

Subjective aspects of patients with traumatized teeth

A 15-year follow-up study

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Robertson A, Norén JG. Subjective aspects of patients with traumatized teeth. A 15-year follow-up study. *Acta Odontol Scand* 1997;55:142-147. Oslo. ISSN 0001-6357.

The aim of this study was to obtain detailed information about adults who suffered trauma to the teeth as children. A total of 102 patients took part. The patients answered a questionnaire and were interviewed before the oral examination. Thirty-nine per cent of the patients reported dissatisfaction either with the color and/or anatomic form of the traumatized teeth or reconstruction. Most of the individuals did not remember having received any information about prognosis for the traumatized teeth. Twenty-one per cent of the patients remembered pain during treatment, and 25% remembered only the behavior and attitudes of the dental team. It can be concluded that all dental treatment in children with traumatized teeth must be carried out as painlessly as possible, and the dental team should minimize discomfort during the treatment. Good knowledge about traumatology and management can reduce stress and anxiety for both the patient and the dental team. □ *Anxiety; dental traumatology; questionnaire; tooth fractures; tooth luxation*

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Traumatic injuries in children and adolescents are a common problem, and several studies have reported that the prevalence of these injuries has increased during the past 10- to 20-year period (1-5). About 25% of the traumatized children sustained trauma more than once (5). According to Andreasen & Ravn (1), approximately 50% of children are exposed to dental trauma before leaving school (15 years old). Uncomplicated crown fractures are the commonest diagnosis, and the teeth predominantly affected are the maxillary central incisors (1-5). Trauma to the face, teeth, and oral soft tissues may lead to interference with normal occlusion and may also result in physical and emotional complications.

The maintenance of healthy and esthetic oral structures during a lifetime is important for both physiologic and physical reasons. Restorative therapy always requires adaptation, both on a functional and on a physiologic level. Thus, besides functional problems, poor adaptation may give rise to several emotional reactions. However, since most of the injuries are apparently minor (1-5), real problems probably occur in a limited number of cases, but the feeling of insecurity and fear of losing the restoration may subsequently lead to anxiety. In severe cases great problems arise concerning treatment and prognosis. These injuries may require extensive orthodontic, surgical, or prosthetic treatment. Extraction is sometimes the only treatment alternative, and space closure is achieved either by orthodontic or prosthetic therapy. It is not always possible to carry out therapy in young individuals, partly because of growth and partly because

of the width of pulp chambers. Treatment with partial dentures may therefore be the only alternative (6). This can be a stressful experience for young people going through puberty, mainly for psychologic but also for functional and esthetic reasons.

Little information is available on the ability of individuals with injured teeth to perceive their treatment result objectively. Treatment goals are based on professional ideals of function and esthetics. Dental injuries, in contrast to most other injuries, often cause permanent damage and may cause problems for many years after the accident. Esthetics plays a major role when the loss of tooth structure involves the anterior teeth, which may alter or limit our ability to restore form and function.

Many teenagers have appalling dental behavior and compliance problems in and out of the dental office. Most studies have focused on the etiology and treatment of dental fear. Several factors have been identified as etiologic, and among those most often reported are previous dental trauma, family modeling, and general anxiety. A poor patient-to-dentist relationship is also reported (7). At present, however, there is little information on the relationships between patients with early dental trauma, their subjective experiences, and possible development of dental fear. Extended observation periods (years) could be expected to be more reliable in reflecting the end point.

The aim of this study was, therefore, to present detailed information about adults with trauma to their teeth in childhood and to identify post-traumatic factors related to life-long discomfort.

Patient materials and methods

Subjects

All patients, schoolchildren between 7 and 19 years of age, treated for an acute dental injury to their permanent dentition at the Department of Pedodontics, Göteborg, Sweden, during the period 1977–78, were selected for the investigation (15-year follow-up). A total of 195 patients were thus identified. Clinical and radiographic examinations of the teeth were performed at irregular intervals at the Department of Pedodontics in the follow-up period. The examination and treatment were performed by different dentists, in accordance with standardized procedures.

After the follow-up period the patients were transferred to their regular dentist in the Public Dental Service, which provides free dental care for all children between 0 and 19 years of age. After 19 years of age, the participants continued to receive dental care at private clinics or at the Public Dental Service.

Inclusion criteria for the patient material were as follows: clinical information from the time of injury and throughout the observation period (crown color, pulpal sensibility, tooth mobility, tenderness to percussion, gingival pocket depth); diagnosis from the time of injury and throughout the observation period; and radiographs from the time of injury and throughout the observation period.

