David Gfeller
Thomas von Arx

Department of Oral Surgery and
Stomatology, School of Dental
Medicine, University of Bern,
Switzerland

CORRESPONDENCE
Dr. med. dent. David Gfeller
Zahnarztpraxis
Buchenstrasse 5
CH-6210 Sursee
Tel. +41 41 921 88 28
E-mail: david.gfeller@
zahnarzt-gfeller.ch

Retrospective Analysis of Dento-alveolar Injuries at a Swiss University Clinic (2011–2015)

SUMMARY

The aim of this study was to evaluate all dento-alveolar injuries occurring within a period of five years that were examined at the Department of Oral Surgery and Stomatology at the University of Bern. The case histories of 852 patients (522 males and 330 females) were assessed retrospectively. The mean age was 17 years and 9 months. The youngest patient was 10 months old, the oldest was 91 years old. Most accidents were recorded in the months of March and July. Friday was observed as the weekday when accidents were at their peak. 54% of the trauma patients were first examined on the day of the accident. The most frequent causes of accident were falls, cycling or sports accidents. Injury types included concussion (72.4%), subluxation (14%) and luxation (7.7%). Crown fractures without pulp exposure were recorded in 522 teeth (10.7%). Rare types of trauma were crown frac-

tures with pulp exposure (3.7%), and avulsion injuries (3.2%). The most frequently affected teeth were central incisors (40%), followed by lateral incisors (35.6%) and canines (19.5%). 71.5% of the patients with dento-alveolar trauma also had soft-tissue injuries (from abrasions to lacerations), mostly lip (51.6%), gingival (19%), and chin injuries (10.9%). The multivariate analysis showed that age had a significant impact on concussions, subluxations, intrusions, crown fractures, root fractures and non-oral injuries. For concussions and subluxations, the probability of an injury was highest for the mixed dentition group. For intrusions, the probability of an injury decreased with age, but it was vice versa for crown fractures, root fractures and non-oral injuries. It was found that after bicycle accidents avulsions, luxations, subluxations, soft-tissue injuries and non-oral injuries were most likely.

Introduction

Dental trauma is the result of sudden unforeseen forces acting on the teeth and/or the surrounding hard and soft tissues (Lam 2016).

In the literature the prevalence of dental trauma ranges from 6% to 59% (Altay & Güngör 2001; Traebert et al. 2003; Azami-Aghdash et al. 2015; Berti et al. 2015; Lam 2016; Petti et al. 2018; Born et al. 2018). Studies in various countries show that around one-third of pre-school children suffer from trauma to their deciduous teeth (Glendor 2008). Around one-quarter of school-children sustain dental trauma and approximately one-third of adults experience trauma to their permanent teeth (Glendor 2008, 2009). It is estimated that in 2015 over one billion people worldwide suffered from dental trauma. Due to this high incidence, dental trauma was on the fifth position with regard to the most prevalent acute and chronic illnesses in the Global Burden of Disease Study 2015 (GBD 2015; Petti et al. 2018).

The contributing factors and causes of dental trauma are highly complex and often multi-factorial. At the same time, cultural backgrounds as well as social aspects may also play a role (Lam et al. 2008).

Many studies show that the most frequent causes of dental trauma are falls (Caldas et al. 2001; Al-Jundi 2002; Çelenk et al. 2002; Traebert et al. 2003; Sandalli et al. 2005; Tuli et al. 2005; Lam et al. 2008; Kovács et al. 2012; Lam 2016). Further causes of trauma include accidents during recreational activities, collision with objects, traffic accidents, sport accidents and physical violence (Caldas et al. 2001; Tuli et al. 2005; Traebert et al. 2006; Lam et al. 2008; Hecova et al. 2010; Kovács et al. 2012). The proportion of injury causes varies according to the patients' ages (Lam et al. 2008; Kovács et al. 2012).

The literature reports data of dental trauma with regard to various age groups (Altay & Güngör 2001; Traebert et al. 2003; Traebert et al. 2006; Brunner et al. 2009; Berti et al. 2015) and in various types of sports (Tschan et al. 2003; Schildknecht et al. 2012; Petrović et al. 2016).

In addition, evaluations of dento-alveolar trauma in conjunction with oro-maxillo-facial injuries have been reported (Tuli et al. 2005; Gulinelli et al. 2008).

Study data demonstrate that the upper central incisors are the most frequently affected teeth in accidents (Brunner et al. 2009; Berti et al. 2015). Depending on the severity of damage to the tooth and periodontium, dental rehabilitation can be expected to require significant treatment time and incur high costs (Lam 2016).

The aim of this study was a retrospective evaluation of all the patients with dento-alveolar trauma who were examined from 2011 to 2015 at the Department of Oral Surgery and Stomatology of the University of Bern.

Materials and Methods

In Switzerland, dental injuries are recorded through completion of a standardised registration form irrespective of the patient's insurance policy. In order to gather all the data of dental trauma in the analysed period from January 2011 to December 2015, the records of the accounts section at the Department of Oral Surgery and Stomatology of the University of Bern were scanned for the corresponding dental procedure code (code 4040).

From the 3177 hits, all patients whose registration was not in connection with sustained dental trauma, or whose registration was for follow-up treatment after an accident, were excluded. Furthermore, patients who had their first examination before or after the analysed period were excluded. In total, 852 cases fulfilled the inclusion criteria.

The relevant data was gathered from the medical records of the 852 patients. For this purpose, the standardised registration form, the entries in the medical history and the existing photos and radiographs were consulted. The data analysis was carried out by one person (DG) and the data was encrypted and saved in a database (REDCap, Vanderbilt University, Nashville, USA).

The data collected from the case histories is presented in Table I.

The study protocol was submitted to and approved by the local swiss ethics committee (Approval number: 2019-02248).

Statistical analysis

The corresponding data collected from the patients' charts was summarised in tables. The evaluation was initially based on descriptive statistics.

In a second step, statistical calculations were performed. First, binary outcome variables were created for each injury type and coded to "yes" if the injury actually occurred to a patient and "no" otherwise.

Differences in injury frequencies between seasons were assessed using a chi-squared test.

The following target variables were analysed: concussion, avulsion, luxation, subluxation, intrusion, crown fractures, root fractures, oral soft-tissue injuries and non-oral injuries, i. e. fractures of the skull, jaw, nose and lacerations of chin and forehead.

The impact of the following factors was first assessed univariately and for each outcome variable: gender, age divided according to dentition status, season, weekday und cause of accident.

