Dental traumas and their treatment during military service in Finland

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Abstract

This article aimed to investigate the types of dental trauma occurring among Finnish conscripts during their military service. The article also focused on how dental traumas are treated in the Finnish Defence Forces. *Background:* All Finnish males must attend compulsory military service that lasts from six months to one year. About 25 000 males (approximately 80% of each age cohort) and 400 volunteer females complete the service annually. *Material and methods:* All dental records in the Defence Forces' patient register concerning dental traumas during the years 2011 and 2012 were analysed by tooth number, treatment procedures and number of visits. *Results:* According to the patient register, 361 conscripts suffered an oral trauma during their military service; thus, the average annual incidence was 7.2 traumas per 1 000 conscripts. A total of 483 teeth were traumatised in the two-year period. The most frequently traumatised teeth were the first upper incisors (61%), and the most common findings were enamel or enamel dentin fractures (63% of all findings). Severe traumas were not common, and the most severe ones occurred during off-duty hours. The most common treatment was direct filling (n=189 patients). Only 53 patients had soft tissue injuries (bruises, wounds). Among patients with dental traumas, the mean number of visits to the Defence Forces' dental clinic was 1.9. *Discussion and conclusion:* Minor traumas are common. Great variation exists in recording findings concerning dental and oral traumas.

Background

Annually about 25 000 men (approximately 80% of the age cohort) enter mandatory military service in Finland. The number of voluntary female conscripts is about 400 each year. Majority of the Finnish conscripts are 19–20 years old, but it is possible to complete the service until the individual is 28 years old (Statistics of the Defence Forces). During military service, as well as while participating in physical activities like sports, individuals are more likely to suffer dental traumas than in the normal, tranquil life (1–3). In the article by Immonen et al. (3) concerning dental traumas during military service in Finland, the total number of trauma cases during military service in the year 2009 was 1 432, with 165 cases involving dental traumas. The rate of occurrence of dental traumas was thus 6.5 cases per 1 000 persons per year. The location where each dental trauma had occurred was described, but the clinical type of the trauma was not identified.(3)

According to a recently published review article, only a few epidemiological studies have been published on dental traumas in adults. The prevalence of dental traumas in adults has been reported to vary greatly (1–44 per 1 000 persons) due to several reasons, such as differences in the ways of registering the traumas.(4) Dental traumas cause individual inconvenience and significant costs to both the society and the individual. There are a few Scandinavian studies investigating the costs of dental traumas. In Sweden, the estimated costs caused by dental traumas are USD 3.3–4.4 per inhabitant per year, when monitored up to the age of 19 years. The respective figure for Denmark is USD 2–5 per inhabitant per year (5). Corresponding figures are not yet available for Finland.

A Swiss population-based study revealed that the most commonly traumatised tooth is the central upper incisor. The most common trauma type is a crown fracture without pulp involvement, and the most common treatments are direct fillings and custom-made crowns (6). The costs of dental traumas are higher than for traumas of other parts of the body, because treating dental traumas usually requires 1.9–9.1 visits to healthcare compared to the 1.5 visits for other traumas (5).

The present article aimed to investigate the types of dental traumas occurring among Finnish conscripts during their military service. The study also investigated how dental traumas are treated in the Defence Forces. The hypothesis was that dental traumas occur most frequently in the upper incisors. In addition, dental traumas are most often treated by using direct fillings or prosthetic crowns, there are only a few mandibular fractures and specialist care is seldom necessary. Furthermore, there is variety in registering traumas and procedures in the patient documentation, and there is hardly any references to soft tissue injuries.

Material and methods

Study group

The study was a retrospective population- and practice-based study that utilised the Defence Forces' records of traumas suffered during military service in the years 2011 and 2012. The study population comprised all dental traumas of conscripts registered in the Defence Forces' database, Mildoc® during those two years. The data were collected by the oral and maxilla facial surgery (OMFS) specialist in the Defence Forces (PP), with the written permission of the keeper of the register (Finnish Defence Forces). The data were prepared for analyses by AA. The total number of dental trauma patients reported was 394, but some cases were excluded because of obscurities in the records concerning the dental trauma or its treatment. Therefore, the total number of cases included in this study was 361.

