

Frequency of pulp canal obliteration in primary teeth after traumatic dental injury and its association with related variables

Frequência de obliteração do canal pulpar nos dentes decíduos após traumatismo dentário e sua associação com variáveis relacionadas

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ABSTRACT

Objective: The aim of this study was to determine the frequency of pulp canal obliteration (PCO) after traumatic dental injury (TDI) of primary anterior teeth and to investigate its relation with the related variables. **Methods:** This retrospective study has been done with dental records of patients selected from the Paediatric Dental Trauma Clinic between 2006 and 2016. Those who had PCO in the primary anterior teeth and were aged 0-108 months at the time of trauma were considered eligible. Data related to patients and TDI, such as sex, the child's age at the time of trauma, aetiology, affected teeth, the child's age at the time of the eruption of the permanent successor as well as the presence of crown discoloration were extracted from the dental records. **Results:** Among the 483 children with traumatised teeth, 14.9% had PCO and the most of them exhibited crown discoloration. The average age of the children at the time of the trauma was 38 months and the most common aetiology of the TDI was falls. The average time for the beginning of the PCO process was 13.5 months. There was no statistically significant association between the child's age at the time of trauma and the types of TDI, PCO and the presence of crown discoloration. **Conclusion:** The frequency of PCO was relatively low though the presence of crown discoloration was considerable. There was no association between the child's age at the time of trauma and the studied variable.

Indexing terms: Dental Pulp Cavity. Tooth Deciduous. Tooth Injuries.

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RESUMO

Objetivo: O objetivo desse estudo foi determinar a frequência de obliteração do canal pulpar (OCP) após traumatismo dos dentes decíduos anteriores e investigar sua associação com variáveis relacionadas. **Métodos:** Este estudo retrospectivo foi realizado com base nos prontuários odontológicos de pacientes selecionados da Clínica de Trauma Dentário Pediátrico entre 2006 e 2016. Aqueles que tinham OCP nos dentes decíduos anteriores e tinham entre 0-108 meses no momento do traumatismo foram considerados elegíveis. Dados dos pacientes e dos traumatismos, tais como, sexo, idade da criança no momento do traumatismo, etiologia, dente afetado, idade da criança na época no momento da erupção do sucessor permanente, bem como presença de alteração de cor da coroa foram extraídos dos prontuários. **Resultados:** Dentre as 483 crianças com dentes com traumatismos, 14.9% tinham OCP e a maioria delas apresentava alteração de cor da coroa. A média de idade da criança no momento do traumatismo foi de 38 meses e a etiologia mais comumente associada ao TD foram as quedas. O tempo médio decorrido para o início do processo de OCP foi de 13,5 meses. Não houve associação estatisticamente significativa entre a idade da criança no momento do traumatismo e os tipos de TD, OCP e presença de alteração de cor da coroa. **Conclusão:** A frequência de OCP foi relativamente baixa, embora a presença de alteração da coroa tenha sido considerável. Não foi encontrada associação entre a idade da criança no momento do trauma e as variáveis estudadas.

Termos de indexação: Cavidade pulpar. Dente decíduo. Traumatismos dentários.

INTRODUCTION

Traumatic dental injuries (TDI) are very common in childhood and occur mostly between the ages of 1 and 4 years old [1-3]. The greatest number of traumas occur at home and falls from their own height are the most common causes of accidents [2,4-8]. Maxillary primary anterior teeth are usually involved with TDI and the incisors are the most affected [5,9]. The prevalence of trauma of the primary teeth in Brazilian children varies from 11 to 47% [2,6,8,9,10]. Primary teeth can have different sequelae due to TDI such as crown discoloration, pulp necrosis, pathological root resorption related to pulp inflammation, ankyloses or pulp canal obliteration [11-15].

Pulp canal obliteration (PCO) is a progressive tissue reaction of the dental pulp that can occur due to trauma in the primary teeth [16,17]. It is normally detected in radiographic exams as a not well-marked radiolucent image of the pulp chamber [16,18]. A tooth with this sequela presents a greyish crown becoming yellowish over time [12,19]. This is an important finding because the most parents or guardians seek a pediatric dentist due to this discoloration related to PCO, and its frequency it is not well reported in the literature. Pulp canal obliteration can be classified as partial or total according to the radiographic image. In total pulp canal obliterations, the pulp chamber and the root canal are hardly visible (or not at all), while in partial obliterations, the pulp chamber is narrowed and the root canal is clearly visible [13,14,20].

