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Influence of the type of dental trauma on the pulp vitality and the time elapsed until treatment: a study in patients aged 0–3 years

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Abstract – The purpose of the present study was to determine the influence of the type of trauma on the pulp vitality and the time elapsed until seeking dental care in children aged 0–3 years seen at the Baby Clinic of the Araçatuba Dental School, UNESP. A total of 1813 records were analyzed. Two hundred and three patients, corresponding to 302 traumatized teeth, were assessed clinically and radiographically. Hard-tissue injuries were the most frequent (52%), with a predominance of enamel crown fractures (41.4%), followed by concussions (12.6%) and intrusions (11.6%). Clinical and radiographic examination revealed that 72% of the traumatized teeth maintained pulp vitality. In the case of supporting-tissue lesions, 51.1% of the patients sought care within 1–15 days after injury, while in the case of hard-tissue injuries, 52.7% sought care only after 16 days. The results showed that supporting-tissue injuries had a significant influence on the faster seeking of dental care.

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Key words: dental trauma; primary teeth; dental luxation; crown fracture

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Dental trauma is a common event in children from an early age on since children are learning to walk and discover their environment, thus being subject to frequent falls. Dental injuries are considered emergency situations that require immediate care (1, 2). In addition to the physical trauma, emotionally these injuries involve not only the child but also the accompanying person, thus representing a challenge to the dentist (3).

Injuries affecting the primary dentition should be monitored clinically and radiographically in order to detect probable alterations in the traumatized tooth and in support structures. One of the major sequelae is pulp necrosis, which often culminates in tooth extraction (4, 5). The anatomical relationship between the traumatized primary tooth and its permanent successor is considered to be a risk factor for the triggering of damage to this developing tooth (6–10). Thus, treatment of the traumatized primary tooth is aimed at minimizing damage to this tooth and the factors that might cause alterations in the germ of the permanent tooth, with successful treatment being dependent on the age of the child at the time of trauma, type and severity of the injury, and the period between dental trauma and care (5, 11–15).

According to Dale (16), the dentist should be seen immediately after dental trauma, and this time interval should be less than 1 h in some cases to increase the chances of successful treatment and to minimize the occurrence of pain, probable sequelae and subsequent costs. The type of trauma is known to influence the time that elapses until dental care is sought, which occurs more rapidly in cases of bleeding, crying, and occlusal complications, situations resulting from luxation (17).

As the philosophy of dental care for babies implies periodic follow-up of these patients, the recording of dental injuries, which occur frequently in this age range, becomes easier and better reflects reality, thus providing new insights into this subject (13). The purpose of the present investigation was, therefore, to analyze dental injuries in patients aged 0–3 years and to determine the influence of the type of trauma on the pulp vitality and time that elapses until care is sought.

Materials and methods

A total of 1813 records of patients of both sexes regularly attending the Baby Clinic of the Araçatuba Dental School, UNESP, were analyzed during the period from January 1996 to May 2002. Only patients with a history of dental trauma were selected, and the records were analyzed regarding the time for seeking dental care, involved teeth, and type of traumatic injury.

The care protocol applied to patients with dental traumatic injuries seen at the Baby Clinic consists of reception of the patient and the accompanying person, preliminary guidance, and clinical and radiographic assessment of the injured region, which is performed by dentists previously instructed by one of the authors.

The following data are then recorded: history of trauma, involvement of soft tissue, affected dentition, affected teeth, and the type of lesion. Depending on the trauma and the presence or absence of sequelae, the appropriate type of treatment is adopted and, from this point on, the patient receives individualized care including control visits during which clinical and radiographic assessments are performed. Clinical evaluation consists of the determination of the presence of symptoms in the traumatized tooth, crown discoloration, degree of dental mobility, and the health status of the surrounding soft tissues. Radiographic analysis includes the determination of root integrity and scanning of the root canal and supporting structures of the traumatized tooth. It should be noted that the number of return visits will be scheduled depending on the type of trauma and its complications. However, as these patients come to the clinic every 2 months for the prevention program, clinical assessment and, if necessary, radiographic evaluation are performed at least every 2 months.

