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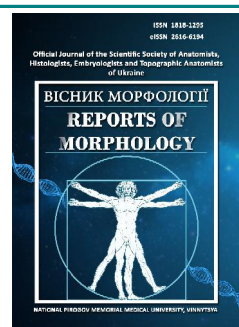
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Forensic medical evaluation of dental-jaw injuries in cases of traffic accidents

Plevinskis P.V.¹, Mishalov V.D.², Kozlov S.V.³, Kozan N.M.⁴, Dunayev O.V.

¹Odessa National Medical University, Odessa, Ukraine

²Shupyk National Medical Academy of Postgraduate Education, Kyiv, Ukraine

³State Institution "Dnipropetrovsk Medical Academy of the Ministry of Health of Ukraine", Dnipro, Ukraine

⁴Ivano-Frankivsk National Medical University, Ivano-Frankivsk, Ukraine

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CORRESPONDING AUTHOR

e-mail: pavelppw1@gmail.com

Plevinskis P.V.

Information about the differential diagnosis of human bodily injuries, which were formed when the body, wheel and bottom of a modern car came into contact with the body of a pedestrian; a person on the road surface, in the cabin of a modern car (driver and passengers), when a cyclist comes into contact with a car, in cases of combined types of car injury, is not enough. The purpose of the study is to increase the objectivity of forensic examinations by determining the criteria for assessing damage to the dental system in cases of the most common types of accidents: collision of moving vehicle with man; run over the body with a wheels or the bottom of vehicle; at an injury inside the vehicle on the basis of the analysis of morphological features and the mechanism of the specified damages. The archival materials of 130 forensic medical examinations of the municipal institution "Odessa Regional Bureau of Forensic Medical Examination" concerning victims of living persons and corpses as a result of traffic accidents that were accompanied by their injuries in the period 2015-2020 were used. The following research methods were used: anthropometric, morphometric, photographic, radiological, statistical. The article presents our own experience of improving the objectivity and provability of forensic examinations by determining the criteria for assessing damage to the dental system in cases of the most common types of vehicle: collision of moving vehicle with man; run over the body with a wheels or the bottom of vehicle; at an injury inside the vehicle on the basis of the analysis of morphological features and the mechanism of the specified damages. It is proved that according to the degree of gravity of physical injuries (health disorder or disability), damage to the dental apparatus in traffic accidents should be investigated only in cases of isolated injuries. In this case, fractures of the jaws, regardless of their nature, should be assessed as moderate injuries according to the criterion of long-term health disorders; Crown fractures, traumatic tooth dislocations, and soft tissue fatal wounds should be considered simple injuries that have caused short-term health disorders. Abrasions, bruises should be attributed to simple injuries. Thus, it is impractical to separately determine the severity of the injury of the dental system in cases run over the head with a wheels or the bottom of vehicle - in these cases, we always deal with gross, massive destruction of the bones of the skull.

Keywords: physical injuries, dental apparatus, traffic accident, vehicle injury, forensic examination.

Introduction

Traffic injuries are one of the most pressing problems of today, because, according to official statistics of the SAI of the Ministry of Internal Affairs of Ukraine, every day there are an average of 477 traffic accidents in which about 12 people die and about 100 people are injured. the number of people killed in road accidents in Ukraine fluctuated

annually within 4 thousand people [13]. Accident statistics remain at about the same level today.

The main causes of traffic accidents are disregard for traffic rules, including collisions due to speeding, non-compliance with the distance, violation of maneuvering rules, collision with standing vehicles or various obstacles,

poor road conditions, etc. In addition, according to the Center for Traffic Safety SAI UMIA, more than 40 % of all accidents occurred when the participants of the accident were in a state of alcohol intoxication, in particular, in 2015 there were 2358 (9.7%) cases of accidents with victims, committed by drivers in a state of alcohol intoxication, which killed 317 people and injured 3203 [13].

It is clear that one of the most important pieces of evidence in road accident cases is the opinion of a forensic expert. Of course, the most important objects of study in performing such examinations are the victims (corpses or living persons). In general, these issues have been carefully studied by both domestic [11, 22, 23] and foreign authors [1, 10, 17, 18, 19, 24, 25]. Particular attention in cases of accidents was paid to comprehensive studies [1, 3, 4, 5, 7]. However, in the study of injuries in victims of traffic accidents traditionally paid attention primarily to damage to the lower extremities (due to the action of the car bumper), torso, skull bones and brain [5, 6, 10, 15, 17, 19, 26]. Therefore, accordingly, in the forensic literature there are very few works related to other injuries received by victims of traffic accidents, in particular, injuries of the dental apparatus [3, 8, 12, 20, 24, 25, 27]. Meanwhile, the assessment of such injuries by their severity is extremely important, especially in situations where injuries in victims are limited to damage to the bones of the facial skeleton [16, 26].