Tab. I Evaluation parameters		
Demography	**Type of dental trauma**	**Type of associated injury**
– Gender – Date of birth – Dentition stage (deciduous, mixed, permanent) – Date of injury – Date of examination – Age at time of injury – Month of injury – Day of injury – Cause of injury	– Crown fracture with/without pulp exposure – Root fracture with/without dislocation – Luxation injury (concusion, subluxation, luxation, intrusion, avulsion)	– Upper and lower jaw gingival injury – Enoral and extraoral injury to upper and lower lip – Enoral soft-tissue injury (floor of mouth, tongue, cheeks, gum) – Extraoral injury (nose, chin, forehead) – Fractures (upper jaw, lower jaw, cranial fractures) – Alveolar fracture to upper and lower jaw

Logistic regression models were then used to model outcome variables in both univariate and multivariate context. To test for factor effects and interactions, type II and type III ANOVAs were performed using likelihood ratio tests. The goodness of fit for these models was assessed with the Hosmer-Lemeshow Test and with Cook's distance limiting the maximal residual leverage to 0.1 (Cook et al. 1982; Hosmer et al. 2000). The models' predictive power was assessed by the ROC–AUC method (Fawcett 2006). Throughout, p-values less than 0.05 were considered statistically significant. No post-hoc tests were performed due to the large number of categories within each factor. Instead, odds ratios together with 95% confidence intervals were calculated for selected reference categories of risk factors. No correction for p-values were applied.

All analyses were performed with the statistics software R, version 4.0.2 (R Core Team 2020).

Results

From 852 patients, 330 were women (38.7%) and 522 men (61.3%). The mean age was 17 years and 9 months (Fig. 1). The youngest patient was 10 months old and the oldest was 91 years old. A total of 4886 teeth were traumatised.

Most accidents occurred in the months of March (88) and July (87). The lowest number of accidents were registered in December (45) (Fig. 2). In terms of day of the week, most dental injuries occurred on a Friday (Fig. 3).

Over 54% of the patients were examined on the same day of the accident. 20.7% of the patients were examined on the day after and 17.8% were examined within day two to one week later. Nine patients (1.1%) were examined one month after the

accident and in two cases the patients were examined only after a year (Fig. 4).

Cause of injury

The cause of injury varied with increasing age and also between genders. Falls were the most common cause in boys and girls in the deciduous dentition (97 respective 59 cases), followed by recreational activities (43/31) or cycling (23/14). In the mixed dentition group, boys had most injuries from doing sport activities (43), followed by falls (25) and finally from cycling (18). Falls were in first position for the girls (16). In second position, sports, cycling accidents and recreational activities accounted for 13 instances each. In the permanent dentition, the most common cause for males was sport (60), followed by falls and cycling each with 37 cases, and in 33 cases acts of violence. For females, falls were in first position (58), followed by cycling (43) and sport accidents (16). Table II shows a detailed summary of the data for the aetiology of dental trauma categorised according to dentition status.

Type of dental injury

Concussion was the most common injury registered in 3,538 teeth (72.4%) (Figs. 5 and 6).

In case of avulsion (3.2%), subluxation (14%), luxation (7.7%) and intrusion injuries (2.7%), the upper central incisors were the most frequently affected teeth in the deciduous as well as in the permanent dentition. No difference between right or left sides was observed (Figs. 7 and 8).

Uncomplicated crown fractures occurred in 522 teeth (10.7%) and enamel-dentin fractures with pulp exposure were regis-
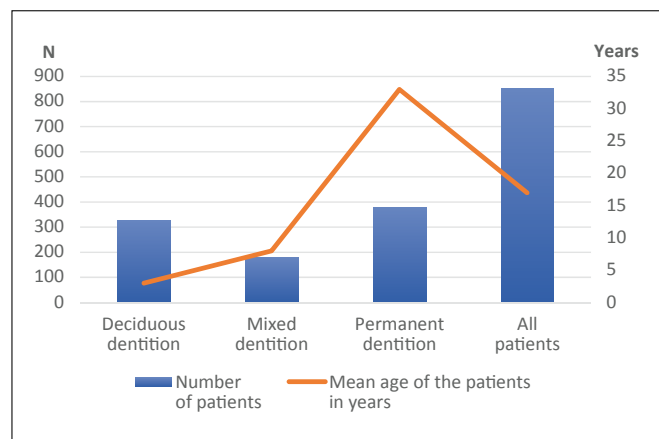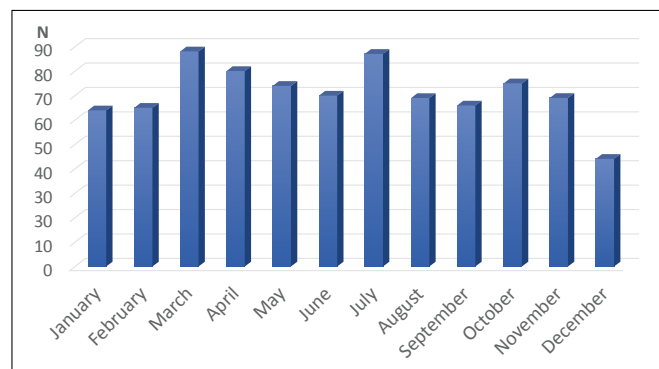

Fig. 1 Number and mean age of patients
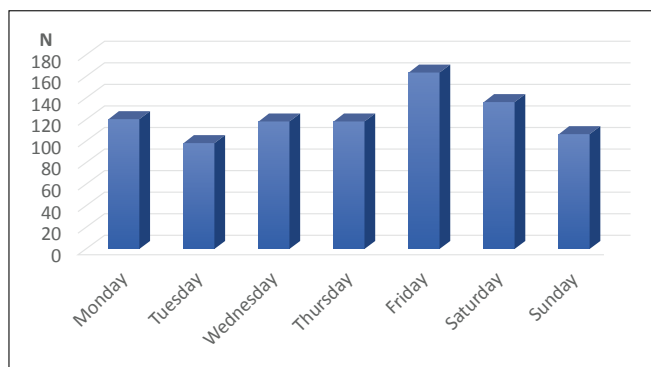

Fig. 2 Number of accidents per month

Fig. 3 Number of accidents per weekday
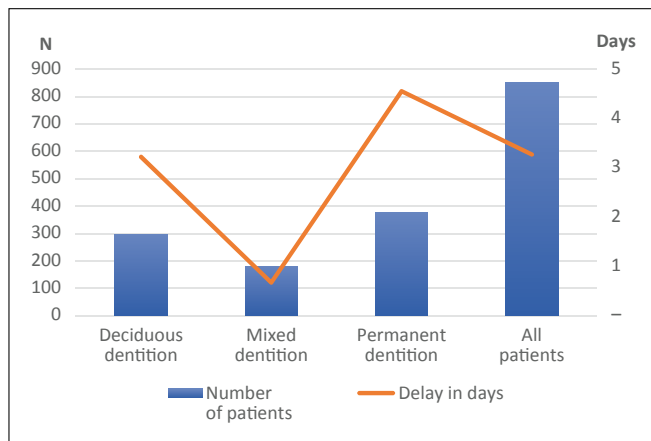
Fig. 4 Delay between accident and first examination

Tab. II Cause of injury per gender and dentition state						
Cause	Total	Total gender	Gender	Permanent dentition	Mixed dentition	Deciduous dentition
Fall	292	159	male	37	25	97
		133	female	58	16	59
Bicycle	148	78	male	37	18	23
		70	female	43	13	14
Sport	140	109	male	60	43	6
		31	female	16	13	2
Recreational activities	119	72	male	6	23	43
		47	female	3	13	31
Violence	53	45	male	33	9	3
		8	female	8	–	–
Medical	23	10	male	10	–	–
		13	female	12	1	–
Traffic accident	22	14	male	12	1	1
		8	female	8	–	–

