57.7 %) and consequently to fall from height (73%). The most common type of dislocation for injury was intrusion (53.3 %) and color change (42.7%), pulp necrosis (37.3 %) and obliteration of the root canal (13.3%) the most frequent sequelae. **Conclusion:** The high prevalence of sequelae (74.7 %) shows that proper treatment should happen at right time in order to reduce the occurrence of sequelae.

## KEYWORDS

Deciduous teeth; Sequelae; Tooth injuries.

## RESUMO

**Objetivo:** Determinar a prevalência de lesões por luxação na dentição primária e as sequelas associadas em crianças atendidas na Clínica de Odontopediatria da Faculdade de Farmácia, Odontologia e Enfermagem da Universidade Federal do Ceará. **Material e Métodos:** O protocolo de pesquisa foi revisado e aprovado pelo Comitê de Ética em Pesquisa Institucional da Faculdade de Medicina da Universidade Federal do Ceará, Fortaleza, Ceará. Este estudo foi realizada através de uma investigação observacional retrospectiva transversal. Os dados foram coletados dos registros médicos entre os anos 2000 e 2014. Utilizamos o software de análise estatística SPSS (Statistical Packacge for the Social Scientes) 17.0 para Windows. **Resultados:** A amostra foi composta por 52 pacientes, totalizando 75 dentes primários traumatizados. A idade média de lesão foi de 37,6 meses e o sexo mais atingido foi o sexo masculino (65,4%). A maioria das lesões ocorreu em casa (57,7%) e, consequentemente, a queda de altura (73%) foi o motivo mais de maior prevalência. O tipo mais comum de luxação por lesão foi a intrusão (53,3%) e alteração de cor (42,7%), necrose pulpar (37,3%) e obliteração do canal radicular (13,3%) as sequelas mais frequentes. **Conclusão:** A alta prevalência de sequelas (74,7%) mostra que o tratamento adequado deve ocorrer no momento adequado para reduzir sequelas.

## PALAVRAS-CHAVE

Dentes Decíduos; Sequelas; Injúrias traumáticas.

## INTRODUCTION

Traumatic dental injury (TDI) has become a worldwide health problem, and scientific community has improved its effort in order to minimize it [1]. Frequency of TDI varies from 10.2% to 69.2 [2-6], and is more prevalent in young children than in adults [7]. In primary

teeth, luxation injuries are more frequent than crown fracture, and may impact the growth and development of the permanent dentition [8,9].

Sequels have been related frequently after TDI in primary teeth, such as crown discoloration, pulp necrosis, root obliteration and inflammatory or substitution resorption [10]. In relation to permanent teeth, traumatic injuries in primary teeth may lead to consequences, such as minimal enamel opacities, hypoplasia and hypocalcification, crown dilacerations, root dilaceration, ectopic eruption, and non-irruption of permanent tooth [11-13].

Although treatment is established, TDI has been largely neglected by dentists, both in developed countries and developing countries as Brazil. The resulting sequelae of trauma has had a high impact on the quality of life of children in terms of physical and psychological discomfort, and the high potential of negative interference in social relationship [14]. A wider knowledge about TDI is important to prevent it and to treat adequately the consequences resulting from trauma in primary teeth. Thus, it would be of great interest to dentists identify the consequences and make a correlation between the types of injuries their possible consequences aiming to minimize them. Then, this study aims to investigate the prevalence of sequelae in primary teeth after traumatic injury.

## METHODS

This study was a transversal retrospective observational investigation. The data were collected from dental records of patients who presented at Pediatric Dentistry Clinic of the School of Pharmacy, Dentistry and Nursing, Federal University of Ceara, Brazil from 2000 to 2014 after traumatic injury in primary teeth.

Fulfillment of the following inclusion criteria was required: dental records had been properly fulfilled, containing the diagnosis, treatment plan, and initial and control radiographs with at least six-month follow-up. The following data were collected from dental records evaluated: (1) age; (2) gender; (3) teeth affected; (4) injured teeth per patient; (5) type of injury, classified according to Andreasen et al. (2007)[15] ; (6) place of occurrence; (7) etiology; (8) time elapsed before treatment; (9) initial treatment performed; (10) treatment carried out during follow-up; and (11) sequelae in the injured tooth. Two examiners evaluated the dental registers after intra-examiner (0.97 and 0.91) and inter-examiner (0.82) calibration verified by Kappa test. Radiographs were evaluated in a dark room with light box and magnifying glass.

The data were entered in Excel 7.0 (Microsoft Corp, Redmond, Wash) and SPSS 17.0 (SPSS Inc, Chicago, 111) for Windows software. The chi-square test was used to analyze the statistical significance of the differences with $p < .05$. Descriptive analysis was performed to describe absolute frequency and Fisher's exact test or Chi-square test was used to compare the groups and verify the existence of differences among them.

## RESULTS

A total of 988 dental records of traumatic injuries in primary teeth were analyzed. However, only 52 dental records were included in this study, totaling 75 injured teeth. The mean age was 37.6 months (±16.03) ranging from 12 to 77 months. The gender most affected was male (65.4%) (Table 1), and the mean follow-up was 17.2 months (±10.2).