One hundred and fifty-five patients fulfilled the inclusion criteria and were called for a final control examination. Of these patients, 102 appeared, 35 had left the city (27 of these 35 patients were interviewed by phone, by one of the authors), and 18 did not appear for unknown reasons (Table 1).

Data from the records. Information was collected about the cause of injury, diagnosis, number of teeth involved, previous treatment of the injury, and number of dental visits.

Dental injuries were classified as hard-tissue injuries and injuries involving periodontal tissues. The former included crown fractures, root fractures, and crown root fractures, and the latter subluxations, extrusive luxations, lateral luxations, intrusive luxations, and avulsion injuries.

Dental status. Anamnestic and clinical data were collected in connection with the oral examination. Anamnestic data included cause of accidents, history of previous or later dental injuries, and any subjective symptoms. Clinical data consisted of degree of mobility, tenderness, discoloration, pulp testing, pocket depth around the teeth, fillings, restorations.

The radiographic examination included periapical exposures of all traumatized teeth. Furthermore, four standardized 35-mm color transparencies were obtained for each subject, including frontal views of the injured teeth.

Questionnaire

The purpose of the questionnaire (detailed information about the adult with trauma to the teeth in childhood) had been explained to each patient before the oral examination.

The questionnaire concerned general questions about dental injuries and questions about psychosocial activities and factors related to normal functions. The questions were of multiple-choice type except for open questions about memories from emergency treatment and from follow-ups. The questionnaire consisted of descriptive variables (nine variables) and of questions reflecting functional (six questions), personal (six questions), and social (five questions) effects of the patients' oral situation. The descriptive variables (nine questions) included in the present study were sex, age, education, occupation, regular dental care, age at trauma, and etiology. Examples of questions asked in the different categories are 'Can you eat all kinds of food?' (functional aspects), 'Are you afraid that something is going to happen when you bite?' (personal aspects), 'Did you lose many hours of schooling?' (social aspects). The

Table 1. Frequency distribution of the sex and age of dentally injured patients and type of injury in the present material (the figures for the original material are incorporated within parentheses for comparison)

	Patients	Teeth
Number	102 (155)	244 (344)
Gender		
Males, <i>n</i>	65 (96)	152 (214)
Females, <i>n</i>	37 (59)	92 (130)
Diagnosis, %		
Infraction	5 (4)	
Uncomplicated crown fractures	39 (41)	
Complicated crown fractures	8 (6)	
Crown-root fractures	2 (2)	
Root fractures	1 (1)	
Concussion/subluxation	39 (33)	
Extrusive lux./lateral lux.	18 (20)	
Intrusive lux.	4 (3)	
Avulsion injuries	5 (5)	

Table 2. Distribution of dentoalveolar injuries in accordance with place of occurrence

	Girls		Boys	
	<i>n</i>	%	<i>n</i>	%
Accidents at home, indoors	5	14	2	3
Accidents at school, indoors	2	5	3	5
Collision during play and falling over, outdoors	15	41	25	38
Traffic accidents (bicycle and cars)	6	16	20	31
Sporting accidents	7	19	12	18
Violence	0	0	3	5
Medical history	2	5	0	0
Total	37	100	65	100

Table 3. Prevalence of patient evaluation of functional disturbances

Functional aspects		Females		Males	
		n	%	n	%
Difficulties in eating any kind of food?	Yes	4	11	6	9
Difficulties in biting food?	Yes	8	22	7	11
Concern about something happening to the traumatized teeth when biting?	Yes	17	46	19	24
Any problems with the occlusion?	Yes	9	24	10	15
Any problems with speech?	Yes	0	0	6	9

responses to each question are summarized in Tables 2–4.

Interview

Standardized and structured open-ended questions were used in the interview. Information about the individual's restorations was collected. The subjects were asked about their opinion about the color and form of the injured teeth without reconstruction and the color and anatomic form of the anterior fillings and/or the prosthetic reconstruction, and information on the age of the fillings and reconstructions.

The complete questionnaire and interview questions are available on request from the authors.

Results

Overall findings

A total of 102 patients (37 females and 65 males) were available for the analysis. The average age of the patients was 26.9 ± 2.7 ($\bar{x} \pm s$) years (range, 23–34 years) (Table 1). Most individuals had 11–12 years of education (56%), whereas 10% had academic training. Most (77 individuals) of the patients were employed,

and the rest (25 individuals) were students or unemployed. Thirty-five per cent of the patients received regular dental care at private clinics, and 62% at Public Dental Service. Three patients did not see a dentist at all. The highest incidence of trauma was at the age of 8–10 years. In 39% of the cases two teeth were injured; four or more injured incisors were uncommon in both sexes (7.5%).