Tab. II Cause of injury per gender and dentition state						continued
Cause	Total	Total gender	Gender	Permanent dentition	Mixed dentition	Deciduous dentition
Collision	20	12	male	6	–	6
		8	female	6	–	2
Work–related	18	13	male	12	–	1
		5	female	4	1	–
Other accident	10	6	male	1	2	3
		4	female	–	1	3
Unknown	3	1	male	1	–	–
		2	female	1	1	–
Foreign body in food	2	1	male	1	–	–
		1	female	1	–	–
Domestic/ Home–work	1	1	male	–	1	–
		–	female	–	–	–
Military service	1	1	male	1	–	–
		–	female	–	–	–

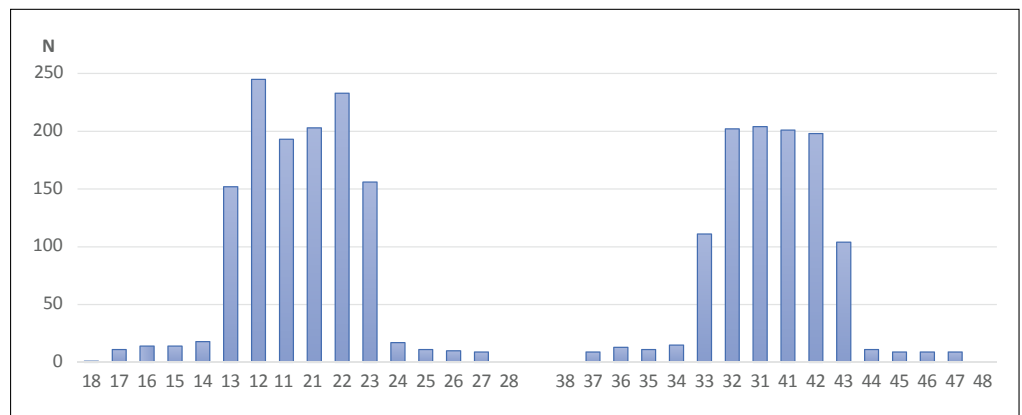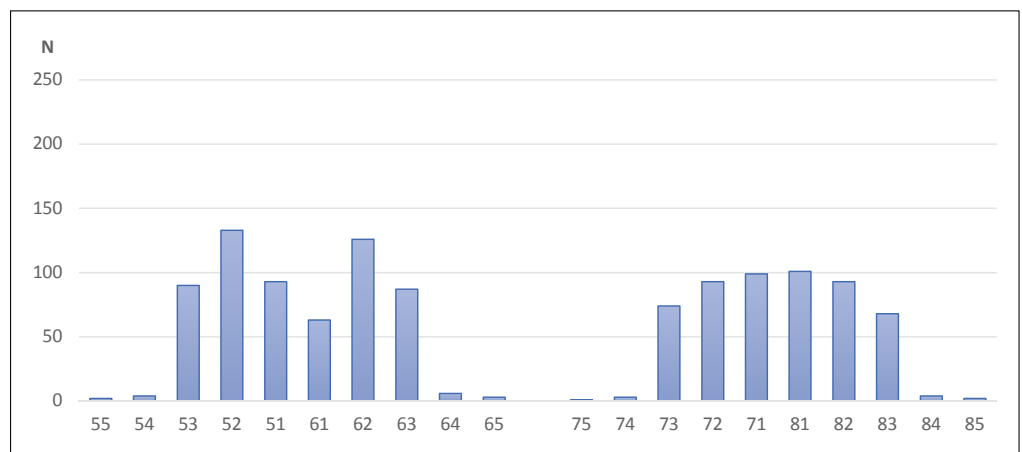**Fig. 5** Concussions per tooth – permanent dentition

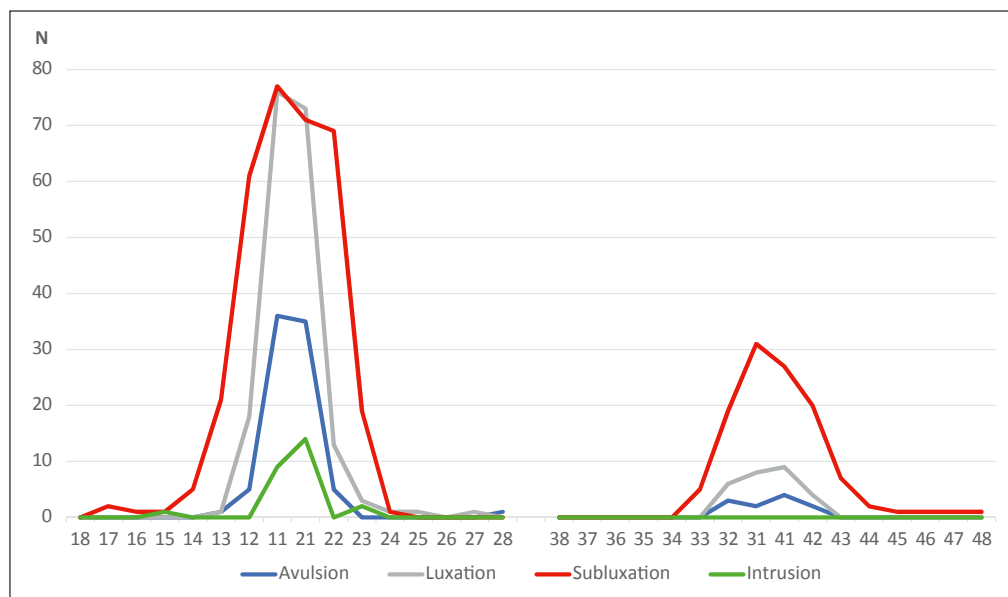**Fig. 6** Concussions per tooth – deciduous dentition

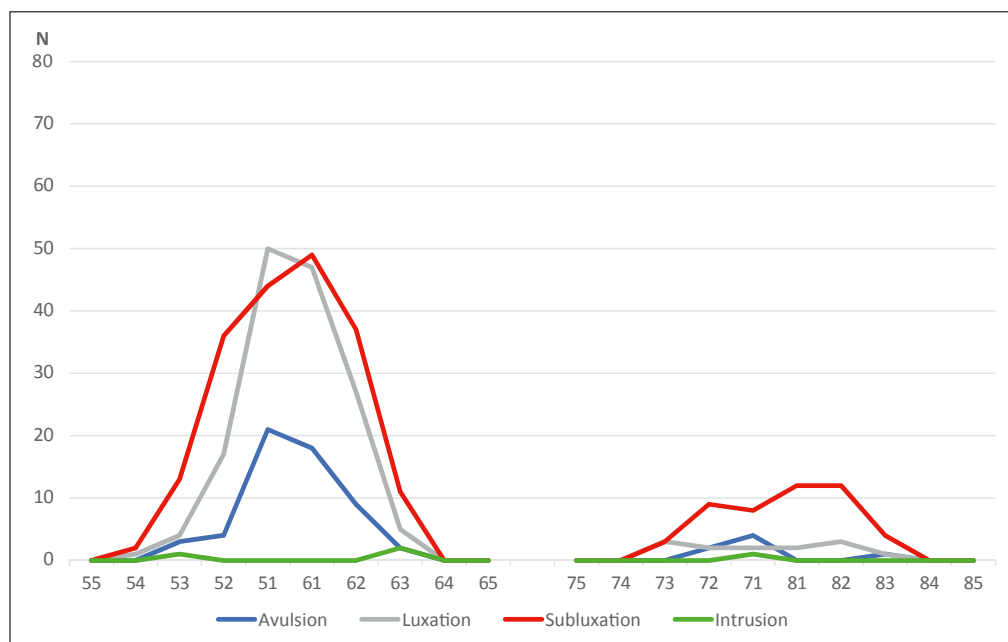**Fig. 7** Luxation injuries per tooth – permanent dentition

