Dental Traumatology 2004; 20: 1–5
Printed in Denmark. All rights reserved

DENTAL TRAUMATOLOGY

Type of treatment, prognosis, and estimation of time spent to manage dental trauma in late presentation cases at a dental teaching hospital: a longitudinal and retrospective study

Al-Jundi SH. Type of treatment, prognosis, and estimation of time spent to manage dental trauma in late presentation cases at a dental teaching hospital: a longitudinal and retrospective study. Dent Traumatol 2004; 20: 1–5. © Blackwell Munksgaard, 2004.

Abstract – Traumatic dental injuries are emergencies that must be treated promptly and properly in order to reduce the suffering, costs, and time for patients, parents, and health care providers. The aim of this study was to investigate the treatment, long-term prognosis, and number of visits needed to manage cases resulting from complications of late presentation of traumatic dental injuries. The sample consisted of 195 children, all presented with complications of dental trauma at the Pediatric Dentistry Clinics in the Dental Teaching Hospital of Jordan University of Science and Technology in Irbid city, Jordan. Retrospective data relied on trauma forms as well the clinical notes and radiographs in the patients' records. Prospective data was collected by examining patients at recall appointments. The treatment of traumatized teeth in this sample ranged from no active treatment to extraction and prosthetic replacement. It was estimated that the number of visits needed to carry out the planned treatment for these patients ranged between 3 and 17.2 visits according to the type of treatment. Apexification procedure was the most time consuming. Thirty-two per cent of teeth with apexification ended up with root fracture mainly subsequent to another minor trauma episode (in 85%), the rest were reported to be spontaneous fractures. Almost half of the teeth with luxation injuries became necrotic after 3 years. Teeth with avulsion actually kept on deteriorating even at the 36-month follow-up appointment. The long-term prognosis of teeth with middle root fracture was favorable in (80%) of the teeth in the sample, despite the fact that they were splinted late. Luxation injuries led to more necrotic teeth (50%) than uncomplicated crown fractures. Multiple dental trauma episodes (MDTE) were reported in about 30% of the patients in the sample and were responsible for some of the complications noticed in this report. As all cases followed up in this report are late presentation of dental trauma, the findings may emphasize and highlight predictors for healing and favorable long-term prognosis for such injuries. This will help selecting the treatment option that would lead to better outcomes with less expense and less time consumption for dentists and patients alike. The findings of this report also stress the importance of prevention of dental trauma and minimize its complications through proper treatment, educational programs, supervision of children during play, use of mouth guards, and orthodontic treatment of proclined incisors.

Suhad H. Al-Jundi

Preventive Dentistry Department, Jordan University of Science and Technology, Irbid, Jordan

Key words: dental trauma; prognosis; complications; number of visits

Dr Suhad Al-Jundi, Preventive Dentistry Department, Jordan University of Science and Technology, Irbid, PO Box 810053, Jordan
e-mail: suhadj@just.edu.jo

Accepted 14 May, 2003

Traumatic dental injuries are emergencies that must be treated promptly and properly in order to reduce the suffering, costs, and time for patients, parents, and health care providers.

As many reports indicate that dental trauma accounts for a fairly high percentage of cases presenting at hospital emergency departments, providing prompt and high standard dental care should be the target of dental and pediatric emergency care providers (1).

However, many authors recently expressed concerns about improper treatment for traumatic dental injuries (1–3).

The aim of this study was to investigate the treatment, long-term prognosis, and number of visits needed to manage cases resulting from complications of late presentation of traumatic dental injuries among children seen at the Pediatric Dentistry Clinics in the Dental Teaching Hospital of Jordan University of Science and Technology in Irbid city, Jordan.

Materials and methods

In this study, dental records of children who presented with complications of dental trauma at the emergency visit were included in the survey. The pattern of these injuries was reported in a previous article (1). These cases were then provided with treatment and were followed up for 12–36-month period.

One hundred and ninety-five children were included in this study, they all presented late with complications of dental trauma at the emergency visit. Estimation of the treatment received by these patients, as well as the outcomes, prognosis and number of visits needed to manage their trauma was collected retrospectively and prospectively.

Retrospective data relied on trauma forms, normally filled out for each child presenting with trauma, as well the clinical notes and radiographs in the patients' records. Prospective data was collected by examining patients at recall appointments by the author. Data analysis was in the form of descriptive statistics.

Results

At the beginning of the study, 195 children who sustained trauma to 287 teeth were included. At the end of the 3-year follow up, 20% were lost leaving 156 patients with 210 teeth (Table 1).