Given the above, this work aims to address this shortcoming.

The aim of the study was to increase the objectivity of forensic examinations by determining the criteria for assessing damage to the dental system in cases of the most common types of accidents: collision of moving vehicle with man; run over the body with a wheels or the bottom of vehicle; injury inside the vehicle on the basis of the analysis of morphological features and the mechanism of the specified damages.

Materials and methods

The objects of the study were archival materials of the municipal institution "Odessa Regional Bureau of Forensic Medical Examination" for 2015-2020, namely: 1) 30 "Expert Conclusions" on traffic accidents that were accompanied by injuries and deaths; 2) 73 "Expert conclusions" on traffic accidents that were accompanied by injuries to survivors; 3) 20 "Expert conclusions" (complex forensic medical and transport-trasological examinations on the facts of traffic accidents, which were accompanied by death and injury).

All 130 victims had injuries to the dental apparatus. The distribution of the number of all victims studied by us as a result of traffic accidents with injuries of the dental apparatus for different types of injuries is shown in table 1.

It should be noted that during forensic examinations of corpses conducted research and analysis:

a - a description of the damage to the dental apparatus in the victims (corpses), which was made by an expert

Table 1. Distribution of the number of victims who received injuries of the dental apparatus for different types of injuries

No	Type of injury	Number of victims
1	collision of moving vehicle with man	40
2	inside the vehicle	62
3	run over the body with a wheels or the bottom of vehicle	21
Total		123

directly "at the section table";

b - photographic images of the relevant damage;

c - schematic images of injuries of the dental apparatus in the victims (corpses), which were made by an expert who performed a forensic autopsy;

d - the results made by the expert who carried out autopsy of the corpse of the victim in traffic accident.

In the study of forensic examinations of victims, accused and other persons conducted research and analysis:

a - a description of the damage to the dental apparatus in the victims, which was made by an expert who examined the victim in the accident;

b - schematic images of injuries of the dental apparatus in the victims, which was made by an expert who examined the victim;

c - the results of radiological examinations of the bones of the facial skeleton in the victims;

d - dental cards of victims and other medical documentation;

e - the results made by the expert who conducted the examination of the victim.

In the study of complex forensic and transport-trasological examinations on the facts of the accident studied and analyzed:

a - a description of the injuries of the victims, which was made by an expert directly "at the section table", or during the examination of the surviving victim by an expert;

b - photographic images of bodily injuries in the victims;

c - schematic images of bodily injuries in the victims, which were made by an expert who performed a forensic autopsy or examined a living person;

d - the results of forensic examination of objects that were seized during a forensic autopsy;

e - results of X-ray examinations of victims (radiography, CT and MRI examinations) - during the examination of living persons;

f - results of the commission of experts.

The research results are processed by standard methods of variation statistics.

Anthropometric, morphometric, photographic, radiological and statistical research methods are used in the work.

Results

During the forensic analysis of injuries of the dental system in cases of various types of traffic accidents, the following was established. *In cases of collision of moving*

Table 2. Distribution of the nature of injuries of the dental system depending on the types of injuries in the number of cases.

№	The nature of the damage	Injury due to collision of moving vehicle with man	Injury inside the vehicle	Injury due to run over the body with a wheels or the bottom of vehicle
1	Fractures of tooth crowns	11	38	Massive destruction
2	Traumatic dislocations of teeth	14	8	Massive destruction
3	Fractures of the lower jaw	10	7	Massive destruction
4	Fractures of the upper jaw	5	9	Massive destruction
Total		40	62	

vehicle with man, the most typical were the following injuries of the dental system:

- fractures of the crowns of the 1st and 2nd teeth of the upper jaw and the 1st, 2nd, 3rd teeth of the lower jaw, which were accompanied by hemorrhage and stab wounds of the mucous membrane of the upper and lower lips, as well as large abrasions and stab wounds to the skin face in the area of these injuries (11 cases);

- closed and open fractures of the mandibular bones in the area of its body (4 cases) or corners of the jaw (6 cases);

- closed fractures of the bones of the upper jaw LeFort (LeFort, 1901) type II (5 cases);

- complete and incomplete traumatic dislocations of the 1st, 2nd, 3rd teeth of the upper and lower jaws with hemorrhages, fatal wounds of the mucous membrane of the upper and lower lips of the victims, as well as accompanied by facial skin injuries in the area of these injuries (14 cases);

- these injuries were combined with each other in different variants - fractures or traumatic dislocations of the teeth were combined with fractures of the jaw bones, or only with injuries of the soft tissues of the face;

- it should be noted that in this type of accident in no case we found isolated damage to the dental system - they were all accompanied by damage to the bones of the skull or injury to other parts of the body (fractures of limbs, ribs, internal injuries, etc.).