Fig. 8 Luxation injuries per tooth – deciduous dentition

tered in 180 teeth (3.7%). Root fractures without displacement occurred in 55 teeth (1.1%). Root fractures with displacement of the coronal fragment occurred in 33 teeth (0.7%) (Figs. 9 and 10).

Type of associated injury

In 852 patients, 609 (71.5%) had associated soft-tissue injuries (from abrasions to lacerations). The upper-lip was injured in 33.7% and the lower lip in 17.9%. The maxillary gingiva was involved in 17.2% whereby the mandibular gingiva only in 1.8%. 119 patients (10.9%) sustained chin injuries (Fig. 11).

The statistical evaluation showed that men had a significantly higher frequency of soft-tissue injuries than women (50.4% vs 38.2%, p = 0.0005)

Statistical evaluations

Table III presents a detailed summary of how gender, age, season, day of the week and cause of accident had an influence on the various types of dental trauma. In order to obtain larger groups for the statistics, the cause of accident was divided into five main groups (falls, play and sport, violence, bicycle and others). With these groups, a significant effect of the cause of the accident was found for almost all outcome variables.

It was found that age had a significant impact on concussions, subluxations, intrusions, crown fractures, root fractures and non-oral injuries. For concussions and subluxations, the probability of an injury was the highest in the mixed dentition group. For intrusions, the probability of an injury decreased with age, but it was vice versa for crown fractures, root fractures and non-oral injuries.

With regard to the season, a significant impact was seen for concussions, avulsions, luxations and subluxation injuries: concussions seemed to be more likely in autumn (85.2%), avulsions and subluxations more likely in spring (20.1% and 50.9% respectively) whereas luxations were more likely in summer (32.4%).

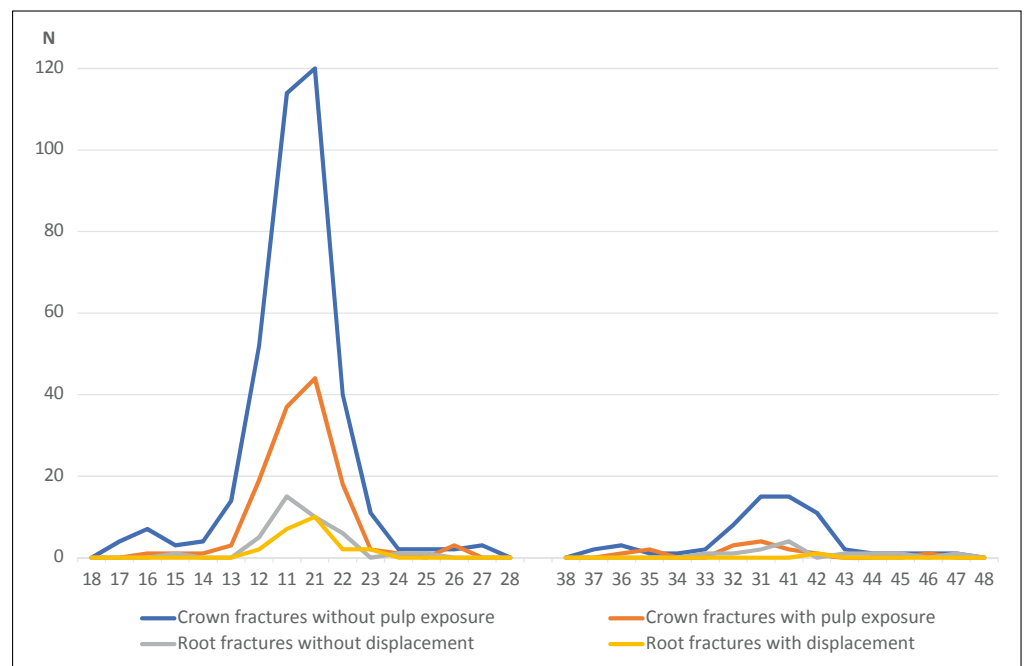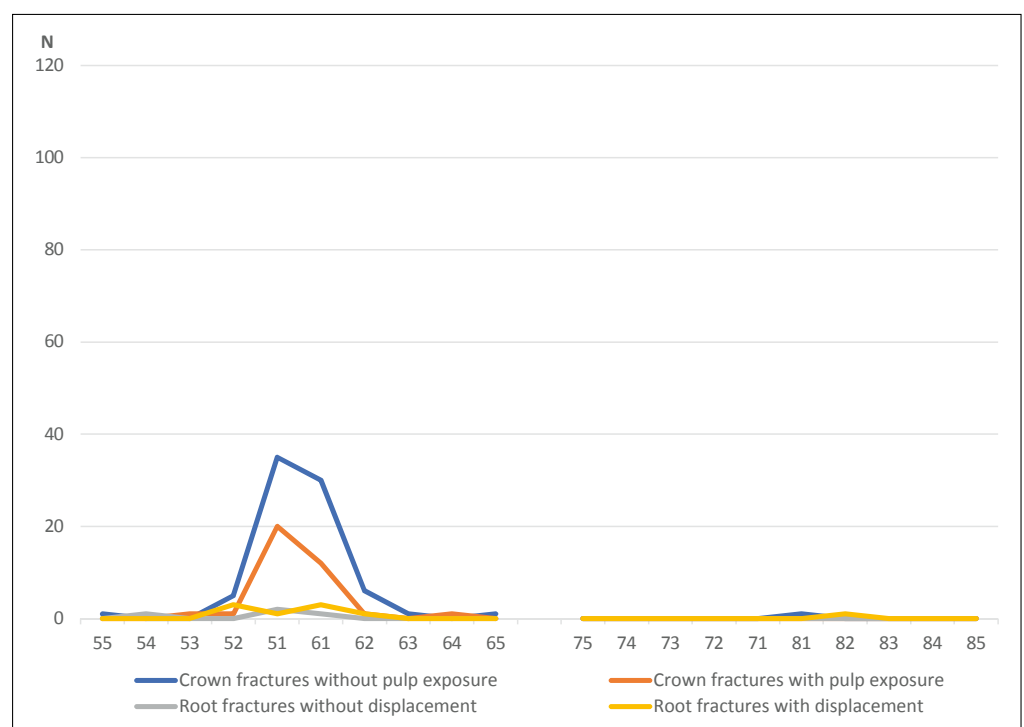**Fig. 9** Fracture injuries per tooth – permanent dentition

Fig. 10 Fracture injuries per tooth – deciduous dentition

Differences in injury frequencies between seasons and months were assessed using the chi-squared test. No differences in injury frequencies between seasons were found (p = 0.29). However, frequencies varied significantly between months (p = 0.04) ranging from 5.3% in December to 10.3% in March.

