Dental Traumatology

Dental Traumatology 2009; **25**: 110–114; doi: 10.1111/j.1600-9657.2008.00668.x

A 6-year investigation into types of dental trauma treated in a paediatric dentistry clinic in Eastern Anatolia Region, Turkey

Ozge Eyuboglu, Yucel Yilmaz, Cigdem Zehir, Hakan Sahin

Department of Pedodontics, Ataturk University, Faculty of Dentistry, Erzurum, Turkey

Correspondence to: Yucel Yilmaz DDS, PhD, Ataturk Universitesi, Dis Hekimligi Fakultesi, Pedodonti Ana Bilim Dali, Erzurum, Turkey
Tel.: +90 442 2311684
Fax: +90 442 2360945
e-mail: yyilmaz25@atauni.edu.tr

Accepted 23 October, 2007

Abstract – The purpose of this study was to assess the frequency, the effective factors and the applied treatments for dental trauma among children aged 1–15 years from Eastern Anatolia in a 6-year period. The total frequency of trauma in this study was calculated as 4.9% during a 6-year period. The males were found to have more traumatic injury than females ($P < 0.05$). Also, the permanent teeth were more vulnerable to dental trauma than the primary teeth ($P < 0.05$). The highest frequency of traumas in the primary teeth was observed at the age of 5, whereas the rate for the permanent teeth was at the age of 10. The teeth mostly influenced by the traumas were the upper central incisors in both primary and permanent teeth. It was in October that traumas were mostly seen for the permanent teeth and in June for the primary teeth. The most frequent source of trauma in both genders and in both primary and permanent teeth were falls. The most common type of trauma in the primary teeth was lateral luxation, while it was enamel-dentin crown fracture in the permanent ones. Soft tissue injuries were observed in 143 of 653 dental traumatized children. The most common method of treatment was examination and follow up for the primary teeth, and only direct restoration for the permanent teeth without any endodontic treatment. 15% of the patients applied for treatment 1 year after injury event. Therefore, it was concluded that the patients, parents and teachers living in Eastern Anatolia should be informed about the necessity of early treatment of dental traumas and the consequence of a delay.

Traumatic dental injuries are among the problems commonly observed in the primary and permanent teeth. To take the preventive strategies against such injuries and to decide on effective treatments, it has been reported that it is of importance to know the distribution of the traumatized teeth, type of trauma and etiological factors in occurrence of trauma (1, 2). A variety of frequencies have been reported for dental trauma all over the world (3). Andreasen et al. (3) reported that Turkey has a high frequency of traumatic injuries. However, data about the frequency of dental trauma in various geographical regions of Turkey are either limited or unreported (4). One of the regions with such a limited amount of data in Turkey is the region of Eastern Anatolia (5).

This study investigated the total frequency, associated factors and treatment procedures of dental trauma of 1- to 15-year-old patients who visited Ataturk University, Faculty of Dentistry, Department of Pedodontics in Eastern Anatolia Region during 6 years.

Material and methods

Over a last 6-year period (from March 2000 to March 2006), a total of 13 480 patients from Eastern Anatolia region of Turkey, aged between 1 and 15 years, have been recorded in Ataturk University Pedodontics Clinic. Of these, 653 patients' records (mean age: 9.1 ± 3.6 years) were for dental trauma. The data obtained from the records were including the patients' gender, age, the period elapsed between trauma and time of seeking dental care, source of trauma, injured primary and permanent teeth, types of trauma, soft tissue injuries and the treatment procedures. The trauma types were classified according to Andreasen & Andreasen classification (6) (Table 1).

The cases suffering from more than one type of trauma (listed in Table 1) were recorded as having 'multiple injuries'. Moreover, soft tissue injuries (the lip, frenulum, cheeks, gingivae, floor of the mouth, palate and skin crushing, bruising, tearing and cutting) were assessed and noted.

Differences between the types of trauma in primary and permanent teeth, genders and age groups as regards the source of trauma, type of trauma and soft tissue injuries were analysed using chi-squared test. In addition, the relationship between the number of trauma and age was analysed by using cubic regression equation. SPSS 11.00 software statistical programme (SPSS Inc., Chicago, IL, USA) was used to analyse the data.