Methods

The variables included in the analyses were: *dental trauma patients; teeth involved (the traumas were classified according the ISO 3590 method); type of treatment (only examination, monitoring, direct filling, endodontic treatment, extraction, splinting, smoothening of rough surface/F-application, wound treatment, prosthetic treatment, implant)* and *total number of treatment visits*. In the data collection, teeth with an ICD 10 trauma diagnosis or a written trauma diagnosis were considered traumatised. The classification of dental traumas was as follows*: enamel or dentin fracture*, *enamel dentin pulp fracture* and *root fracture.* Periodontal traumas included: *sensitivity of teeth, luxation, avulsion* and *concussion.* Wounds included: *extra-oral wounds* and *intra-oral wounds*. Bone fractures included: *alveolar bone fractures* and *mandibular bone fractures*. Pulp involvement included: *pulpitis* and *necrosis*. As for temporomandibular joints, all symptoms were combined (*pain, joint sounds, difficulty in opening mouth*). All traumas were registered and recorded by dental professionals.

Statistics

The study is statistically descriptive. The results are presented as frequencies and distributions, as well as graphically. All analyses were executed using the SPSS software (version 23.0, SPSS, Inc. 2015, Chicago, IL).

Ethics

The patients were given ID codes and all personal identification details were excluded from all analyses. The authors did not have access to the true identity of the patients. The key to the IDs was

held by the chief dental officer, Finnish Defence Forces. The permission to use the data in the Defence Forces' register was granted by the register keeper of the Finnish Defence Forces.

Results

Almost 1% (n=361) of all conscripts suffered an oral trauma during their military service in 2011–2012. The prevalence was 7.2 dental traumas per 1 000 conscripts. About 10% of the conscripts with oral traumas (n=43; 12%) got the trauma during their off-duty hours or leisure time; for example, while visiting home on their days off. The total number of traumatised teeth was 483. Thirty-one (n=31) patients had other than dental oral findings, such as a wound (n=53) or pain in the temporal-mandibular joint area (n=18) (Fig. 2). The upper central incisors were the most commonly injured teeth (61%) (Fig. 3 and Table 2). On average, 1.3 teeth were traumatised per accident (min 0, max 12, standard deviation 1.10) (Fig. 1). Most patients were treated in basic health care at military dental clinics, and only two patients needed specialist health care outside the military clinics.

Most often the finding was enamel or enamel dentin fracture (n=285). Only 16 patients had a complicated tooth fracture also involving pulp. In 55 cases, there was a periodontal trauma. Bone fracture occurred in three cases: one alveolar bone fracture, one mandibular hairline bone fracture, and in one case there was a mandibular hairline fracture and fracture in maxilla. The last two cases happened during the conscripts' days off. (Fig. 2)

Table 2 presents the minor dental trauma cases and cases when only one tooth was involved in the trauma, according to the tooth location and trauma type. All one-tooth trauma cases concerned central incisors, and majority of such trauma types were enamel or enamel-dentin cracks.

Among patients with dental traumas, the mean number of visits to the Defence Forces' dental clinic was 1.9 (min 1, max 12, standard deviation 1.47), also including visits to a dental assistant or oral hygienist. Almost one-third (n=104; 29%) of all patients had one or more visits to an oral hygienist or dental assistant. Treatments given by a dental assistant or oral hygienist included, for example, smoothening cracks and applying topical fluoride. Fewer than one in ten patients (n=27: 8%) did not meet a military dentist at all, most commonly because the finding was so minor that treatment was possible and reasonable to be given by a dental assistant or oral hygienist. Only a small number (n=5; 1%) of all patients had two oral accidents during their military service.