The clinical parameters analyzed were the presence or absence of crown discoloration and dental mobility determined by visual examination and palpation, and radiographic parameters included the presence or absence of radicular resorption, periapical injury, and obliteration of the pulp canal. For radiographic evaluation, periapical Insight (Kodak) films, an X-ray Spectro apparatus (Dabi Atlante) with 60 kVp, and an exposure time of 0.8 s were used.

The clinical and radiographic parameters were analyzed together to establish the condition of pulp vitality or necrosis. The diagrams presented below were constructed to facilitate the understanding of this analysis.

The analyzed tooth was considered to present pulp vitality when showing the following association between parameters:

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes ( ) No (X)	Yes ( ) No (X)
Dental mobility	Periapical lesion
Yes ( ) No (X)	Yes ( ) No (X)
	Obliteration of the pulp canal
	Yes ( ) No (X)

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes (X) No ( )	Yes ( ) No (X)
Dental mobility	Periapical lesion
Yes ( ) No (X)	Yes ( ) No (X)
	Obliteration of the pulp canal
	Yes ( ) No (X)

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	Obliteration of the pulp canal
	Yes ( ) No (X)

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes (X) No ( )	Yes ( ) No (X)
Dental mobility	Periapical lesion
Yes ( ) No (X)	Yes ( ) No (X)
	Obliteration of the pulp canal
	Yes (X) No ( )

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes ( ) No (X)	Yes (X) No ( )
Dental mobility	Periapical lesion
Yes ( ) No (X)	Yes ( ) No (X)
	Obliteration of the pulp canal
	Yes ( ) No (X)

The analyzed tooth was considered to present pulp necrosis when showing the following association between parametres:

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes (X) No ( )	Yes (X) No ( )
Dental mobility	Periapical lesion
Yes (X) No ( )	Yes (X) No ( )
	Obliteration of the pulp canal
	Yes ( ) No (X)

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes (X) No ( )	Yes (X) No ( )
Dental mobility	Periapical lesion
Yes (X) No ( )	Yes (X) No ( )
	Obliteration of the pulp canal
	Yes (X) No ( )

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes (X) No ( )	Yes (X) No ( )
Dental mobility	Periapical lesion
Yes (X) No ( )	Yes ( ) No (X)
	Obliteration of the pulp canal
	Yes ( ) No (X)

Clinical parameters	Radiographical parameters
Crown discoloration	Radicular resorption
Yes (X) No ( )	Yes ( ) No (X)
Dental mobility	Periapical lesion
Yes (X) No ( )	Yes (X) No ( )
	Obliteration of the pulp canal
	Yes ( ) No (X)

If traumatized tooth presented pulp vitality, follow-up was performed until tooth exfoliation. If it presented pulp necrosis, the patient was referred to endodontic or surgery treatment.

The results were analyzed statistically by a proportion test and the chi-square (χ^2) test, with the level of significance set at 5%.

Results

Of the 1813 patients analyzed, 203 (11%) patients participated corresponding to a total of 302 traumatized primary teeth.

Table 1 shows the classification of dental injuries, with the most frequent trauma being enamel crown fractures (41.4%), followed by concussions (12.6%) and intrusions (11.6%).

Seventeen teeth suffering from avulsion were excluded from the analysis of the status of pulp condition. Two hundred and six (72%) of the 285 teeth examined showed pulp vitality and 79 (28%) pulp necrosis.

Table 2 specifies the type of dental trauma and its relationship with the condition of pulp vitality or necrosis. Enamel crown fractures were associated with a larger number of teeth, which maintained pulp vitality. On the other hand, intrusion and subluxation were responsible for a larger number of cases of pulp necrosis, with 18 (22.8%) and 13 (16.5%) cases, respectively.