No significance was seen for the individual weekdays. But dividing the week into working days (Mondays to Fridays) and weekend, a significant effect was noted for root injuries: the probability of a root injury was higher on the weekend compared to working days (11.2 vs 5.7, p = 0.007).

Bicycle accidents had the highest probability for avulsions, luxations, soft-tissue injuries and non-oral injuries. Violence had the highest frequency of concussions and root injuries.

The multivariate analysis showed that age and season were risk factors for concussions. The age group 0–6 years had an odds ratio of 0.55 with 95%-CI of 0.38–0.79 compared to the group 12+ years.

Season and cause of accident were risk factors for avulsions and luxation injuries, but only the cause of accident was significant.

For subluxations, age and season were risk factors. For the factor age, no significant differences in odds ratios were found. As for the season, the odds of subluxations were significantly higher in spring compared to the reference season of summer.

Only age was a significant risk factor for the categories intrusions, crown fractures and root injuries. While all odds ratios for
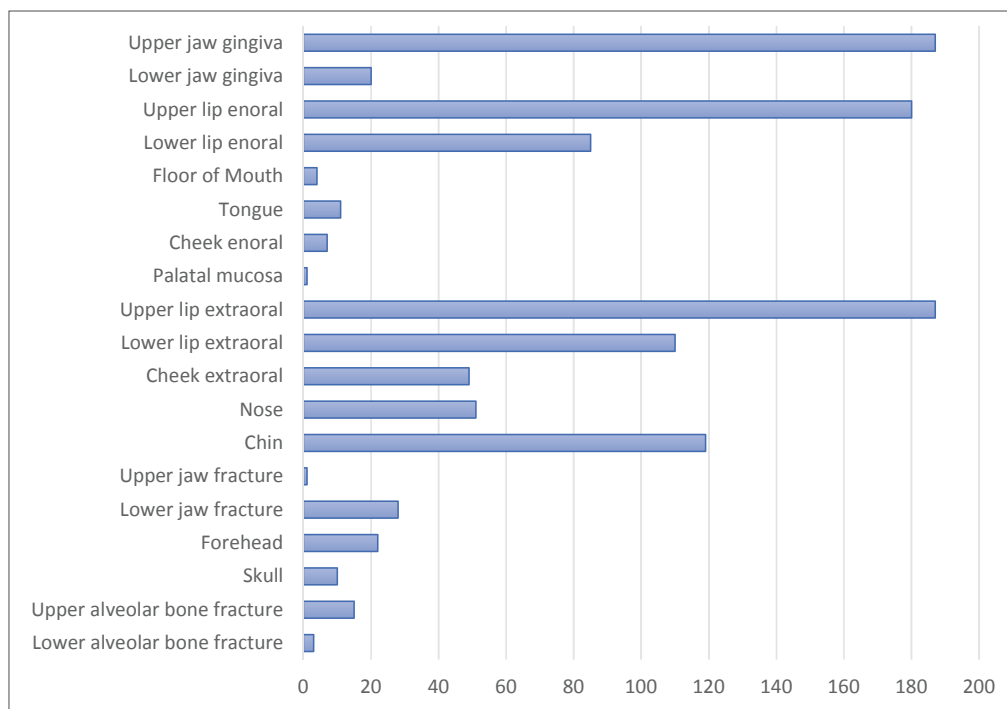
Fig. 11 Soft- and hard-tissue injuries

Tab. III Univariate statistical analysis

Parameters	Concus- sion	Avulsion	Luxation	Sub- luxation	Intrusion	Crown fracture	Root fracture	Oral soft- tissue injury	Non-oral injury
Gender									
% Men	78.2	15.5	28	41.2	9.4	44.6	8	50.4	45.2
% Women	77.6	13.3	27.3	40.9	10.9	47.3	6.1	38.2	51.2
p-value	0.84	0.38	0.83	0.94	0.47	0.45	0.28	**0.0005**	0.09
Age									
% Deciduous dentition	69.6	13.9	26.4	34.5	17.6	29.4	3.4	43.9	34.8
% Mixed dentition	84.9	18.4	27.6	57.3	9.7	47	4.3	53	47.6
% Permanent dentition	81.1	13.2	28.9	38.1	4.1	58.1	11.9	43.2	57.6
p-value	**<0.0001**	0.26	0.76	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	0.07	**<0.0001**
Season									
% Winter	71	14.7	28.1	40.6	10.1	49.3	6	46.1	42.4
% Spring	79	20.1	29.5	50.9	10.3	43.8	10.3	46	46.9
% Summer	77.5	12.6	32.4	37.4	12.6	50	6.3	47.7	50.5
% Autumn	85.2	10.6	19.6	34.4	6.3	38.6	6.3	42.3	50.8
p-value	**0.007**	**0.04**	**0.03**	**0.003**	0.19	0.08	0.28	0.74	0.27
Weekday									
% Working days	78.4	14.7	26.8	41.2	9.2	44.4	5.7	44.1	46.9
% Weekend	76.7	14.6	30	40.8	12.1	48.8	11.2	49.6	49.2
p-value	0.58	0.97	0.35	0.93	0.21	0.26	**0.007**	0.15	0.55
Cause of accident									
% Falls	72.9	12	26	38	14.4	40.1	3.8	43.2	40.1
% Play and sport	78.8	13.5	28.6	40.2	11.2	44.8	6.6	49.8	40.5
% Violence	84.9	11.3	28.3	39.6	3.8	43.4	11.3	30.2	41.5
% Bicycle	84.5	25.7	37.8	49.3	4.1	50	9.5	54.7	77
% Others	77	11	15	41	6	59	14	37	47
p-value	**0.04**	**0.003**	**0.002**	0.25	0.001	**0.02**	**0.007**	**0.003**	**<0.0001**

intrusions were significantly higher, indicating a higher risk for the age groups 0-6 years and 7-12 years, all odds ratios for crown fractures and root injuries were significantly lower, indicating a lower risk for the age groups 0-6 years and 7-12 years. The area under the curve (AUC) was between 63.6% for crown fractures and 67.6% for intrusion injuries. The prediction was thus moderate for all three categories (intrusions, crown fractures and root injuries).

Gender and cause of accident were both significant risk factors for soft-tissue injuries. The risk of having a soft-tissue injury was significantly higher for men than women (OR 1.74). For the cause of accident, all causes but "play and sport" showed significantly lower odds for injuries than bicycle accidents.