The main complaint presented was pain or sensitivity (31.3%), with falls being the leading cause of dental trauma (80%). The upper permanent incisors were the most frequently involved teeth with crown fracture being the most prevalent type of injury occurring in 76.6% of the cases.

Table 1. The distribution of the teeth at follow-up appointments

Follow up duration (months)	Number of teeth
3	287
6	287
12	275
24	266
36	210

Table 2. Type of treatment provided to teeth in the sample

Treatment	Percentage in whole sample (*n*)	Number of visits
No active treatment	6.2 (18)	3
Tooth colored restoration	30.9 (89)	7.5
Pulp therapy	41.3 (118)	8.4–17.2
Pulpotomy	5.2 (15)	8.4
Apexification	28.9 (83)	17.2
RCT	7.2 (20)	10.6
Splinting	13.4 (38)	6.4
Replantation	3.1 (9)	9.2
Extraction and prosthesis	5.1 (15)	6
Total	100 (287)	

The treatment of traumatized teeth in this sample ranged from no active treatment to extraction and prosthetic replacement. It was estimated that the number of visits needed to carry out the planned treatment for these patients ranged between 3 and 17.2 visits according to the type of treatment as illustrated in Table 2. Pulp therapy procedures were the most time-consuming particularly apexification, which required an average of 17.2 visits.

The detailed management of the different types of traumas is highlighted in Tables 3–4. It is noticed that a fairly high percentage (33.3%) of enamel and dentine fracture cases required pulp therapy. All teeth with whole crown fracture, and 7.4% of those with complicated crown–root fracture were extracted at the emergency visit (Table 3).

Teeth with lateral luxation, although presenting late, were repositioned and splinted. Nine of the 15 avulsed teeth were replanted. Five avulsed teeth

Table 3. The distribution of treatment of crown-fractured teeth according to the type of crown fracture

Type of fracture	Treatment modality	Percentage of teeth (*n*)
Enamel fracture	No active treatment	66.7 (4)
	Tooth colored restoration	33.3 (2)
Enamel and dentine	Tooth colored restoration	66.9 (87)
	Pulp therapy	33.3 (43)
Enamel, dentine and pulp	Pulp therapy	92.6 (75)
	Extraction	7.4 (6)
Whole crown fracture	Extraction	100 (3)
Total		220

Table 4. The distribution of treatment of luxation injuries

Type of injury	Treatment modality	Percentage of teeth (*n*)
Concussion	No active treatment	100 (3)
Subluxation	Splinting	100 (22)
Lateral luxation	Splinting	100 (12)
Avulsion	No active treatment	33.3 (5)
	Replantation	60 (9)
	Prosthesis	6.9 (1)
Total		52

Table 5. The distribution of treatment of root-fractured teeth

Type of injury	Treatment modality	Percentage of teeth (*n*)
Coronal root fracture	Extraction and prosthesis	100 (3)
Apical root fracture	No active treatment	100 (6)
Middle root fracture	Splinting	66.6 (4)
	Extraction and prosthesis	33.3 (2)
Total		15

required no active treatment, four of these were primary teeth, and the fifth was a supernumerary (Table 4).

It is worth noting that all teeth with coronal root fracture were extracted, whereas only one-third of those with middle root fracture were extracted at the emergency visit (Table 5). Extraction was the treatment of choice in five of the 15 root-fractured teeth, and only four of these teeth were splinted (Table 5).

Prognosis

The cases were followed up clinically and radiographically at 3, 6, 12, 24, and 36 months. Only 210 teeth were followed up for 36 months. All teeth were followed up for a minimum period of 6 months, and only 12 teeth were lost for the 12-month follow-up visit (Table 1).

The prognosis of the treated teeth was estimated to be favorable if one or more of the following conditions were fulfilled:

1 Sustained pulp vitality of teeth with vital pulps at the initial presentation.

2 The condition of the tooth did not deteriorate from the initial presenting complaint. For example, a non-vital tooth deteriorating into abscess formation.

3 Favorable outcome of the treatment provided. For example, apical barrier formation in teeth treated with apexification, or favorable function and esthetic of tooth colored restorations and prosthesis.

All teeth were given a score of 100 initially and the percentage of teeth with favorable prognosis was recorded at different recall visits according to the above criteria, the prognosis of teeth with different types of traumatic injuries are illustrated in Figs. 1–3.

In general, it is noticed that the more severe the injury, the more likely it is that the involved teeth would keep deteriorating, whereas with less severe injuries it is more likely that the condition of the injured teeth will stabilize after 12 months. (Figs. 1–3).