Table 1. Classification of traumatic dental injuries according to Andreasen & Andreasen (6)

Injuries to the hard dental tissues and the pulp
Enamel fracture
Enamel-dentin fracture
Complicated crown fracture
Injuries to the hard dental tissues, the pulp and the alveolar process
Crown-root fracture
Root fracture
Alveolar fracture
Injuries to the periodontal tissues
Concussion
Subluxation
Luxation injuries
Lateral luxation
Intrusive luxation
Extrusive luxation
Avulsion

Results

The total frequency of dental trauma of Eastern Anatolian children attending a university pedodontics clinic (between 1 and 15 years old) in a 6-year period (March 2000–March 2006) was calculated as 4.9% (range 4.4–5.6) during 6 years.

A total of 1021 teeth were recorded (90 primary and 264 permanent teeth in females; 188 primary and 479 permanent teeth in males). Figure 1 shows the distribution of dental trauma frequency according to age. The cubic regression equation revealed that there was a statistically significant relationship between age and dental trauma frequency ($P < 0.05$).

The distribution of dental trauma frequency with regard to tooth number is given in Fig. 2. However, Fig. 2 does not include the alveolar fractures. Maxillary central incisors were the most vulnerable teeth to dental trauma. The highest dental trauma frequency was noted in October and March for the permanent teeth and in June for the primary teeth (Fig. 3). There was a significant difference between males and females in terms of trauma sources ($P < 0.05$). The most common source of trauma observed was 'falls' in both genders and primary and permanent teeth (Table 2).

The most common dental trauma in both males and females were 'enamel-dentin crown fracture' (Table 3). There were statistically significant differences between primary and permanent teeth according to trauma type(s) ($P < 0.05$). 'Lateral luxation' and 'subluxation' for primary teeth and 'enamel-dentin crown fracture' for permanent teeth were commonly observed. Moreover, a total of 41 'multiple injuries' (18 in primary teeth and 23 in permanent teeth) were noted.

The evaluation of the relation between trauma type and trauma source was performed. Lateral luxation occurred mostly because of traffic accident and subluxation occurred mostly because of falls on staircase. Only four [three primary teeth (avulsion) and one permanent teeth (enamel-dentin crown fracture)] of 1021 teeth

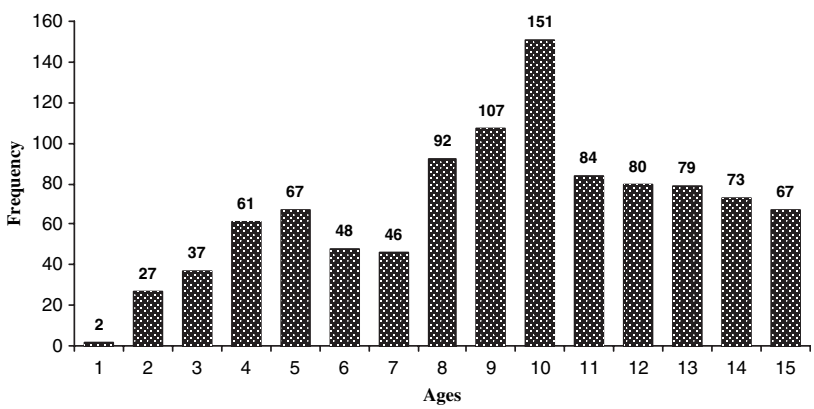

Fig. 1. Distribution of dental trauma frequency according to age.

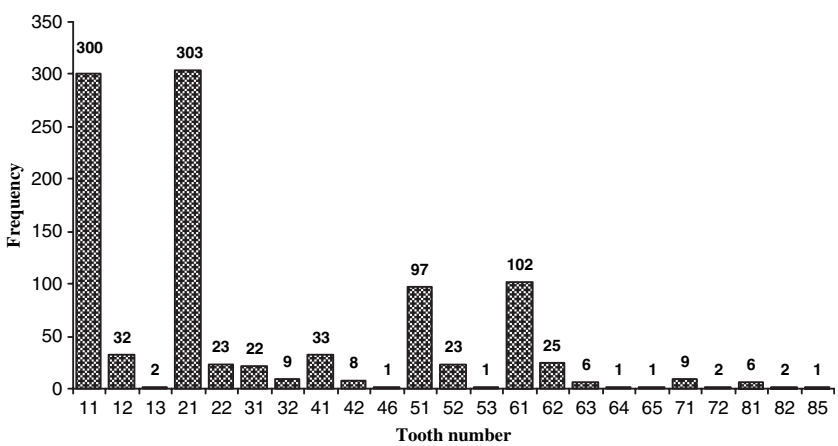

Fig. 2. Distribution of dental trauma frequency according to tooth number.