Most often, the patients received only one type of treatment (n=308; 85%). The most common treatment type was direct fillings (n=189); in such cases, the mean number of visits to the dental

office was 1.7 (SD 0.98). Many patients needed only an inspection (n=66) or monitoring (n=32). If there was a need for root canal treatment (n=29), the mean number of treatment visits increased to 4.9 (SD 2.27). The treatments requiring most visits were extractions (n=5; mean 6.0, SD 2.12), prosthetic treatments (n=4; mean 6.0; SD 2.22) and splinting (n=5; mean 5.6 visits SD 3.78) (Table 1).

There was variation in documentation. The diagnoses were not usually registered using an ICD-10 code (diagnoses registered with an ICD-10 code; n=115; 32% of total cases), but the diagnoses and findings were written. A distinct diagnosis was often missing. There was also variation and inaccuracy between the dentists. Sometimes the trauma diagnosis was not mentioned at all in the patient files, even if they had been registered as trauma cases. Such cases were excluded from the analyses here.

Discussion

The number of patients who suffered dental trauma during their military service was slightly higher here than in 2009. In 2009, n=165 dental traumas occurred, while the respective figure for 2011–2012 was n=361; meaning about 180 traumas per year (3). The number of draftees in Finland is about 25 000 each year (Statistics of the Defence Forces). According to the previous article on dental traumas in the Finnish Defence Force (3), as well as earlier studies conducted among military personnel abroad (7, 8), the prevalence was in line with the present study results. Usually, the prevalence of dental traumas is higher among children and adolescents than among adults (5). Depending on the study, the annual prevalence rate of new dental traumas per year varies between 1–44 per 1 000 persons (4), which is also in line with the results of the present study.

An interesting finding here was that slightly more accidents occur on the right side of patients' mouth: 58% of the traumatised teeth were on the right side of the mouth. The most frequently traumatised tooth was the first upper incisor. Quite often a dental officer had recorded that the tooth/teeth had been hit by the back of the conscript's personal weapon, which supports the clinical findings and thus the results and is in line with the previous study (3). The finding that the most commonly traumatised teeth are the upper incisors is also in line with other studies (9, 10), as well as with with the original hypothesis of this study. The present study did not investigate the causes of the accidents.

Majority of the traumas were minor, as was originally hypothesised. It must be borne in mind that minor traumas can have long-lasting consequences and side-effects on dentition. There were only three bone fractures, and often there was only an enamel or dentin fracture. The most common treatment was direct fillings, as in the Swiss population study (6). These findings support the initial

hypotheses of the present study. Only 12% of all traumas were wounds. This is interesting because the most common trauma mechanism reported was a blow type trauma (3). This means that either the trauma mechanism does not often cause soft tissue injuries or that the soft tissue injuries were not recorded, as hypothesised. It is likely that dentists often tend to report only findings concerning dentition.

The mean number of visits to the Defence Forces' dental care in trauma cases was almost two, the maximum number of visits being 12. The mean is quite low compared to previous studies (5). Most likely, any treatment needing 12 dental visits also indicates a need for future treatments. Conscripts serve in the military forces for 6–12 months. Therefore, it is difficult to follow the guidelines for dental traumas, which advice, for example, to take radiological control images of enamel fractures after one year (11). Long-term follow-up visits are not possible to arrange. They should be organised by the person himself after the service by contacting a municipal health centre or a private sector service provider. Any costs of treatments caused by military accidents are covered by the Finnish State Treasury even after the service. Further studies are needed to estimate the total costs of dental traumas suffered during military service for the individual and for the society.

The different types of treatments given to the patients here were recorded according to the treatment visit. For example, if a patient had direct filling and endodontic treatment during one visits, the visit was recorded for both treatments. In addition, for patients having similar treatments to several teeth, the treatment type was only recorded once despite the number of treatments. This may have caused some bias in the number of visits and treatments. Most patients (85%) had only one type of trauma and one type of treatment, so the data can be considered as reliable.