Maxillary central incisors were traumatized in 54.7% of total cases, and maxillary lateral incisors in 45.3%. The most affected tooth was the maxillary right central incisor (46.7%), followed by the maxillary left central incisor (40.0%). Thirty-three (63.5%) patients had only one traumatized tooth, sixteen (30.8%) had two and three patients (5.7%) had more than two injured teeth.

**Table 1 -** Distribution of pediatric dental injury according to age, gender, injured teeth, type of dental injury, place of occurrence, and etiology

| | Total n (%) |
|---|---|
| **Age (month)** | |
| ≤ 12 | 1 (2.0) |
| 13 – 24 | 12 (23.0) |
| 25 – 36 | 14 (27.0) |
| 37 – 48 | 12 (23.0) |
| 49 – 60 | 9 (17.3) |
| > 60 | 4 (7.7) |
| **Gender** | |
| Male | 34 (65.4) |
| Female | 18 (34.6) |
| **Injured teeth** | |
| Maxillary right central incisor | 35 (46.7) |
| Maxillary left central incisor | 6 (8.0) |
| Maxillary right lateral incisor | 30 (40.0) |
| Maxillary left lateral incisor | 4 (5.3) |
| **Injured teeth per patient** | |
| 1 | 33 (63.5) |
| 2 | 16 (30.8) |
| 3 | 2 (3.8) |
| 4 | 1 (1.9) |
| **Type of dental injuries** | |
| Concussion/ subluxation | 23 (30.7) |
| Intrusion | 40 (53.3) |
| Extrusion | 6 (6.7) |
| Lateral luxation | 8 (9.3) |
| **Place of occurrence** | |
| Home | 30 (57.7) |
| School | 4 (7.7) |
| Street | 8 (15.4) |
| Other | 10 (19.2) |
| **Etiology** | |
| Falls | 38 (73.1) |
| Collisions | 4 (7.7) |
| Car accidents | 3 (5.8) |
| Others | 3 (5.8) |
| Unknown | 4 (7.7) |

Most injuries occurred at home (57.7%), followed by street (15.4%) and school (7.7%). The main etiology was falls (73%), collision (7.7%), and car accidents (5.8%) (Table 1). The average time between the occurrence of the trauma and the demand for care was 120 days (±327.4), maximum of 1825 days. The clinical and radiographic examination was the only initial treatment performed in 86.7% of cases, followed by repositioning and splinting (10.6%), and tooth extraction (2.7%). To follow-up sessions, clinical and radiographical control was performed as only treatment in 53.3% of cases, followed by tooth extraction (24.0%), endodontic treatment (13.4%) and splinting (9.3%) (Table 2).

The injury most prevalent was dental intrusion (53.3%), followed by concussion or subluxation (30.7%), lateral luxation (9.3%) and extrusion (6.7%) (Table 3). Sequelae was observed in 56 (74.7%) teeth, and was most

**Table 2 -** Distribution of pediatric dental injury according time elapsed before treatment, initial treatment performed and follow-up

| | Total n (%) |
|---|---|
| **Time elapsed before treatment** | |
| ≤ 24 hours | 4 (7.7) |
| 25 – 48 hours | 10 (19.2) |
| 3 – 15 days | 19 (36.5) |
| 16 – 30 days | 4 (7.7) |
| > 30 days | 15 (28.9) |
| **Initial treatment** | |
| Clinical and radiography exam | 65 (86.7) |
| Tooth extraction | 2 (2.7) |
| Reposition + Splinting | 8 (10.6) |
| Splinting | 0 (-) |
| Endodontic treatment | 0 (-) |
| **Follow up treatment** | |
| Clinical and radiography exam | 40 (53.3) |
| Tooth extraction | 18 (24) |
| Reposition + Splinting | 0 (-) |
| Splinting | 7 (9.3) |
| Endodontic treatment | 10 (13.4) |

frequent after dental intrusion (80.8%). The sequelae observed were color change (85.3%), periapical lesion (74.6%), pulp obliteration (26.6%), sinus tract (4.0%), and ankylosis (5.3%) (Table 2). Color change was present in 32 teeth, 12 (37.5%) of them gained shades of gray, and 12 (12.5%) acquired yellowish. Pulp canal obliteration and sinus tract were was most frequent after concussion or subluxation and lateral luxation, respectively.

## DISCUSSION

This study examined dental records of patients who presented to a referral center of oraldental trauma located in Fortaleza, northeastern Brazil, for suffering trauma in primary dentition. The prevalence of trauma in one or more primary teeth is higher in children under seven years, with highest prevalence in 0-4 years-old age group [16-18]. It may be associated with their motor coordination, which is still in development. So, they are learning to walk and run and a greater number of falls and accidents may happen. In addition, injuries are more prevalent in male children, with the most common etiologic factor to fall from own height [17-19]. In the present study, there was a higher prevalence of injuries in male children (1.88:1), which is consistent with other epidemiological studies [20-22], which principally occurred in their own homes (57.7%) and had as the major etiologic factor falling from own height (73%).