Of all injuries observed, 12% took place indoors at home or at school, 39% outdoors, and 26% was divided between sports and traffic accident injuries (Table 2).

Restorative dentistry was necessary in 50% of the teeth, and endodontic and prosthetic treatment was needed in 39% and 29%, respectively. Tooth extraction was indicated in 15%.

Questionnaire and interview

Functional effects. The findings are summarized in Table 3. Twenty-two per cent of the females and 11% of the males answered that their biting-off ability was reduced. A chi-square test showed that patients with crown fractures reported difficulties more often in eating and biting and concern about something happening to their teeth compared with those with other injuries ($P < 0.05$).

Personal effects. Twenty-one per cent of the patients remembered pain during emergency treatment and 25% remembered only the behavior and attitude of the dentist and the dental assistant (13% remembered pleasant behavior and 12% remembered unpleasant behavior). Patients less than 12 years old and patients with injuries to periodontal tissues remembered pain during the emergency treatment more often than the older children or children with other injuries; however, no statistically significant differences were found. Sixteen per cent remembered what the dentist did. Five per cent remembered long treatment time, and 33% did not remember anything from the emergency treatment.

Fourteen per cent of the patients remembered the behavior of the team (10% remembered bad behavior and 4% pleasant behavior) and 12% remembered pain during follow-up treatments. Eighteen per cent complained about too many appointments, 11% had doubts whether the team had enough clinical competence, and 45% had no opinion.

Eight per cent of the patients answered that they often thought about the trauma, 67% sometimes, and 25% never thought about the trauma. The females thought about the trauma significantly more often ($P < 0.01$).

Twenty-eight per cent reported dental fear, and 43% of those reported dental fear because of the treatment effects at the time of the accident.

Forty-six per cent of the females and 20% of the males reported anxiety about the future of their injured teeth ($P < 0.01$).

Table 4. Prevalence of patient evaluation of social disturbances

Social life aspects		Females		Males	
		n	%	n	%
Many school hours missed due to dental trauma follow-ups	Yes	10	27	11	17
Need for parents to take time off from work for dental follow-ups	Yes	15	41	17	26
Any influence of dental trauma on your spare time activities	Yes	5	14	3	5
Any influence of dental trauma on relationships with friends	Yes	8	22	1	2***
Any influence of dental trauma on choice of profession	Yes	1	3	2	3

*** $P < 0.001$.

Social life effects. Thirteen per cent reported negative social life effects such as meeting with friends, playing, and sports activity. No statistically significant differences were found between age of injury and diagnosis.

Twenty-one per cent reported that the need for treatment involved the loss of many hours of schooling; 31% of the parents had to take time off from work to accompany the child to the dentist (Table 4). About 25% answered 'don't know' to both questions.

All of the patients who had teeth extracted (15%) due to trauma reported problems with the replacement during adolescence. Removable dentures created problems such as fear of losing them, fear that they would break, their appearance, and problems kissing.

Esthetic evaluation. In the interview 51% of the females and 31% of the males were dissatisfied with the color and/or anatomic form of the restoration of the traumatized teeth and/or the color of the injured teeth ($P < 0.05$).

Subjective symptoms. Absence of subjective symptoms was reported by 86% of the patients.

Information. Most (61%) of the patients claimed that they had never received any information about the prognosis of the traumatized teeth.

Discussion

This study has shown that a higher prevalence of accidental damage was recorded for males than for females, and a high frequency of cases with more than one traumatized tooth. Thirty-nine per cent of the patients reported dissatisfaction with either the color and/or the anatomic form of the traumatized teeth or reconstruction. Most of the individuals did not remember receiving any information about prognosis. Twenty-one per cent of the patients remembered pain during treatment, and 25% remembered only the behavior and attitude of the dentist and the dental assistant.

This patient material can be considered representative of the injuries concerned, which is supported by findings in other studies (1–5). The distribution of age, sex, and diagnosis corresponds closely with the original basic material and agrees with what was found in several other studies (1–5).

The etiology of injuries in the present sample was in agreement with earlier reports (1–5), showing that accidents recorded as having taken place outdoors at home or at school were common. The study confirms that falls and blows during games are one of the predominant causes. Information and mouth protectors may have some effect on prevention of injuries in sports and traffic accidents (8), but it may not be possible to prevent those occurring in everyday situations.

The questionnaire

The questionnaire contained several important

factors affecting daily life, many of which have to do with the mouth: nutrition, communication, emotional expression, and patients' reactions and attitudes concerning the outcome of the treatment.

Functional effects. Speech difficulties were experienced by six patients. However, this does not represent a major problem for the patients, but the problem should be kept in mind in certain complicated cases.