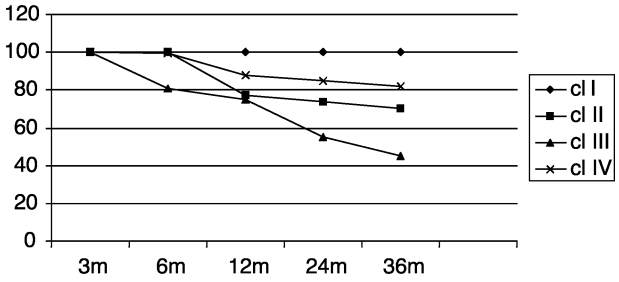

Fig. 1. The percentage of crown-fractured teeth with favorable prognosis at different follow-up appointments.

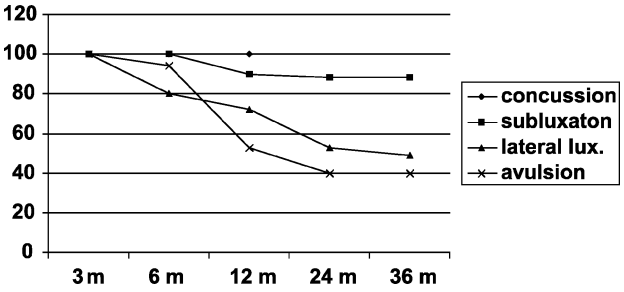

Fig. 2. The percentage of teeth with injuries to periodontal ligaments showing favorable prognosis at different follow-up appointments.

Among crown-fractured teeth, the worst prognosis was for teeth with complicated crown fracture, especially those with apexification treatment (Fig. 1). Thirty-two per cent of teeth with apexification ended up with root fracture mainly subsequent to another minor trauma episode (in 85%), the rest were reported to be spontaneous fractures.

As far as teeth with injuries to supporting structures are concerned, the condition of the teeth in the sample stabilized at the 12-month follow-up appointment for the less severe injuries (concussion and subluxation). Almost half of the teeth with luxation injuries became necrotic after 3 years. Teeth with avulsion actually kept on deteriorating even at the 36-month follow-up appointment (Fig. 2).

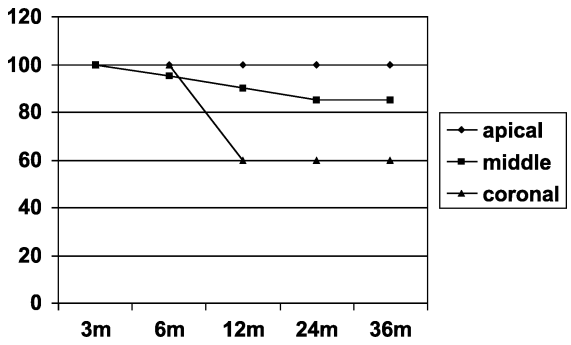

Fig. 3. The percentage of root-fractured teeth with favorable prognosis at different follow-up appointments.

All replanted avulsed teeth were extracted because of external root resorption, which started appearing at the 6-month follow-up appointment. All shared the fact that they were improperly handled before replantation. Six of the nine replanted teeth were kept dry for 24–39-h period. Three were soaked in disinfectant by the attending adult, mostly a teacher or a school nurse for 14–28 h.

Teeth that were soaked in disinfectant showed significantly more rapid root resorption than those kept dry. The long-term prognosis of teeth with middle root fracture was favorable in (80%) of the teeth in the sample, despite the fact that they were splinted late. Most of the failures in root-fractured teeth were a result of continuous mobility and failure to maintain vitality of the pulp (Fig. 3).

Discussion

As all cases followed up in this report are late presentation of dental trauma, the findings may emphasize and highlight predictors for healing and favorable long-term prognosis for such injuries. This may help selecting the treatment option that would lead to better outcomes with less expense and less time consumption for dentists and patients alike.

A close look at the treatment provided initially indicates that pulp therapy was the most frequently provided treatment (41.3%), with apexification being the procedure of choice in almost 70% of teeth requiring pulp therapy. This is explained by the gross delay in seeking treatment leading to more complications and necrotic teeth. This corresponds with the findings of other researchers investigating the outcome of treatment of traumatic dental injuries (4, 5), in which they highlighted the association between delayed treatment of dental trauma and the occurrence of complications.

Luxation injuries led to more necrotic teeth (50%) than uncomplicated crown fractures (30%), which again emphasize the findings of Robertson, indicating very little pulpal response to crown fracture as long as there was no concomitant luxation injury (6).