Age and cause of accident were both significant risk factors for non-oral injuries. The odds ratios of the age groups 0-6 years and 7–12 years were significantly lower than 1.00 compared to the group 12+ years.

Discussion

The current study is a retrospective analysis of dento-alveolar injuries seen at the Department of Oral Surgery and Stomatology at the School of Dental Medicine, University of Bern, from 2011 to 2015.

As there was no specific focus on any particular sport or age group, the dento-alveolar injuries could be evaluated in terms of type and cause of injury representing the population in the region of Bern.

As reported in other studies (AL-JUNDI 2002; TRAEBERT ET AL. 2003; SANDALLI ET AL. 2005; GULINELLI ET AL. 2008; LAM ET AL. 2008; AZAMI-AGHDASH ET AL. 2015; IVKOVITS ET AL. 2015; LAM 2016), more males than females suffered dento-alveolar trauma in the present study with a ratio of 1.6:1, which is consistent with previous studies (SANDALLI ET AL. 2005; TULI ET AL. 2005; GULINELLI ET AL. 2008; KOVÁCS ET AL. 2012; LAM 2016). One may speculate that this difference, among other things, not only arises from males' greater participation in outdoor activities and in activities that require physical contact, but also from a more risky and aggressive behaviour (AL-JUNDI 2002; LAM ET AL. 2008; LAM 2016). In the current study, gender was found to be a significant risk factor for soft-tissue injuries: men had a 1.74 times higher risk than women.

Most studies of dento-alveolar trauma have been limited to children, a narrow age range, or participants in specific sport groups (ALTAY & GÜNGÖR 2001; AL-JUNDI 2002; BRUNNER ET AL. 2009; KOVÁCS ET AL. 2012; AZAMI-AGHDASH ET AL. 2015).

The age range in the current study was 10 months to 91 years and represents a cross section of the population in Switzerland. The mean age was 17 years and 9 months, which is similar to the data from TULI ET AL. (2005) (17.96 years). The mean age of patients with deciduous dentition was 3 years and 3 months, of those with mixed dentition 8 years and 9 months, and of those with permanent dentition 33 years and 5 months. The age distribution was similar to that of the study by LAM ET AL. (2008). In that study, the youngest patient was also 10 months old and the oldest was 78 years old.

Most injuries occurred in the permanent dentition (377), followed by the deciduous dentition (294) and the mixed dentition (181). The permanent dentition was also found to be significantly more frequently affected than the deciduous dentition in the Romanian study by KOVÁCS ET AL. (2012), in the Brazilian study by GULINELLI ET AL. (2008) and in the Turkish study by SANDALLI ET AL. (2005). This is contrary to the results of an Australian study

by LAM ET AL. (2008), in which most injuries occurred between birth and 14 years of age. As age increased, they observed a constant decrease in the number of dento-alveolar trauma (LAM ET AL. 2008).

In the current study, age had a significant impact. Concussions and subluxations were more common in the mixed dentition. While crown fractures, root fractures and non-oral injuries were significantly more common in permanent teeth, intrusions were significantly more frequent in the deciduous dentition.

Similar to the study of LAM ET AL. (2008), most injuries occurred on a Friday. However, a difference can be seen on the day of the week when the fewest trauma occurred. While Lam and co-workers recorded Sunday as the day with the fewest accidents, in the current study it was Tuesday.

March and July were the peak months in the present study, whereas LAM ET AL. (2008) registered most accidents in February and August. In Lam's study the maxima between the two peak months was exactly six months apart (LAM ET AL. 2008). In the current study it was only four months apart, occurring in spring and in summer.

A slight difference was observed between the warmer and colder seasons. During the spring and summer months from March to August, 468 instances of dento-alveolar trauma (54.9%) were registered. However, only 384 instances (45.1%) were noted in the autumn and winter months from September to February. Similar results were shown in the Turkish study by ALTAY & GÜNGÖR (2001), in which the percentages of instances were 54% for spring to summer and 46% for autumn to winter.

In the study by ALTAY & GÜNGÖR (2001), 48% of the patients and in the study by LAM ET AL. (2008), 36% of the patients were examined within 24 hours after the accident. However, in the current study, the first examination was carried out in 54.2% of the patients on the same day of the accident. While in the study of ALTAY & GÜNGÖR (2001) 72% and in the study of LAM ET AL. (2008) 67% of the patients were examined in the first week, in the current study the initial examination was carried out in 92.7% of the patients in the first week.

In all three studies there were patients appearing for a first examination six months after the date of accident. In the study by LAM ET AL. (2008) and in the current study, there were very few cases having their first examination twelve months after the accident (ALTAY & GÜNGÖR 2001; LAM ET AL. 2008).

In the current study, a possible explanation for the high rate of early examination after trauma could be the much shorter distance and better access to medical centres compared to other countries. In addition, it could be advantageous that an emergency dentist was on duty around the clock.

As in previous studies (ALTAY & GÜNGÖR 2001; AL-JUNDI 2002; LAM ET AL. 2008; AZAMI-AGHDASH ET AL. 2015), dento-alveolar trauma was mainly caused by falls. This is especially the case for young children, or those with deciduous dentition (LAM ET AL. 2008). LAM ET AL. (2008) described a significant reduction in fall-related alveolar trauma as age increased. This was not observed in the present study. For females, the number of falls causing trauma in deciduous and permanent dentitions were almost identical. For males, the number of falls causing trauma decreased in the mixed dentition, but increased again in the permanent dentition.

There was also a difference in the number of dento-alveolar injuries due to recreational activities relative to age. LAM ET AL. (2008) showed that injuries increased with age, but in the pres-

ent study injuries during recreational activities decreased with age.

Consistent with the study by Lam et al. (2008), the present study demonstrated that, as age increased, the number of dento-alveolar trauma increased more in males than in females for the categories of sport accidents, cycling accidents, traffic accidents and physical violence.

292 falls (34.3%) were analysed in the current study. In the study by Traebert et al. (2003), 47.9% of the injuries were caused by falls and in the study by Kovács (2012) it was 44.6%. This difference can indicate different interpretations of what categorises a fall. In this respect, in the Brazilian study, cycling accidents were in the same category as falls, but in the present study, due to the high number of cycling accidents (n = 148), these cases were categorised separately. If cycling accidents were pooled with falls, then the resulting value would be 51.6%, which would be close to the findings of Traebert et al. (2003). In the study by Sandalli et al. (2005), the number of falls (37.3%) was close to the findings in the current study.

The mixed dentition category was the smallest group. A comparison with previous studies is difficult due to the fact that sub-classifications for deciduous, mixed and permanent dentition have never been made.

As often described in the literature, the maxillary central incisors are the most frequently affected teeth followed by the maxillary lateral incisors (Çelenk et al. 2002; Sandalli et al. 2005; Gulinelli et al. 2008; Lam et al. 2008; Brunner et al. 2009; Kovács et al. 2012; Lam 2016). This observation corresponds to the results of the present study for the deciduous as well as the permanent dentition.

It is rare to find data in the literature relating to premolar and molar injuries. However, the present study as well as that of Brunner et al. (2009) showed that premolars or even molars can occasionally be affected.