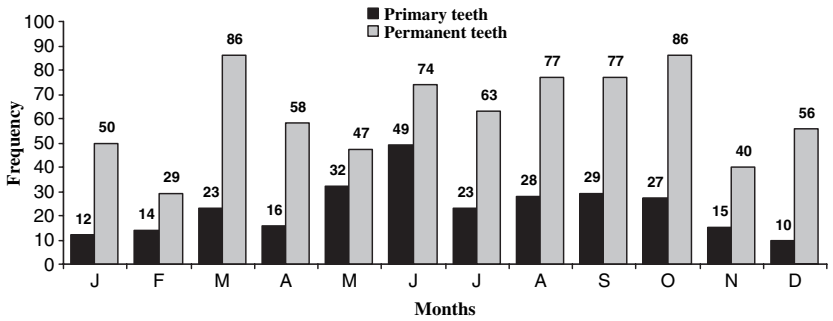

Fig. 3. Distribution of dental trauma frequency in both primary and permanent teeth according to months.

Table 2. Distribution of the dental trauma causes

Trauma sources	Tooth type	Gender		
		Male	Female	Total
Collisions	Primary	52	35	87
	Permanent	144	65	209
Falls	Primary	69	58	127
	Permanent	221	137	358
Bicycle accidents	Primary	14	2	16
	Permanent	46	13	59
Collision with stone	Primary	0	0	0
	Permanent	20	7	27
Collision with another person	Primary	4	2	6
	Permanent	23	3	26
Traffic accidents	Primary	6	4	10
	Permanent	21	13	34
Falls on staircase	Primary	10	11	21
	Permanent	9	3	12
Fight	Primary	0	0	0
	Permanent	9	0	9
Iatrogenic reasons	Primary	0	3	3
	Permanent	0	1	1
Other sources	Primary	8	0	8
	Permanent	7	1	8

suffered from trauma because of iatrogenic reasons (because of intubation procedure for general anaesthesia). Enamel-dentin crown fracture was the most common injury related to collisions, falls, bicycle accidents, collision of stone, collision with another person, fight and other trauma sources.

One-hundred forty-three (21%) of 653 dental traumatized children had soft tissue injuries. In terms of soft tissue injuries, no statistically significant difference was found between females and males ($P > 0.05$). Fifty per cent of traumatized primary teeth and 32% of traumatized permanent teeth were related with a soft tissue injury ($P < 0.05$). The period elapsed between injury event and time of treatment was the same day (11%), 1–3 days (25%), 4–7 days (12%), 8 days–3 weeks (14%), 3 weeks–3 months (11%), 3 months–1 year (13%) and >1 year (14%). In addition, the distribution of trauma types with respect to time elapsed between injury event and time of treatment is given in Table 3.

The most frequent treatment applied was 'examination and follow up' for the primary teeth and 'direct restoration' for the permanent teeth (Table 4).

Discussion

This study was conducted, because there are a few reported articles evaluating the incidence of dental traumas, associated factors and treatment procedures in various geographical regions of Turkey (5, 7, 8). This clinic in which the study was conducted is the only pedodontics clinic belonging to the university in Eastern Anatolia region in which there are some general hospitals; unfortunately, neither dental trauma records are taken, nor treatments are performed in these hospitals. So, data for this study were taken from only one centre.