The lack of trust in the restoration was obvious, as several patients claimed that their chewing ability was impaired after the trauma. Many treatment methods have been unsuccessful, and the loss of restoration is a disconcerting but not uncommon clinical observation.

Personal effects. Luxation of permanent teeth presents a dramatic occurrence that has great psychologic impact on both parents and children. It may create widespread psychosocial effects for some, with consequences that impair the social functioning and well-being of the individual.

The existence of dental fear or avoiding to see a dentist at all reflects negative experiences from the time of the acute treatment and/or the following treatment. The figure of 27% with dental fear should be compared with the 5–10% of adult individuals with dental fear reported in the literature (7). A possible explanation of the higher incidence of dental fear in this investigation could reflect bias in reporting anxiety. Thus for screening purposes and in research there is a need for precise instruments for the measurement of dental fear. However, several reports show that dental fear is related to experiences from earlier dental treatment situations (7). Experiences of pain during treatment increased the risk of developing dental fear. Therefore, all dental treatment in children must be carried out as painlessly as possible, and the dental team should minimize discomfort during the treatment (9). This is supported by the fact that 21% of the patients in this study had experienced pain during treatment in the emergency treatment situation. The emergency and the follow-up treatments should not be carried out without the considerate use of local anesthetics and other substances for reducing pain and tension. This is especially important in young children, who do not fully understand the reason or the need for dental treatment. Discomfort during treatment and unpleasant conduct on the part of the dental team are also risk factors in the development of dental fear which were found in the answers to the questionnaire. Further, the patients also claimed that they had doubts during the follow-up treatments as to whether the team had enough clinical competence. One feature common to all patients with acute trauma is the fact that they come to the dental clinic unexpectedly, which is why good knowledge in traumatology and management can reduce stress and anxiety for both the patient and the dental team. There is a clear need to improve the knowledge of etiology, diagnosis, treatment, and complications of trauma among dental teams.

Social effects. Repairing the damage is often time-consuming, and the results from the questionnaire showed that the need for treatment involved loss of many hours of schooling. In many cases the parents had to get off from work, which involves economic consequences for the individual and/or the employer.

All of the patients who had teeth extracted because of trauma reported problems with the replacement during adolescence. Removable dentures created problems, such as fear of losing them, fear that they would break, their appearance, and problems kissing, and it was a stressful experience for the patients going through puberty. It was also reported that participation in different sports was not possible.

Esthetic evaluation. Esthetically pleasing restoration of young, fractured permanent incisors has long been a perplexing problem for dentists, as is reflected in this study with 39% of the patients reporting dissatisfaction with either the color and/or the anatomic form of the traumatized teeth or reconstruction. The restoration of fractured incisors is important from both the esthetic and the functional point of view. A composite restoration is often the treatment of choice. The technique is well known and has been described in numerous publications (10–12). The clinical results of anterior composite resin restorations tend to vary with regard to loss, color stability, and marginal integrity (13, 14). The success of composite resin restoration is still regarded as highly technique-sensitive, thus requiring strict moisture control (15–17). The results indicate that female patients are more aware of esthetics than males. A common sequel to injuries involving periodontal tissues is darkening or discoloration, which was also found in this study (18, 19). Gray discoloration may represent intrapulpal bleeding or necrosis. Some authors report a transient discoloration with continued pulpal vitality. Yellow discoloration is a common finding in teeth with pulp canal obliteration (18), and most patients with a yellow shade of an obliterated tooth were dissatisfied. These patients were young people with mostly intact teeth and one single tooth with a yellow shade.

Information. Analysis of the material showed that most of the individuals did not remember having received any information about prognosis. During the time before healing the dental practitioner should inform the patient of the diagnostic dilemma and the need for additional and regular recurrent visits. Information is important to obtain a cooperative attitude to treatments and good motivation in controls.

Conclusions

All dental treatment in children with traumatized teeth must be carried out as painlessly as possible, and the dental team should also minimize discomfort during the treatment.

During the time before healing the dental practitioner should inform the patient of the diagnostic

dilemma and the need for additional and regular recurrent visits.

Many of the patients were dissatisfied with color and/or anatomic form. Esthetically pleasing restoration of young, fractured permanent incisors is a perplexing problem for the dentist.

This investigation emphasizes the need for more research in methods to reduce the high frequency of dental injuries, as these injuries are a great socio-odontologic problem. Social costs, patient satisfaction, and psychologic aspects are factors that are difficult to quantify, and further studies are needed in these areas.

Acknowledgement.—This study was supported by grants from Stiftelsen Länsförsäkringsbolagens Forskningsfond (project P1/96), Stockholm, Sweden.

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Received for publication 4 October 1996

Accepted 5 December 1996