One big problem in studying dental traumas is deficiencies in the medical records. There is no standardised way to record findings after a trauma. This should be emphasised in the dental education curriculum. It should also be kept in mind when developing medical record software. For example, dentists should be required to record a diagnosis or an ICD-10 code before the system allows them to close the files. Here, only in one-third of the cases, an ICD-10 code was recorded. Variation in recording may have impacted the outcome of this study, because the researcher (AA) had to draw conclusions on the basis of manually written patient records. For example, in one case, a patient suffered a dental trauma but the only diagnosis in his patient files was dental caries. Of course, it may be the correct diagnosis; perhaps the tooth had such a large caries lesion that only a very low-energy blow was enough to damage the tooth. But another dentist might have provided a different diagnosis, such as fracture involving dentin. It is possible that not all dental trauma cases are recorded as trauma

cases in military patient files. Such cases were not included in this study. Furthermore, in some garrisons, dental care is purchased from a municipal health care centre or a private sector operator. In such cases, only limited or no information is available, which was a limitation here. However, in a majority of the cases, at least some information was available.

The study group here is unique because it represents the entire age cohort of males born in the early 1990s in Finland. The study group comprised mostly males. All draftees undergo a medical examination before their military service, and the draftees with physical or mental conditions are exempted from service. Thus, the study population can be considered as healthy. Oral diseases are present in this study population (12), but oral diseases are not a reason for exempting someone from military service. In some cases, decayed teeth were traumatised. Health services during military service are free of charge, and after the service, insurance covers possible costs of dental traumas suffered during service, provided that they are recorded adequately. The military service environment can involve physical risks because the conscripts participate in physical exercise daily. Therefore, this study presents traumas in a specific situation, and thus has value specifically for military officials. Our results cannot be directly compared with results from studies concerning general populations (6).

The American Dental Association, ADA, recommends mouth guards during spotting activities (13). Immonen et al. (3) also recommend using mouth guards during physical actives in military service. This study supports those recommendations because mouth guards could prevent the most common or minor dental traumas.

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Conflict of interest

The authors declare no conflict of interest as to this work.

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Figure legends

Fig. 1. Number of traumatised teeth in one patient.

Fig. 2. Findings after the trauma. Same patient may have more than one finding. Total number of findings is 451.

Fig. 3. Distribution of dental traumas in different teeth (n=483).

Table 1. Mean number of dental visits according to the type of treatment. Some patients had several treatments. If so, all treatments were recorded equally.

Treatment	Number of visits				
	N	Mean	SD	Min	Max
Direct filling	189	1.69	0.980	1	6
Smoothening or fluoride application	77	1.61	0.891	1	6
Inspection only	66	1.42	0.681	1	4
Monitoring	32	3.31	1.635	1	8
Endodontic	29	4.90	2.273	1	12
Wound treatment	9	2.89	1.764	1	7
Extraction	5	6.00	2.121	4	9
Splinting	5	5.60	3.782	2	12
Prosthetic treatment	4	6.25	2.217	4	9
Implant	1	5.00	-	5	5
Total	417	1.94	1.467	1	12

Table 2. Distribution (n and (percent)) of diagnoses of minor dental traumas involving only one tooth, at tooth level according to the location

Trauma diagnosis	Tooth groups						
	17-14	13-23	24-27	37-34	33-43	44-47	Total
Enamel or enamel-dentin fracture	- (0)	194 (73)	- (0)	- (0)	8 (3)	- (0)	202 (76)
Periodontal trauma	- (0)	22 (8)	- (0)	2 (1)	2 (1)	- (0)	26 (10)
Wound	- (0)	20 (7)	- (0)	- (0)	3 (1)	- (0)	23 (9)
Enamel-dentin-pulp fracture	- (0)	7 (3)	- (0)	- (0)	- (0)	- (0)	7 (3)
Caries	- (0)	3 (1)	- (0)	- (0)	- (0)	- (0)	3 (1)
Pulpitis or gangreena	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	2 (1)
Root fracture	- (0)	2 (1)	- (0)	- (0)	- (0)	- (0)	2 (1)
No description	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)	1 (0)
Pain in TMJ area	- (0)	- (0)	- (0)	1 (0)	- (0)	- (0)	1 (0)
Periapical periodontitis	- (0)	1 (0)	- (0)	- (0)	- (0)	- (0)	1 (0)
Bone fracture	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)	- (0)
Total	-	252	-	3	13	-	268

Fig. 1.