In cases of injury inside the vehicle there were the following injuries of the dental system:

- fractures of crowns of 1st, 2nd, 3rd teeth of the upper and lower jaw with hemorrhages and fatal wounds of the mucous membrane of the upper and lower lips, bruises and small abrasions of the face (38 cases);

- closed and open fractures of the mandible in the body (3 cases) or corners (4 cases);

- closed fractures of the upper jaw bones LeFort (LeFort, 1901) type II (6 cases), LeFort (LeFort, 1901) type III (3 cases);

- in 8 cases there were complete and incomplete traumatic dislocations of the 1st, 2nd, 3rd teeth of the upper and lower jaws, which were accompanied by hemorrhages, fatal wounds of the mucous membrane of the upper and lower lips of the victims, as well as facial skin lesions in the area of injuries;

- in contrast to the cases of collision of moving vehicle with man, in cases of injury inside the vehicle in about half

of the cases (30 cases) there were isolated injuries of the dental system - only teeth, jaw bones, soft tissues of the face not accompanied by trauma to the bones of the skull, other parts of the victim's body (we deliberately did not take into account the diagnosis of concussion, which, in our opinion, is not always justified and is not informative to establish the mechanism of injury). All cases of isolated injuries of the dental system concerned living persons and did not occur in cases of examination of corpses;

- other cases (combined damage to the dental system and bones of neurocranium, as well as other parts of the body) occurred in both cases of examinations of living persons and corpses.

In the case of injuries to the victim by run over the body with a wheels or the bottom of vehicle, all cases concerned the rolling of the wheel (or injury to the bottom of the car) of the victim's head. In these cases, we encountered only gross damage to the dental apparatus in the form of multifracture fractures of the jaws, the destruction of the dentition, which was *always accompanied by the same gross damage to the bones of the skull and brain.*

The distribution of the nature of the damage depending on the conditions of injury is shown in table 2.

Discussion

Thus, the analysis of archival material of the municipal institution "Odessa Regional Bureau of Forensic Medical Examination", including materials of the departments: forensic medical examination of corpses, forensic medical examination of victims, accused and others, as well as forensic medical examinations of injuries of the dental apparatus in automobile injury to 130 people, indicates that in the most common types of traffic accidents (collision of moving vehicle with man, injury inside the vehicle, run over the body with a wheels or the bottom of vehicle) damage to the dental system is quite common.

Of the 130 cases, these injuries were most common in victims of the first two types of traffic accidents and are fractures of dental crowns (49 people), traumatic dislocations of the teeth (usually 1st - 2nd) (22 people), closed and open fractures of the mandible (usually in the area of the body or corners of the jaw) (17 people), closed fractures of the upper jaw bones LeFort (LeFort, 1901) type II and III (14 people) and various soft tissue injuries of the face.

We believe that damage to the dental system when the

car comes into contact with a pedestrian could be formed either by throwing the body on the car, or by falling the body on the road surface, which coincides with the results of research P.V. Plevinskis [11, 21, 22, 23].

Damage to the dental system due to injury in the car could occur when the person comes into contact with parts of the car, usually in frontal collisions, namely with the steering wheel, front panel, front windshield. This assumption of the mechanism of damage is consistent with the results of other similar studies [1, 5, 12, 14, 20, 24, 25].

The use of modern methods of control and diagnosis of changes in dental status and maxillofacial area in general helps to increase the level of objectification of the consequences and disorders arising from traffic accidents [3, 4, 5, 8, 12, 24]. The relevant task is to develop criteria for assessing the state of the dental system (level of dental health) before the direct impact of traumatic factors on the victim's body, and after completion of all necessary iatrogenic manipulations during rehabilitation after a traffic accident - thus, it will be possible to achieve proper stratification of the parameters of loss of dental health, differentiating them into those associated with previous violations of dental status, those that are directly related to the fact of injury, those associated with the residual compensation available at the time of injury range, and those that depend on the effectiveness of the chosen method of treatment [10, 20, 25, 27].