The aim of this study was to determine the frequency of pulp canal obliteration (PCO) after dental trauma of primary anterior teeth and to investigate its relation with the variables: presence of tooth crown discoloration and

average time spent for the PCO to develop. This study also investigated whether age of TDI occurrence, categorised into < 36 months or ≥ 36 months, had any association with the type of trauma, the type of obliteration and the presence of tooth crown discoloration.

METHODS

Study design and study population

This research is a retrospective study. Dental records from children that joined the Paediatric Dental Trauma Clinic at the Rio de Janeiro State University (FOUERJ) were selected from the list of patients who were treated between 2006 and 2016. Those who had some record of PCO in the primary anterior teeth (incisors and canines) and aged 0-108 months at the time of trauma were considered eligible for the study. Records that did not have signed consent were not included.

Ethical considerations

The study was approved by the Ethics Committee for research of the Pedro Ernesto University Hospital (Number of the approved protocol: 2683). The guardians/parents signed an informed consent form.

Data collection

All patients were examined by paediatric dentists previously trained by the same more experienced paediatric dentist. Clinical and radiographic exams were carried out

at intervals of 7, 15, 30, 90, 180 and 360 days according to the severity of the dental trauma. Data related to patients and TDI, such as sex, the child's age at the time of trauma, aetiology, types of affected teeth and trauma, the child's age at the time of the eruption of the permanent successor as well as the presence of crown discoloration were extracted from the dental records. It is relevant to note that one child could have more than one tooth affected by PCO. The collateral tooth was used as a parameter of comparison of the eruption date. All radiographs were evaluated by a single trained and experienced examiner in a darkened room using a negatoscope (NGP 91, Odonto Larcon), a black card mask and a magnifying glass lens (6X, Waltex-Lumagny). The radiographs were always analysed during the morning period and the limit of the examinations was ≤ 15 films each session.

Pulp canal obliterations were diagnosed from radiographic exams in the dental records and classified as partial or total according to Jacobsen & Sangnes [20]. Dental crown discoloration was detected visually by an experienced examiner as the presence of a yellowish hue [3]. As soon as any alteration was detected at recall visits, related to crown discoloration and/or radiographic PCO, it was recorded.

Statistical analysis

Data were processed using SPSS software version 17.0 (SPSS Inc., Chicago, Ill.,

USA). Descriptive analysis and association among the variables were performed. The Chisquare test was used to verify the association between the child's age at the time of trauma and the types of TDI, PCO and the presence of crown discoloration. The level of significance was set at 95%.

RESULTS

Out of 1,230 children assisted in the Paediatric Dental Trauma Clinic, 734 children had some recorded data of TDI in the permanent dentition. Out of 496 children who had some record of TDI of the primary dentition in their data, 13 children were excluded because all the required information was not present in their dental records. Then, out of the 483 remaining children, 72 children (14.9%) had a PCO recorded in their data and were included in this study, totalling 80 primary anterior teeth with this sequela.

Among the included children, 40 (55.6%) were boys and 32 (44.4%) were girls. The average age of the children at the time of the trauma was 38 months (± 14.8), ranging from 10 to 70 months of age. The most common aetiology of the TDI was falls (88.8%).

From the 80 teeth with obliteration, the right upper central incisor (55%) and the left upper central incisor (42.5%) were the most affected. The number of teeth with PCO per type of TDI is described in Table 1. Total pulp canal obliterations were diagnosed in 27 (33.8%) teeth, while partial obliterations were diagnosed in 53 (66.2%) teeth. The pulp canal obliterations occurred, on average, 13.5 months (± 8.76) after the dental trauma.

Forty-nine (61.3%) teeth were followed-up until the eruption of the permanent successor and the child's average age at the time of eruption was 81 months (± 13). Forty-seven (58.8%) teeth had obliteration and crown discoloration. Table 2 shows that there was no association between the child's age at the time of trauma and the types of TDI, PCO and the presence of crown discoloration.

Table 1. Number of teeth with pulp canal obliteration per type of traumatic dental injury.

Type of TDI	Teeth with PCO	
	n	%
Enamel fracture	11	13.8
Crown fracture without pulp exposure	2	2.5
Concussion	7	8.8
Subluxation	20	25
Lateral luxation	4	5
Extrusive luxation	5	6.2
Intrusive luxation	31	38.7
Total	80	100

Note: n: number of primary anterior teeth with PCO.