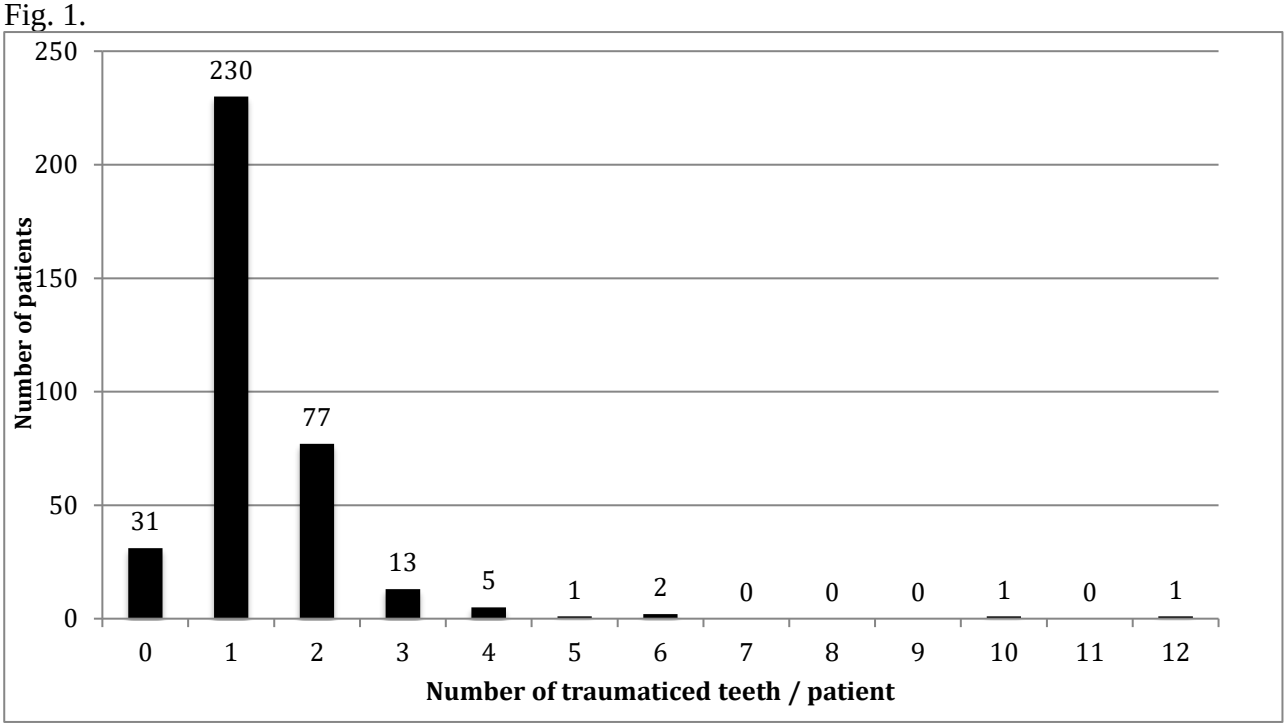

250
200
150
100
50
0
Number of patients
230
77
31
13
5
1
2
0
0
0
1
0
1
0
1
2
3
4
5
6
7
8
9
10
11
12
Number of traumaticed teeth / patient