However, the percentage of teeth with necrotic pulp subsequent to uncomplicated crown fracture is much higher in this study than previously reported (7). This can be explained by the excessive delay in seeking treatment in 42% of the cases, history of concomitant luxation injury in 30% of the cases, and multiple trauma episodes involving the same tooth in 28% of the cases.

Although Andreasen in his recent review article indicated that delayed treatment for uncomplicated crown fractures with no luxation injuries could be realistic (8). Excessive delay of more than 3 months can be harmful to the pulp as indicated by the findings of the current report.

It is worth noting that in 62% of the cases, all teeth with crown–root fracture were extracted at the emergency visit mainly because of the presence of an abscess. Poor patient/parent compliance in 22% of the cases and very deep fracture line in immature teeth in the remaining 16% of the cases were reported. At the end of the third year, almost 80% of these patients were satisfied with the prosthetic replacement provided.

For complicated crown fractures, treatment delay reflected on the choice of emergency treatment of these cases, where apexification was the treatment of choice for most cases. It is wise to note that 32% of teeth treated with apexification ended up with root fracture. This rather disturbing finding was reported earlier (9). A very recent report proved the hypothesis, stating that fracture strength of calcium hydroxide-filled immature teeth is halved in about a year as a result of the root filling (10). The above-mentioned finding, in addition to the fact that apexification procedure is very time consuming, requiring an average of 17.2 visits, further support the conclusion drawn by Andreasen et al. (10), in which they stated that alternative treatment procedures for root canal filling other than those using calcium hydroxide should be considered.

The prognosis of root-fractured teeth was good despite the delay in seeking treatment. Only 20% of middle root-fractured teeth had unfavorable prognosis mainly because of the loss of vitality of the coronal fragment. This finding is supported by those of a large clinical study of root-fractured teeth referred to by Andreasen et al. (8).

Multiple dental trauma episodes (MDTE) were reported in about 30% of the patients in the sample and were responsible for some of the complications noticed in this report. An even higher percentage of MDTE were reported in a recent longitudinal report on dental trauma in children and adolescents (11).

This finding strongly support the conclusions drawn by many other authors stressing the importance of prevention of dental trauma and minimizing its complications through educational programs, supervision of children during play, use of mouth guards, and orthodontic treatment of proclined incisors (4, 12).

Efficient and properly timed treatment as well as raising public awareness of the importance of proper management of traumatic dental injuries will help reducing complications, costs and time for patients, parents, and primary health care providers.

References

1. Al-Jundi SH. Dental emergencies presenting to a dental teaching hospital due to complications from traumatic dental injuries. Dent Traumatol 2002;18:1–5.
2. Marcenes W, Zabot WE, Traebert J. Socioeconomic correlates of traumatic injuries to the permanent incisors

in schoolchildren aged 12 years in Blamenau, Brazil. Dent Traumatol 2001;17:222–6.
3. Al-Majed I, Murray JJ, Maguire A. Prevalence of dental trauma in 5–6 and 12–14 year-old boys in Riyadh, Saudi Arabia. Dent Traumatol 2001;17:153–8.
4. Caliskan MK, Turkun M. Clinical investigation of traumatic injuries of permanent incisors in Izmir, Turkey. Endod Dent Traumatol 1995;11 (5):210–3.
5. Oulis CJ, Berdouses ED. Dental injuries of permanent teeth treated in private practice in Athens. Endod Dent Traumatol 1996;12 (2):60–5.
6. Robertson A. Pulp survival and hard tissue formation subsequent to dental trauma. A clinical and histological study of uncomplicated crown fractures and luxation injuries. Swed Dent J Suppl 1997;125:1–65.
7. Glendor U, Halling A, Andreason L, Andreasen JO, Klitz I. Type of treatment and estimation of time spent on dental trauma- alongitudinal and retrospective study. Swed Dent J 1998;22:47–60.
8. 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.
9. Cvek M. Prognosis of luxated non-vital maxillary incisors treated with calcium hydroxide and filled with gutta percha. Endod Dent Traumatol 1992;8:45–55.
10. Andreasen JO, Farik B, Munksgaard EC. Long -term calcium hydroxide as a root canal dressing may increase risk of root fracture. Dent Traumatol 2002;18:134–7.
11. Glendor U. On dental trauma in children and adolescents. Incidence, risk, treatment, time and costs. Swed Dent J Suppl 2000;140:1–52.
12. Adekoya-Sofowora CA. Traumatized anterior teeth in children. a review of the literature. Niger J Med 2001;10 (4):151–7.