The most affected are the upper anterior teeth, usually only one of them [19, 17, 23-26], as shown in our study (63, 5%). Lack of lip seal and excessive overjet are some predisposing factors to trauma in primary dentition [23]. Children with overjet between 3 and 6 mm or more than 6 mm may suffer, respectively, twice and three times over dental traumas compared to those with only 0 to 3 mm overjet [17, 27]. Other studies also corroborate our findings that the maxillary central incisors are the most affected dental elements [26, 28], and this situation might be assigned to the greater vulnerability position of those teeth in the dental arch [29].

The initial care within the first 24 hours after trauma occurred in only 27% of cases. Most patients (63.5%) searched for treatment within until 10 days after trauma, in contrast to data reported by Arikan et al. (2010) which most patients only sought treatment after more than 10 days. From the 52 patients included in this study, four patients sought initial treatment after more than one year of dental trauma to treat recently appearance of sequelae. The average time between the occurrence of the trauma and the demand for care were 120 days, which may indicate that treatment for dental trauma in primary teeth is pretty neglected by parents.

Injuries, as subluxation, concussion and intrusion, may occur more often in children

**Table 3 -** Relation of deciduous tooth injuries and sequelae presence

| Sequelae | Concussion or Subluxation | | Intrusion | | Extrusion | | Lateral Luxation | |
|---|---|---|---|---|---|---|---|---|
| | TOTAL | % | TOTAL | % | TOTAL | % | TOTAL | % |
| Ankilosys | 0 | 0.0% | 4 | 100.0% | 0 | 0.0% | 0 | 0.0% |
| Pulp obliteration | 10* | 50.0% | 6 | 30.0% | 2* | 10.0% | 2 | 10.0% |
| Periapical lesion | 14 | 25.0% | 32 | 57.1% | 4 | 7.1% | 6 | 10.7% |
| Sinus tract | 0 | 0.0% | 4 | 66.7% | 0 | 0.0% | 2* | 33.3% |
| Pulp necrosis | 14 | 26.9% | 28 | 53.8% | 4 | 7.7% | 6 | 11.5% |
| Color change | 22 | 34.4% | 32 | 50.0% | 6* | 9.4% | 4 | 6.3% |
| Root resorption | 16 | 30.8% | 28 | 53.8% | 2 | 3.8% | 6 | 11.5% |
| Infraocclusion | 0 | 0.0% | 32* | 100.0% | 0 | 0.0% | 0 | 0.0% |
| At least one sequelae | 28 | 63.6% | 59 | 80.8% | 5 | 50.0% | 8 | 66.7% |

* $p < 0,05$

under 7 years of age because of low resilience and flexibility of the periodontal ligament [29, 30]. The younger is the child less is the possibility of sequel in the permanent dentition. Injuries like intrusion and avulsion in deciduous teeth are those that are most likely to cause changes in the permanent teeth [31].

Crown color change was the most observed sequel (85.3%), and others studies reported that it is one of the most commonly observed sequelae after dental trauma in primary teeth [32] and may be transient or remain the tooth until exfoliation. The color change may be due to the deposition of mineralized tissue in the root canal, pigmentation due pulp hemorrhage caused by rupture of the capillaries or pulp necrosis. Sometimes, blood may be reabsorbed in a few weeks, but the change may be permanent in some cases [27]. From the teeth presenting color change, 37.5% gained shades of gray, 12.5% acquired yellowish and in 50.0% of those cases the color was not informed. Bennet (1964), Holan et al. (1996), Borum & Andreasen (1998) and Holan (2004) suggested a relationship between the discoloration to yellow obliteration of the root canal and shades of gray or black to development of pulp necrosis.

Pulp necrosis is a common sequel related to trauma in the primary dentition. The diagnosis of necrosis in primary teeth is done by the association of clinical and radiographic parameters. Soporowski (1994) observed necrosis occurrence in 26.3% of traumatized teeth and Borum & Andreasen (1998) reported necrosis in 24.8% of cases. Pulp necrosis were related in 34.7% of traumatized teeth, periapical lesions in 37.3% and fistula appearance was related to injured tooth in 4.0% of cases. Although presence of color change, this parameter can not determine whether or not to endodontic treatment or extraction of the affected tooth. Only one long-term follow may assist in choosing an appropriate conduct [39].

Pugliesi et al. (2004) reported similar results, which subluxation and intrusion presented, respectively, 22.8% and 16.5% pulp necrosis from a total of 79 primary teeth with loss of pulp vitality. Other signs such as changes in soft tissues, spontaneous pain, tenderness to percussion and palpation and increased pulp are also commonly found 30. The signs of inflammation, clinically verified through abscesses or fistulas may be generally diagnosed in an average of 29 months after injury [37].

## CONCLUSION

The demand for care occurred only 120 days after the trauma on average shows that the treatment of patients presenting primary dentition injuries is still largely neglected by parents. The high rate of sequelae presence (74.7%) reveals the importance of the clinical and radiographic follow-up of those traumatized teeth. This figure also shows the need to conduct the appropriate treatment at the right time in order to decrease the occurrence of sequelae consequences or minimize them.

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Date submitted: 2016 Dec 02

Accept submission: 2017 May 08