Table 2. Association between the child age at the time of trauma and types of theDI, PCO, and the presence of crown discoloration.

		Age group				p value*
		< 36 months		≥ 36 months		
		n	(%)	n	(%)	
Type of TDI	Intrusive luxation	12	(44.4)	15	(55.6)	0.439
	Others	26	(49.1)	27	(50.9)	
Type of PCO	Partial	24	(45.3)	29	(54.7)	0.374
	Total	14	(51.9)	13	(48.1)	
Crown discoloration	Present	23	(48.9)	24	(51.1)	0.469
	Absent	15	(45.5)	18	(54.5)	

Note: *Chi-square test. TDI: traumatic dental injury. PCO: pulp canal obliteration. n= 80: number of primary anterior teeth with PCO.

DISCUSSION

This research is an important retrospective study of pulp canal obliteration (PCO) as a sequelae to the primary dentition since most parents and guardians seek pediatric dentists due to teeth's grayish or yellowish discoloration and dental literature does not reported clearly this finding. Pulp canal obliteration was present in 14.9% of the children who had some TDI in the primary dentition. Mello-Moura [13] reported a PCO prevalence of 20.2% among children who suffered trauma in the upper primary incisors. Whereas, Santos [14] showed that 54% of 112 traumatised primary maxillary central incisors exhibited PCO.

This study showed that boys and girls are affected equally by PCO in the primary dentition and this result is consistent with the literature [13,14,20]. The age of the children at the time of trauma ranged from 10 to 70 months and other studies observed that the children who had PCO were between 12-48 or 25-36 months old at the time of trauma [20,21]. According to Jacomo & Campos [2], children between 1-4 years old have a high prevalence of dental trauma. The age of the child at the time of injury is an important factor for the occurrence of sequelae in the permanente successors [22].

The most frequent types of trauma in the primary anterior teeth with PCO were intrusive luxation and subluxation, which were also reported by other authors [20,21]. A study has showed that teeth which suffered luxation injuries were 1.35 times more likely to have PCO than teeth which suffered injury in the dental hard tissue [13]. However, according to transversal design of our study it was not possible to determine the relation between types of trauma in the primary anterior teeth and PCO.

As sequelae, partial pulp canal obliteration was observed more in our sample. This finding is in agreement with those observed by Jacobsen & Sangnes [20]. Another study did not classify pulp canal obliterations the same as the present authors, but they observed that in 41% of all traumatised primary teeth, the degree of obliteration was less than ¼ of the pulp chamber [21]. The average time between the dental trauma and the development of PCO in this study was similar to others [13,14,16], which reported the period to be within 12 months.

Few studies have studied PCO as a sequela of traumatised primary teeth or followed-up the primary teeth until the eruption of the permanent successors. The present study was able to do this and, like some studies, could observe that PCO does not affect the process of exfoliation as well as the eruption of the permanent successors [3,20,23].

According to this study, the most of traumatised primary teeth with PCO had crown discoloration, this was also reported by other authors [20,14]. Similarly to this research, one study observed that there was no association between the child's age at the time of trauma and the presence of PCO, independent of the type [13]. Dental trauma and caries have a negative impact on the quality of life of preschool children [24]. Most parents notice dental crown discoloration due to dental trauma and ask questions about this condition, they are mostly concerned about the aesthetic implications [3]. It is important for paediatric dentists to consider responding to this request based on a correct diagnosis.

Although the prognosis of primary teeth with PCO is generally favourable [11], the management of such teeth includes periodical follow-up with clinical and radiographic exams until eruption of the permanent successors [23,14].

This follow-up can avoid future complications, such as delayed root resorption of the primary teeth and ectopic eruption of the permanent teeth successors [25].

CONCLUSIONS

This study showed a low frequency of pulp canal obliteration in traumatized primary anterior teeth and discoloration of their crowns. However, there was no association between the variables child's age at the time of trauma and the variables: types of TDI, PCO and the presence of crown discoloration.

Collaborators

We inform that SAN MOURA performed the experiments in partial fulfillment of requirements for a degree and wrote the manuscript. KC MACHADO wrote the manuscript. MM LENZI proofread the manuscript and consulted on and performed statistical evaluation. MRTC ANDRADE proofread the manuscript and consulted on and performed statistical evaluation. MWS MARSILLAC proofread the manuscript and contributed substantially to discussion. Campos V participated in the project design, proofread the manuscript, contributed substantially to discussion.

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