With 3,538 teeth in 664 patients concussions were by far the largest trauma category, a category which has not been evaluated in other studies.

Excluding concussions, the current study data is consistent with previous data in which crown fractures without pulp exposure (522) were most frequently observed (Altay & Güngör 2001; Al-Jundi 2002; Sandalli et al. 2005; Tuli et al. 2005; Lam et al. 2008; Brunner et al. 2009; Kovács et al. 2012; Berti et al. 2015; Ivkovits et al. 2015; Lam 2016). Contrary to this, Gulinelli et al. (2008) reported that avulsion was the most common type of injury. In the present study, avulsions tended to be rare, occurring in 158 teeth (3.2%).

Root fractures with and without dislocation occurred in 15.1% of the cases. The current study showed that the age group "permanent dentition" carried the highest risk for root fractures. The study by Feely et al. (2003) demonstrated that root-fractured teeth in which the fracture affected the apical third tended to heal well in 80% of the cases, but the remainder had complications. Similarly, a good prognosis for root fractures was found in the work by Andreasen et al. (2004), in which the degree of displacement of the coronal fragment was taken into account.

With regards to soft-tissue injuries in the present study, upper and lower lip injuries occurred most frequently, followed by gingival injuries and chin injuries.

In the study about children from 15 months to 14 years by Al-Jundi (2002), 16.9% of the children had associated soft-tissue injuries. In the present study comprising all age groups, a much higher frequency of soft-tissue injuries was noted (71.5%).

In order to compare the two studies, the permanent dentition-group of the present study must be excluded. But even then, 475 patients (55.8%) had associated soft-tissue injuries. This difference is possibly due to how soft-tissue injuries were defined.

No accurate details concerning accident location could be ascertained from the retrospective data in the present study. Data from the literature demonstrates that most accidents occurred during leisure time either at home or while doing recreational activities/sports (Al-Jundi 2002; Traebert et al. 2003; Tuli et al. 2005; Brunner et al. 2009; Azami-Aghdash et al. 2015; Lam 2016). This is something that should be taken into account in injury prevention (Traebert et al. 2003).

In the present study, only 18 cases (2.1%) were work-related accidents. The most common causes of trauma included falls (34.3%), followed by cycling accidents (17.4%), sport accidents (16.4%) and accidents during recreational activities (14%). In certain circumstances, sport clubs could better inform athletes in order to minimise the risks. In amateur sport, wearing a mouthguard could help prevent or minimise dental trauma (Tschan et al. 2003; Ivkovits et al. 2015). The use of a mouthguards can often be seen in rugby. While 24% of the rugby players in England wear a mouthguard and the rate of dental trauma amongst them is 45%, in Switzerland, 82% wear a mouthguard with a trauma rate of 6.8% (Schildknecht et al. 2012).

As demonstrated in the studies of Blokland et al. (2016) and Berti et al. (2015), there is no correlation between dental trauma and socioeconomic status. There seems to be a need for nationwide awareness regardless of age and social status. It seems to be equally important to raise parents' awareness of the many accidents that can occur at home. According to Azami-Aghdash et al. (2015), safety precautions at home are the most effective way of preventing accidents.

Furthermore, child-oriented campaigns or advertising could possibly encourage children to accept the wearing of a mouthguard. Targeted prevention in all age groups and raising the awareness of risks in sport, cycling and recreational activities could reduce the number of dento-alveolar trauma.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

Zusammenfassung

Einleitung

Es existieren verschiedene Untersuchungen über dento-alveoläre Traumata der Schweiz. Alle diese Studien fokussieren jedoch auf eine spezielle Sportgruppe oder eine eingeschränkte Untersuchungspopulation. Eine Studie ohne Ausschluss von bestimmten Individuen existiert schweizweit noch nicht.

Das Ziel dieser Studie war die Erfassung aller dento-alveolären Traumata, die im Untersuchungszeitraum von fünf Jahren an der Klinik für Oralchirurgie und Stomatologie der Universität Bern erstversorgt wurden.

Material und Methoden

In der Schweiz werden alle Zahntraumata versicherungsunabhängig mit einem standardisierten Zahnschadenformular angemeldet. Im Untersuchungszeitraum von Januar 2011 bis Dezember 2015 wurde die Buchhaltungssoftware nach der entsprechenden Abrechnungsposition 4040 durchsucht. Von 3177 erzielten Treffern erfüllten 852 Fälle die Einschlusskriterien.

Resultate

Die Krankengeschichten von 852 Patienten (522 Männer und 330 Frauen) wurden retrospektiv ausgewertet. Das Durchschnittsalter betrug 17 Jahre und 9 Monate. Der jüngste Patient war 10 Monate, der älteste 91 Jahre alt. Die meisten Unfälle wurden in den Monaten März und Juli verzeichnet. Der Freitag war der ereignisreichste Wochentag. 54% der Patienten konnten am Unfalltag erstuntersucht werden.

Als Unfallursache wurden am häufigsten Stürze sowie Fahrrad- und Sportunfälle registriert. Die Folgen waren Konkussionsverletzungen (72,4%), Subluxationen (14%) und Luxationen (7,7%). Kronenfrakturen ohne Pulpaexposition wurden bei 522 Zähnen (10,7%) registriert. Seltener waren Kronenfrakturen mit Pulpaexposition (3,7%) und Avulsionen (3,2%). Am häufigsten waren die zentralen Schneidezähne betroffen (40%), gefolgt von den seitlichen Schneidezähnen (35,6%) und den Eckzähnen (19,5%).

Die statistische Analyse zeigte, dass das Alter einen signifikanten Einfluss auf Konkussionen, Subluxationen, Intrusionen, Kronenfrakturen, Wurzelfrakturen und nicht orale Verletzungen hatte. Bei den Konkussionen und Subluxationen war die Wahrscheinlichkeit einer Verletzung für die Gruppe mit der gemischten Dentition am höchsten. Bei den Intrusionen nahm die Wahrscheinlichkeit einer Verletzung mit dem Alter ab. Umgekehrt war es bei den Kronenfrakturen, Wurzelfrakturen und nicht oralen Verletzungen. Es zeigte sich, dass nach Fahrradunfällen Avulsionen, Luxationen, Subluxationen, Weichteilverletzungen und nicht orale Verletzungen am wahrscheinlichsten waren.

Die multivariate Analyse zeigte, dass das Alter den grössten Einfluss hatte, gefolgt von der Unfallursache und der Jahreszeit.

Bei 71,5% der Patienten gingen mit den dento-alveolären Traumata auch Weichgewebsverletzungen einher (von Schürfwunden bis zu Riss-Quetsch-Wunden). Zu verzeichnen waren unter anderem Lippenverletzungen (51,6%), Gingivaverletzungen (19%) und Kinnverletzungen (10,9%).