Figure 2

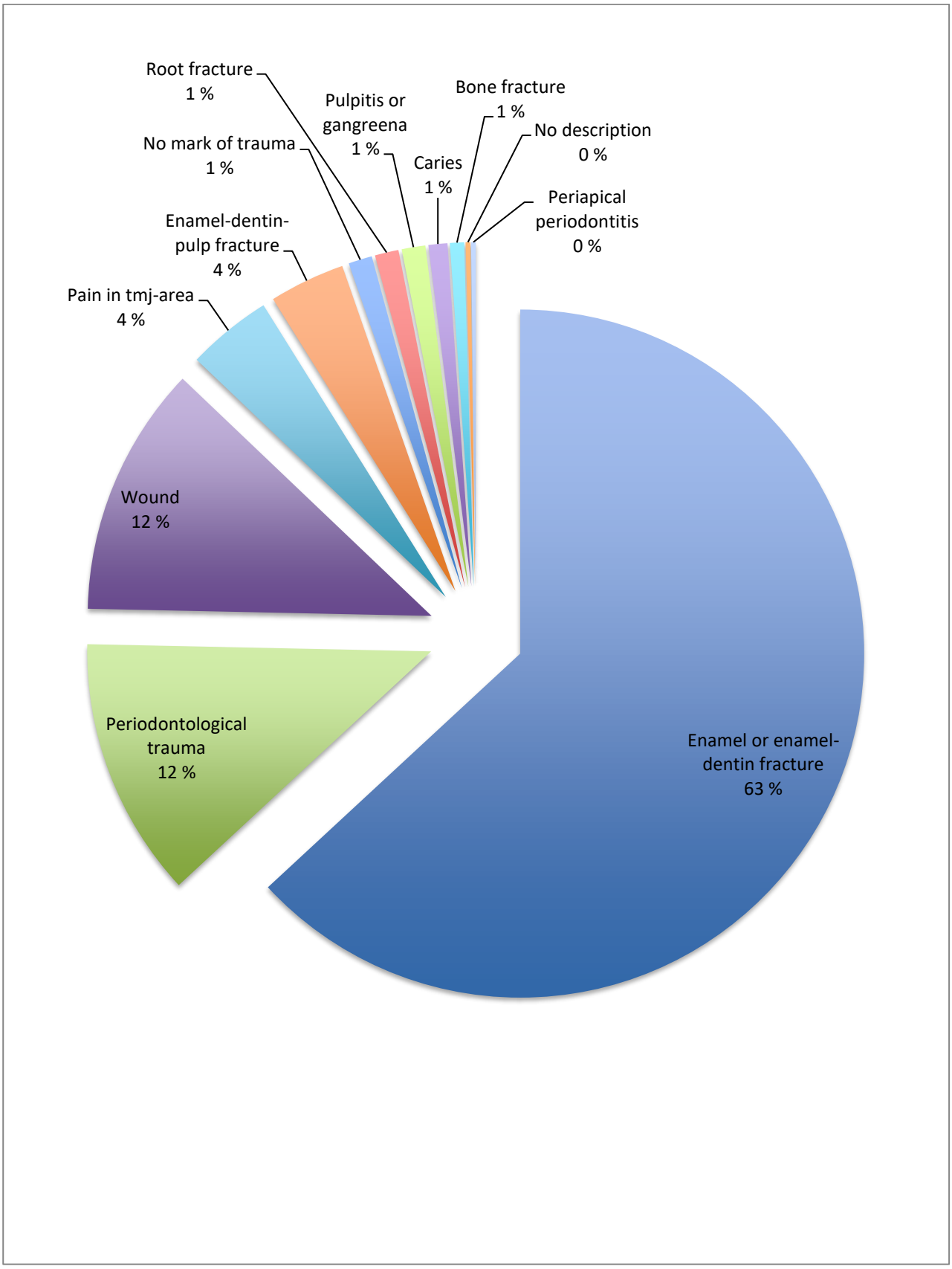
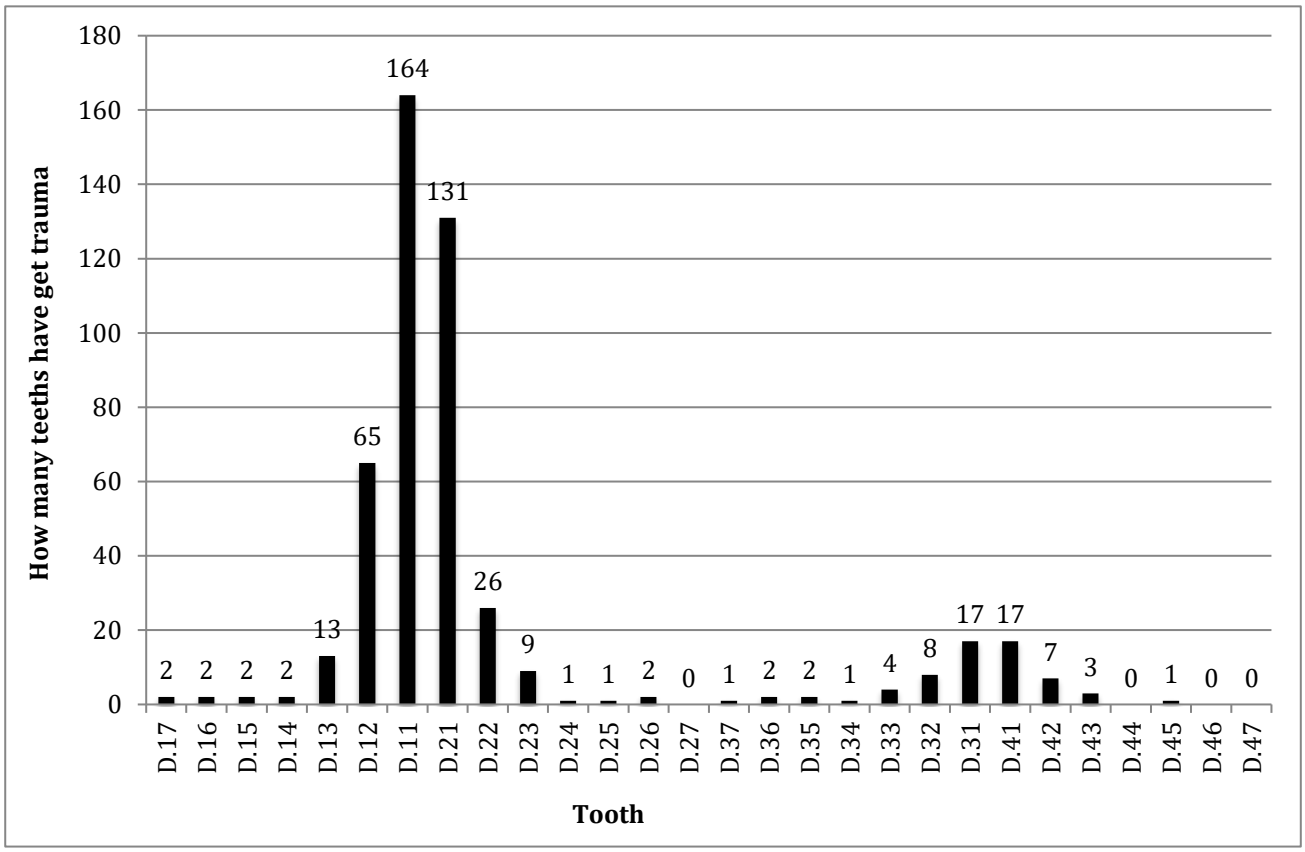

Root fracture
1 %
Pulpitis or
gangreena
1 %
Bone fracture
1 %
No description
0 %
No mark of trauma
1 %
Caries
1 %
Periapical
periodontitis
0 %
Enamel-dentin-
pulp fracture
4 %
Pain in tmj-area
4 %
Wound
12 %
Periodontological
trauma
12 %
Enamel or enamel-
dentin fracture
63 %

Fig. 3.


How many teeths have get trauma
180
160
140
120
100
80
60
40
20
0
2 2 2 2 13 65 164 131 26 9 1 1 2 0 1 2 2 1 4 8 17 17 7 3 0 1 0 0
D.17 D.16 D.15 D.14 D.13 D.12 D.11 D.21 D.22 D.23 D.24 D.25 D.26 D.27 D.37 D.36 D.35 D.34 D.33 D.32 D.31 D.41 D.42 D.43 D.44 D.45 D.46 D.47
Tooth