The total frequency of dental trauma among 13 480 patients visiting the university pedodontics clinic during

Table 3. Distribution of trauma types (in per cent) with respect to time elapsed between injury and time of treatment

Types of trauma	Elapsed time and time of treatment after injury event							
	Same day	1–3 days	4–7 days	8 days–3 weeks	3 weeks–3 months	3 months–1 year	>1 year	Total
Enamel fracture	8	14	16	12	6	20	24	4.8
Enamel-dentin fracture	7	19	11	15	14	18	16	33.5
Complicated crown fracture	10	19	14	13	11	16	17	12.1
Crown-root fracture	0	20	0	0	20	20	40	0.4
Root fracture	19	22	0	44	0	11	4	2.4
Alveolar fracture	9	58	8	17	0	0	8	1.2
Concussion	9	41	23	27	0	0	0	3.1
Subluxation	16	27	20	16	12	8	2	12.3
Lateral luxation	14	52	7	8	7	5	7	9.7
Intrusive luxation	16	27	20	16	12	8	1	5.9
Extrusive luxation	30	30	18	11	4	7	0	2.6
Avulsion	17	20	21	6	12	7	17	7.9
Multiple injury	13	34	2	22	22	7	0	4.1

Table 4. Distribution of treatments performed of primary and permanent teeth

Treatment	Primary	Permanent
Examination and follow up	118	88
Reattachment without endodontic treatment	3	14
Reattachment with endodontic treatment	1	12
Direct restoration	25	319
Direct pulp capping	1	6
Pulpotomy	3	21
Pulpectomy	1	26
Pulpectomy + restoration	7	154
Temporary restoration	0	10
Reimplantation	1	3
Fixation	20	60
Extraction	63	0
Extraction + space maintainer	16	0
Space maintainer	19	30
Total	278	743

a 6-year period was calculated as 4.9%. Only one study has earlier investigated the prevalence of dental traumas in this region (5). In that study, the authors studied on different age groups (13–17 years) and collected data from another patient group of the same faculty (Department of Oral-Diagnosis and Radiology) (5).

It was stated that population-based studies could present more epidemiological evidence than clinic- and hospital based-studies (9). However, the distribution of the treatment procedures cannot be shown in such studies, and the traumas that are treated may escape from one's attention. Therefore, the study was carried out on the dental trauma records of the patients who visited the university pedodontics clinic.

It was reported that gender and age were the predisposing factors for dental traumas (1). It was found in various studies that the boys were more prone to dental trauma than girls for both primary and permanent teeth (1, 10–14). This study is in agreement with the previous studies (1, 10–14). This result may be explicable by the fact that males are more aggressive, venture into more risks and participate more in sports activities; it may also be attributable to the fact that males have higher levels of dopamine and epinephrine (15–17).

Although dental traumas are commonly seen in each age group of children, Andreasen et al. (3) reported that peak incidences are seen at the ages of 2 and 3 years for the primary teeth and at the ages of 9 and 10 years for the permanent teeth. In this study, the peak frequency was observed at the age of 5 years for the primary teeth and at the age of 10 years for the permanent teeth (Fig. 1). The former of our findings was in disagreement with Andreasen et al.'s (3) study, but was in agreement with the study conducted by Osuji's (12) study.

The frequency of traumatic injuries in the permanent teeth in this study was considerably higher than that in the primary teeth. The probable reason for this might be that children could act independently in both school and playground during the ages of permanent teeth.

For both primary and permanent teeth, it was noted that the dental traumas commonly occurred in the maxilla and maxillary incisors (Fig. 2). This finding is in accordance with the previous studies (7, 11, 13, 18, 19). One of the possible reasons for this result may be the preventive effect of maxilla on mandible during the occlusion (20).

It was found that traumatic injuries mostly occurred for the primary teeth in June and for permanent teeth in October and March (Fig. 3). Some authors have reported that there is an increase in the frequency of dental traumas in a warm weather relative to a cold weather (7, 13, 21). Their findings were in agreement with our results in the primary teeth, but in disagreement with those in permanent teeth. Dental traumas in the permanent teeth occurred most frequently in cold weather (October and March). The reason why dental traumas are more commonly observed in this period is that the month of October signifies the opening of the school period in which children tend to get into more close contact with one another physically. The month of March also represents the passage from an indoor life for children to outdoor life following their return from semester holiday, thus encouraging them to be much more active.