Table 1. Distribution of affected teeth in relation to different types of dental injuries

	Total	%
Hard-tissue injuries		
Uncomplicated crown fracture	125	41.4
Complicated crown fracture	29	9.6
Crown-root fracture	3	1.0
Supporting-tissue injuries		
Concussion	38	12.6
Subluxation	25	8.3
Lateral luxation	6	2.0
Extrusion	2	0.7
Intrusion	35	11.6
Avulsion	17	5.6
Associations	22	7.2
Total	302	100

Table 2. Correlation between the type of dental trauma and the clinical condition of pulp vitality or necrosis

Type of dental injuries	Pulp vitality, *n*(%)	Pulp necrosis, *n*(%)	Total
Uncomplicated crown fracture	113 (54.8)	12 (15.2)	125
Complicated crown fracture	21 (10.2)	8 (10.1)	29
Concussion	30 (14.5)	8 (10.1)	38
Subluxation	12 (5.8)	13 (16.5)	25
Lateral luxation	5 (2.5)	1 (1.3)	6
Intrusion	17 (8.3)	18 (22.8)	35
Extrusion	0	2 (2.5)	2
Crown-root fracture	0	3 (3.8)	3
Association	8 (3.9)	14 (17.7)	22
Total	206	79	285

Table 3. Correlation between the time that elapsed until care was sought (delay) and the type of dental trauma

Delay	Hard tissue, *n*(%)	Supporting tissue, *n*(%)	Total
<24 h	7 (5.4)	23 (17)	30
1–15 days	54 (41.9)	69 (51.1)	123
>30 days	68 (52.7)	43 (31.9)	111
Total	129	135	264

Chi-square (χ^2) test = 15.87.
P-value = 0.0004.

Table 3 shows the relationship between the time that elapsed until care and the type of dental trauma. Thirty-eight of the 302 traumatized teeth were excluded as the parents or responsible persons did not know the exact time of dental trauma, corresponding to 264 teeth analyzed. In the case of supporting-tissue injuries, the time between dental trauma and care ranged from 1 to 15 days in 51.1% of patients, while in the case of hard-tissue lesion, this period was longer than 16 days (52.7%), with this correlation being statistically significant ($P = 0.0004$). The mean time that elapsed until dental care was 39.3 days.

Discussion

The recommendation that the first visit of a child to the dentist should occur within the first year of life has led to the development of educational and preventive programs. This routine care favors the recording of dental injuries that are common in this age range (14).

In the present study, the most frequent type of dental trauma were hard-tissue injuries (51%), with a predominance of enamel crown fractures (41.4%). One

reason for this significant number of enamel crown fractures is that the execution of this study in a clinic where periodic follow-ups are carried out favored the recording of this type of trauma, which would normally pass unreported (12). The observation of a high percentage of teeth that maintained pulp vitality (72%) is because of the larger number of enamel crown fracture injuries, which are considered to be less severe lesions. In contrast, cases of pulp necrosis (28%) predominated in traumatic lesions of subluxation, intrusion, and combinations.

Concussions were the most common injuries among supporting-tissue lesions, followed by intrusions. Wilson (18) reported that concussions are probably the most frequent injuries, which are generally not recorded as they cause little or no bleeding, with parents thus being reluctant to seek dental care. In contrast, intrusions are considered to be the most frequent type of injury by some authors (2, 19), while according to others, these lesions represent 8–22% of all luxations (11, 12, 20–22). In the present study, the prevalence of intrusions was 11.6%.

An important aspect is the time that elapses between dental trauma and dental care, as treatment as well as the prognosis of the injured tooth are significantly influenced by this factor. Thus, treatment should ideally be instituted as fast as possible after dental trauma (14, 16, 23). Various studies have shown that the time for seeking dental care can vary between 3 h and 5 years (5, 12, 15, 23, 24)

According to Osuji (5) and Onetto et al. (15), the rate of parents seeking care only 24 h after trauma is high for very young children (61–65%). In the present study, this frequency was 17% for supporting-tissue injuries and 5.4% for hard-tissue lesions. A significant correlation was observed between the type of dental trauma and the time for seeking dental care, i.e. the more severe the trauma the shorter the time. Great concern currently exists in the literature regarding the establishment of awareness programs and campaigns in order to stimulate parents to adopt more adequate measures in the case of dental injuries (5, 15, 17, 25–28).

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