Specific forensic dental criteria can be used as reference points for assessing changes in dental status as a result of traffic accidents, the design of which provides unambiguous interpretation and clear identification orientation [2, 3, 5, 6, 7, 9, 10, 28].

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Based on specific forensic dental criteria, it is possible to develop clear protocols for assessing the loss of dental health in the future, which can be used as additional parameters to verify the severity of the injury and the predicted effectiveness of dental rehabilitation.

Conclusions

1. Analysis of morphological features and mechanism of damage to the dental system of victims in cases of the most common types of traffic accidents (collision of moving vehicle with man; run over the body with a wheels or the bottom of vehicle; at an injury inside the vehicle) and determination criteria by which it is advisable to assess these injuries, increase the objectivity and accuracy of forensic examinations and increase the provability of expert results.

2. According to the degree of severity of damage to the dental apparatus in traffic accidents, it is advisable to investigate only in cases of isolated injuries. In this case, fractures of the jaws, regardless of their nature, should be assessed as moderate injuries according to the criterion of long-term health disorders; crown fractures, traumatic tooth dislocations, and soft tissue contused wound should be considered minor injuries that have caused short-term health problems. Abrasions, bruises should be classified as minor injuries.

3. It is impractical to separately determine the injury of the dental system in cases of run over the body with a wheels or the bottom of vehicle by its severity - in these cases we always deal with gross, massive destruction of bones of the victim's skull, which automatically qualifies as serious injuries.

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СУДОВО-МЕДИЧНА ОЦІНКА УШКОДЖЕНЬ ЗУБОЩЕЛЕПНОГО АПАРАТА У ВИПАДКАХ ДОРОЖНЬО-ТРАНСПОРТНИХ ПРИГОД

Плевінскіс П.В., Мішалов В.Д., Козлов С.В., Козань Н.М., Дунаєв О.В.

Відомостей щодо диференційної діагностики тілесних ушкоджень людини, що утворились при контакті кузова, колеса та днища сучасного автомобіля з тілом пішохода; людини, що знаходиться на дорожньому покритті, у салоні сучасного автомобіля (водія та пасажирів), при контакті велосипедиста з автомобілем, у випадках комбінованих видів автомобільної травми - недостатньо. Мета дослідження - підвищення об'єктивності виконання судово-медичних експертиз шляхом визначення критеріїв оцінювання ушкоджень зубощелепної системи у випадках найбільш розповсюджених видів ДТП: при контакті автомобіля, що рухається, із пішоходом; при перекочуванні через тіло потерпілого колеса та днищевої частини автомобіля; при травмі у салоні автомобіля на основі аналізу морфологічних особливостей і механізму вказаних ушкоджень. У роботі були використані архівні матеріали 130 судово-медичних експертиз комунального закладу "Одеське обласне бюро судово-медичної експертизи" стосовно потерпілих живих осіб і трупів внаслідок дорожньо-транспортних подій, що супроводжувалися їх травмуванням у період 2015-2020 р.р. Використані наступні методи дослідження: антропометричний, морфометричний, фотографічний, рентгенологічний, статистичний. У статті наведений власний досвід підвищення об'єктивності і доказовості судово-медичних експертиз шляхом визначення критеріїв оцінювання ушкоджень зубощелепної системи у випадках найбільш розповсюджених видів ДТП: при контакті автомобіля, що рухається, із пішоходом; при перекочуванні через тіло потерпілого колеса та днищевої частини автомобіля; при травмі у салоні автомобіля на основі аналізу морфологічних особливостей і механізму вказаних ушкоджень. Доведено, що за ступенем тяжкості (розладом здоров'я чи втратою працездатності) ушкодження зубощелепного апарата при дорожньо-транспортних пригодах доцільно досліджувати виключно у випадках ізольованих ушкоджень. При цьому, переломи щелеп, незалежно від їх характеру, слід

оцінювати як тілесні ушкодження середнього ступеня тяжкості за критерієм тривалого розладу здоров'я; переломи коронок, травматичні вивихи зубів, забійні рани м'яких тканин слід оцінювати як легкі тілесні ушкодження, що спричинили короткочасний розлад здоров'я. Садна і синці слід відносити до легких тілесних ушкоджень. Таким чином, недоцільно окремо визначати за ступенем тяжкості травму зубощелепної системи у випадках перекочування через голову колеса автомобіля або травмування дніщевою частиною - у цих випадках ми завжди маємо справу із грубими, масивними руйнуваннями кісток усього черепа потерпілого.

Ключові слова: *тілесні ушкодження, зубощелепний апарат, дорожньо-транспортна подія, автомобільна травма, судово-медична експертиза.*