There was a significant difference between males and females as regards to the trauma source. Consistent with the finding of the other investigations, the most frequent trauma source was falls, and followed by collisions not only for gender but also for tooth type (primary or permanent) (7–9, 13) (Table 2). It was noted in this study as an interesting finding that traumatic dental injury occurred during intubation process of general anaesthesia in four teeth (two subjects). Gutman and Gutman (20) stated that dental traumas might also occur during general anaesthesia procedures.

In this study, the most frequent type of trauma was 'lateral luxation' in the primary teeth and 'enamel-dentin crown fracture' in the permanent teeth. It has been reported that the reason why periodontal tissue injury is more common in primary teeth than in permanent teeth is that the bone is more resilient in this period (8, 10, 21). In the previous studies, it has also been reported that in permanent teeth, either enamel or enamel-dentin fracture is more frequent than the other types (9, 11, 13, 19).

The classification (6), used also for this study, had not included any definition of the cases in which more than one type of trauma are present. Therefore, we recorded such injuries as 'multiple injuries'. In the previous studies, the frequency of soft tissue injuries was reported as ranging from 14% to 58% (8, 10, 14, 15, 22); ours was 21%. Most of patients with severe dental trauma visited the pedodontics clinic within the three first days (Table 3). Forty-one per cent of the patients applied for seeking dental care 3 weeks after the injury. Fehrenbach et al. (23) stated that mucosa and skin injuries might heal approximately in 2 weeks. As healing is observed in soft tissue injuries in the meantime, they may not have been recorded or noted. In this study, the reason for the delayed application for dental treatment of patients may be that the hard winter conditions in this region of Turkey do not allow their easy access to Pedodontic Clinics.

One of the aims of this study was to show the distribution of treatment procedures of traumatized primary and permanent teeth. When the germ of

permanent tooth does not injure and occlusal problems have not occurred because of tooth displacement, the primary teeth were treated to prevent the periodontal and pulpal health (24, 25). Similarly, in this study, when the situation was determined as the above form, the primary teeth were kept in the mouth while performing 'examination and follow up' or treatment procedures. If negative situation occurred, the primary teeth were extracted. In the primary teeth, 'examination and follow up' was the most frequent treatment modality and it was followed by the 'extraction' (Table 4). This result is in accordance with the results of some previous studies (7, 8, 15). However, the most common option of treatment in primary teeth was extraction in a questionnaire study conducted by Kahabuka et al. (26). In the permanent teeth, on the other hand, the most frequent treatment was 'direct restoration' without any endodontic treatment (Table 4), also confirmed by the study by Kirzioglu et al. (11). Meanwhile, 30 teeth were treated using reattachment technique in this study (17 reattachments only and 13 endodontic treatment + reattachment).

Patients seeking dental treatment after a time delay require complicated and expensive treatments. The authors concluded that, although Eastern Anatolia has a wide geographical area, the low number of patients seeking for dental treatment for trauma clearly reveals the fact that patients, their parents and teachers should be informed about the preventive strategies against any probable trauma in terms of different age groups. Moreover, they should be informed about what should be done in case of any trauma and about the necessity of seeing a dentist immediately after the trauma.