Diskussion

Diese retrospektive Studie zeigte, analog zu anderen Studien, dass in der Schweiz Männer nicht nur öfter ein dento-alveoläres Trauma erlitten als Frauen, sondern dass sie auch ein 1,74-mal höheres Risiko von zusätzlichen Weichgewebsverletzungen hatten. Es konnte gezeigt werden, dass das Alter einen signifikanten Einfluss hat. Milchzähne erlitten am häufigsten Intrusionsverletzungen. Während Konkussionsverletzungen und Subluxationsverletzungen bei der gemischten Dentition gehäuft vorkamen, wurden bei der bleibenden Dentition signifikant mehr Kronen- und Wurzelfrakturen und nicht orale Verletzungen registriert. Mit zunehmendem Alter nahmen die Zahlen der

dento-alveolären Traumata bei den Kategorien Sport-, Fahrrad- und Verkehrsunfälle sowie Gewalt bei den Männern stärker zu als bei den Frauen.

Auch wenn sich die meisten dento-alveolären Traumata an einem Freitag ereigneten, konnten 54,2% der Fälle am selben Tag erstversorgt werden und 92,7% in der ersten Woche. Die kurzen Distanzen und der einfache Zugang zu einem Notfallzentrum könnten die Gründe für diese hohe Rate sein.

Bei den Zahnverletzungen wurden am häufigsten Konkussionsverletzungen registriert: 664 Patienten und 3538 Zähne waren davon betroffen. Im Vergleich zu anderen Studien (16,9%) wurden aussergewöhnlich viele Weichgewebsverletzungen (55,8%) verzeichnet. Diese Differenz ist möglicherweise durch eine unterschiedliche Definition zustande gekommen.

Nur 2,1% aller dento-alveolären Traumata ereigneten sich bei der Arbeit. Stürze (34,3%), Fahrradunfälle (17,4%), Sportunfälle (16,4%) und Unfälle bei Freizeitaktivitäten (14%) waren deutlich in der Überzahl.

Eine Reduktion der dento-alveolären Traumata lässt sich möglicherweise mit einer gezielten Prävention erreichen. Beim Sport könnte das Tragen eines Zahnschutzes die Risiken minimieren. Aber auch die Eltern oder ältere Personen könnten durch eine gezielte Sensibilisierung auf die Gefahren aufmerksam gemacht werden.

Résumé

Introduction

Il existe des enquêtes différentes concernant les traumatismes dento-alvéolaires en Suisse. Cependant, toutes ces études se concentrent sur un groupe sportif spécifique ou une population d'étude limitée. Une étude sans exclusion de certains individus n'existe pas encore en Suisse.

L'objectif de cette étude était le recensement de tous les traumatismes dento-alvéolaires qui avaient été traités initialement à la clinique de chirurgie orale et stomatologie de l'Université de Berne dans une période de cinq ans.

Matériels et méthodes

En Suisse, tous les traumatismes dentaires sont enregistrés au moyen d'un formulaire standardisé de dommages dentaires, indépendant de l'assurance. Au cours de la période d'enquête de janvier 2011 à décembre 2015, le logiciel de comptabilité a été recherché pour le poste comptable 4040. Sur 3177 réponses, 852 cas remplissaient les critères d'inclusion.

Résultats

On a réalisé l'exploitation rétrospective des antécédents personnels de 852 patients (522 hommes et 330 femmes). L'âge moyen s'élevait à 17 ans et 9 mois. Le patient le plus jeune avait 10 mois, le patient le plus âgé avait 91 ans. La plupart des accidents étaient recensés en mars et en juillet. Le vendredi a été le jour de la semaine où il y a eu le plus d'événements. 54% des patients ont pu être examinés le jour de l'accident.

La cause d'accident la plus fréquente étaient des chutes ainsi que des accidents de sport et de vélo. Les conséquences étaient la concussion (72,4%), la subluxation (14%) et la luxation (7,7%). Des fractures de couronnes sans exposition de la pulpe dentaire ont été enregistrées pour 522 dents (10,7%). Les fractures de couronnes avec l'exposition de pulpe dentaire (3,7%) et les avulsions (3,2%) apparaissaient rarement. Les incisives centrales (40%) étaient concernées le plus souvent, suivies des incisives latérales (35,6%) et des canines (19,5%).

L'analyse statistique a montré que l'âge avait une influence significative sur les concussions, les subluxations, les intrusions, les fractures de la couronne, les fractures des racines et les blessures non orales. Parmi les concussions et subluxations, le groupe ayant une dentition mixte est le plus susceptible d'être blessé. Pour les intrusions, la probabilité de blessure diminue avec l'âge. Inversement, les fractures de la couronne, les fractures des racines et les blessures non orales étaient plus susceptibles de survenir avec l'âge. Il a été constaté que les blessures à vélo présentaient la plus forte probabilité de blessure pour l'avulsion, la luxation, la subluxation, les blessures des tissus mous – et les blessures non orales.

L'analyse multivariée a montré que l'âge avait la majeure influence suivi par la cause de l'accident et la saison.

Chez 71,5 % des patients, les traumatismes dento-alvéolaires étaient accompagnés de blessures du tissu mou (allant de l'écorchure à la lacération). Entre autres, il faut noter les blessures aux lèvres (51,6 %), les lésions gingivales (19 %) et les blessures au menton (10,9 %).

Discussion

Cette étude rétrospective a montré, comme d'autres études, qu'en Suisse, non seulement plus d'hommes que de femmes souffrent de traumatismes dento-alvéolaires, mais qu'ils courent également un risque 1,74 fois plus élevé de subir des lésions supplémentaires des tissus mous. Cela pourrait montrer que l'âge a une influence significative. Les dents de lait souffrent le plus souvent de blessures intrusives. Alors que les blessures par concussion et subluxation étaient plus fréquentes dans la dentition mixte. Avec la dentition permanente, on a constaté un nombre nettement plus élevé de fractures de couronnes et de racines et de blessures non oral. Avec l'âge, le nombre de traumatismes dento-alvéolaires a augmenté plus fortement dans les catégories des accidents de sport, de vélo, de la circulation et de la violence chez les hommes que chez les femmes.

Bien que la plupart des traumatismes dento-alvéolaires se soient produits un vendredi, 54,2 % des cas ont été traités le même jour et 92,7 % au cours de la première semaine. Les courtes distances et la facilité d'accès à un centre d'urgence pourraient être les raisons d'un taux aussi élevé.

En ce qui concerne les blessures dentaires, les concussions ont été enregistrées le plus fréquemment, 664 patients et 3538 dents concernées. Par rapport à d'autres études (16,9 %), un nombre exceptionnel de lésions des tissus mous (55,8 %) a été enregistré. Cette différence peut avoir été causée par une définition différente.

Il a été constaté que seulement 2,1 % de tous les traumatismes dento-alvéolaires se produisaient au travail. Les chutes (34,3 %), les accidents de vélo (17,4 %), les accidents de sport (16,4 %) et les accidents pendant les loisirs (14 %) sont clairement majoritaires.

Il est éventuellement possible de réduire les traumatismes dento-alvéolaires par une prévention ciblée. Le port d'une protection dentaire pendant les activités sportives pourrait minimiser le risque. Mais les parents et les personnes âgées pourraient également être avertis des dangers par une sensibilisation ciblée.

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