References

1. Bastone EB, Freer TJ, McNamara JR. Epidemiology of dental trauma: a review of the literature. Aust Dent J 2000;45:2–9.
2. Fried I, Erickson P. Anterior tooth trauma in the primary dentition: incidence, classification, treatment methods, and sequelae: a review of the literature. J Dent Child 1995;62:256–61.
3. Andreasen JO, Andreasen FM, Bakland LK, Flores MT, editors. Epidemiology of traumatic dental injuries. In: Traumatic dental injuries – a manual, 2nd edn. Iowa: Blackwell Munksgaard; 1999. p. 8–9.
4. Caliskan MK, Turkun M. Clinical investigation of traumatic injuries of permanent incisors in Izmir, Turkey. Endod Dent Traumatol 1995;11:210–3.
5. Canakci V, Akgul HM, Akgul N, Canakci CF. Prevalence and handedness correlates of traumatic injuries to the permanent incisors in 13-17-year-old adolescents in Erzurum, Turkey. Dent Traumatol 2003;19:248–54.
6. Andreasen JO, Andreasen FM, editors. Classification, etiology and epidemiology. In: Textbook and color atlas of traumatic injuries to the teeth, 3rd edn. Copenhagen: Blackwell Munksgaard; 1994. p. 151–80.
7. Kargul B, Caglar E, Tanboga I. Dental trauma in Turkish children, Istanbul. Dent Traumatol 2003;19:72–5.
8. Kirzioglu Z, Karayilmaz H, Ozay Erturk MS, Koseler Sentut T. Epidemiology of traumatised primary teeth in the west-Mediterranean region of Turkey. Int Dent J 2005;55:329–33.
9. Traebert J, Peres MA, Blank V, Böell RS, Pietruza JA. Prevalence of traumatic dental injury and associated factors among 12-year-old school children in Florianópolis, Brazil. Dent Traumatol 2003;19:15–8.
10. Galea H. An investigation of dental injuries treated in an acute care general hospital. J Am Dent Assoc 1984;109:434–8.
11. Kirzioglu Z, Ozay Erturk MS, Karayilmaz H. Traumatic injuries of the permanent incisors in children in southern Turkey: a retrospective study. Dent Traumatol 2005;21:20–5.
12. Osuji OO. Traumatised primary teeth in Nigerian children attending university hospital: the consequences of delays in seeking treatment. Int Dent J 1996;46:165–70.
13. Saroglu I, Sönmez H. The prevalence of traumatic injuries treated in the pedodontic clinic of Ankara University, Turkey, during 18 months. Dent Traumatol 2002;18:299–303.
14. Zerman N, Cavalleri G. Traumatic injuries to permanent incisors. Endod Dent Traumatol 1993;9:61–4.
15. Lombardi SSM, Sheller B, Williams BJ. Diagnosis and treatment of dental trauma in a children's hospital. Pediatr Dent 1998;20:112–20.
16. Vanderas AP, Papagiannoulis L. Urinary catecholamine levels and dentofacial injuries in children. Endod Dent Traumatol 1997;13:238–44.
17. Yavuzer H, editor. Oyun ve cocukta ilgiler. In: Cocuk Psikolojisi, 19th edn. Istanbul: Remzi Kitabevi A.S; 2000. p. 191–234.
18. Hargreaves JA, Matejka JM, Cleaton-Jones PE, Williams S. Anterior tooth trauma in eleven-year-old South African children. J Dent Child 1995;62:353–5.
19. Kramer PF, Zembruski C, Ferreira SH, Feldens CA. Traumatic dental injuries in Brazillian preschool children. Dent Traumatol 2003;19:299–303.
20. Gutmann JL, Gutmann MSE. Cause, incidence, and prevention of trauma to teeth. Dent Clin North Am 1995;39:1–13.
21. Perez R, Berkowitz R, McIlveen L, Forrester D. Dental trauma in children: a survey. Endod Dent Traumatol 1991;7:212–3.
22. Sae-Lim V, Tan HH, Yuen KW. Traumatic dental injuries at the Accident and Emergency Department of Singapore General Hospital. Endod Dent Traumatol 1995;11:32–6.
23. Fehrenbach MJ, Lemborn UE, Phelan JA. Inflammation and repair. In: Ibsen OAC, Phelan JA, editors. Oral pathology for the dental hygienist. Philadelphia: W.B. Saunders Co; 2000. p. 43–102.
24. Andreasen JO, Andreasen FM, Bakland LK, Flores MT, editors. Injuries to the primary dentition. In: Traumatic dental injuries – a manual, 2nd edn. Iowa: Blackwell Munksgaard; 1999. p. 52–5.
25. Andreasen JO, Andreasen FM, Skeie A, Hjørting-Hansen E, Schwartz O. Effect of treatment delay upon pulp and periodontal healing of traumatic dental injuries-a review article. Dent Traumatol 2002;18:116–28.
26. Kahabuka FK, Willemsen W, van't Hof M, Ntabaye MK, Burgersdijk R, Frankenmolen F et al. Initial treatment of traumatic dental injuries by dental practitioners. Endod Dent Traumatol 1998;14:206–9.