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MORPHOLOGICAL FEATURES AND MECHANISM OF FORMATION OF DAMAGE TO THE STRUCTURES OF THE SPINE AND SPINAL CORD IN PERSONS OF MODERN CAR DRIVERS INJURED IN ROAD ACCIDENTS

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Abstract

In the article, in order to identify the morphological features of the formation of spinal cord injuries (PSMP) The analysis of the results of the examination of corpses in relation to 119 drivers of modern Chevrolet- Daewoo- uz passenger cars was carried out for drivers of modern cars injured in an accident. those killed in an accident. The age of the drivers ranged from 18 to 59 years. It was found that the PSMP in drivers was most often characterized by tear-off fractures, mainly in the cervical region, respectively between C1-C2 or C5-C6, as well as in combination with tear-off fractures of the thoracic region. In some cases, such cervical and occipital injuries were observed. The nature of fractures of spinal structures in drivers indicates that tear-off fractures are the result of extensor-flexor movements of the spine at the time of an accident, and some compression and other types of spinal fractures were probably formed as a result of rotation or compression of the spine in the 1st and 2nd phases of an accident.

Introduction

In-cabin car injury is one of the most frequently observed types of road traffic injuries, according to the literature, this type of injury accounts for 28-30 to 33-35 percent of all types of car injuries. In modern passenger cars, the design of their interior has been significantly improved, they are

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also equipped with active and passive safety equipment, although the speed of movement of modern cars is much higher. Consequently, in any type of car injury and in particular in collisions of modern cars with other vehicles (obstacles) or in case of overturning of cars, the volume of injuries in drivers and passengers associated with inertial movements of the body (body parts) may exceed the volume of injuries formed in the cabin of cars produced in the last century.

Injuries arising from an injury in the passenger car, depending on the location of the victims, differ in their severity, are very diverse in their nature and localization. Different sources of injury to drivers and passengers in case of transport injury, unequal intensity and direction of inertial displacements of their bodies, distinguish the localization and frequency of injuries. [Smirenin A.S., Khabova Z.S., Fetisov V.A., 2015; Pigolkin Yu.I., Dubrovina I.A., Sedykh E.P., Mosoyan A.S., 2015].

In particular, damage to the cervical spine indicates that the victim is in the driver's or front passenger seat. The presence of injuries of the cervical, thoracic and sacral spine indicates that the victim was in the driver's seat. differential diagnostic sign and occurs with the same frequency in drivers and passengers of the front and rear seats. According to the authors, the identified criteria make it possible to build mathematical models in the form of logitregression equations, which can be used to make probabilistic predictions of the location of the victim inside the car in an accident, based on a set of pathomorphological signs [Pigolkin Yu.I., Dubrovin I.A., Sedykh E.A., Mosoyan A.S., Bychkov A.A., Akhmetova D.N. 1, 2018]**.**

The purpose of the study was to identify the features of the formation of spinal cord injuries in drivers of modern cars injured in road accidents.

MATERIALS AND METHODS OF RESEARCH

The materials of the study were the results of the examination of corpses in relation to 119 drivers of modern Chevrolet cars- Daewoo- uz. killed in an accident. Among the dead drivers are 116 men and 3 women. In 2 cases, the drivers were intoxicated at the time of the accident. At the time of the accident, the drivers were driving a Nexia 69 and a Lasetti-50 car. The age of the drivers ranged from 18 to 59 years.

The death of dead drivers in 72% of cases occurred at the scene of accidents, and the remaining 28% of cases were observed in medical institutions.

In the process of retrospective analysis of these conclusions of the SME, special attention was paid to the nature, localization, features of traces of overlays on clothes and shoes, as well as to the nature, localization and volume of damage to organs and tissues. The systematization of combined and multiple injuries was carried out in accordance with the unified anatomical and clinical classification developed by V.A. Sokolov (2006). At the same time, the well-known unified clinical and morphological classifications of TBI, bone fractures, as well as injuries of the spine and internal organs were also taken into account.

In the process of analysis, the case materials were also studied - the protocols of the inspection of the scene of the incident and the corpse at the place of its discovery, the protocol of the inspection of vehicles and the results of the forensic autotechnical examination.

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The obtained data were recorded in coded registration cards for statistical analysis. Statistical analysis was carried out within the framework of variation statistics, the criterion for the reliability of damage indicators (t), their minimum error (m) and the reliability of differences in (p) indicators were determined.

RESULTS OF THE STUDY AND DISCUSSION

It was found that in the deceased drivers of the Lasetti Daewoo-uz. passenger car, concomitant trauma of the structures of the head, chest and abdomen prevailed (18.0%), followed by combined trauma of the structures of the head, chest, abdomen and retroperitoneal organs (8.0%) and combined trauma of the structures of the chest, abdomen and right lower limb (6.0%), as well as combined trauma of the structures of the head and chest (6.0%). Other variants of concomitant trauma of the structures of body parts in this category drivers ranged from 2.0% to 4.0%.

In the deceased drivers of the Nexia - Daewoo-uz car, as well as in the drivers of the Lasetti car, concomitant trauma of the structures of the head, chest and abdomen prevailed significantly - 33.8%. In addition, in contrast to the nature of the combined trauma in the Lasetti drivers, in the drivers of the Nexia 1.2 car, concomitant trauma of the chest and abdominal structures prevailed (10.2%), as well as concomitant trauma of the head structures. front, chest and abdomen (5.8%), which is probably due to the relative tightness of the interior and the lowness of the seats of the Nexia car, compared to such parameters of the interior of the Lasetti car. Other variants of concomitant injury to the structure of body parts in the faces of Nexia drivers, as in the faces of Lasetti drivers, ranged from1.4% to 2.9%.

Morphological characteristics of spinal cord injuries in drivers of modern passenger cars Chevrolet - Daewoo-uz., who died in an accident, are shown in Table No1.

Table 1. Morphological characteristics of spinal cord injuries in drivers of modern passenger cars Chevrolet - Daewoo-uz.

nn No	Nature and location of injuries				
	For Lasetti drivers	Abs	nn №	Nexia drivers have 1.2	Abs
1.	Cervico-occipital trauma and avulsion fracture between 1-2 thoracic vertebrae	1	1/4.	Cervico-occipital injury with spinal cord detachment and hemorrhage +11,43,69	4
2.	Fractures of the spinous processes from 6 to 12 thoracic vertebrae	1	2/18	Avulsion fracture between 5-6 cervical vertebrae with detachment and crushing of the spinal cord	1
3.	Avulsion fracture between 1-2 cervical vertebrae with spinal cord detachment and fractures of 2-3 thoracic vertebrae with displacement, hemorrhages under the membrane and brain matter	1	3/49	Avulsion fracture between 3-4 cervical vertebrae, fractures of 2-3 thoracic vertebrae with displacement, spinal cord detachment with hemorrhage	1
3/12	Cervico-occipital injury and avulsion fracture between 4-5 thoracic vertebrae, detachment and crushing of the spinal cord	1	4/65	Whiplash-shaped fracture of the 2nd cervical vertebra with contusion and hemorrhages in the spinal cord	1

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4/17	An avulsion fracture between the 5th-6th cervical vertebrae, hemorrhages under the membranes and the substance of the spinal cord	1	5/66	Spinal cord injury	1
5/24	Fracture of the body of the 2nd cervical vertebra with contusion and hemorrhage of the spinal cord	1		Altogether	8
6/25	An avulsion fracture between 1-2 cervical vertebrae, a fracture of 2-3 thoracic vertebrae with confusion, a tear of the spinal cord and hemorrhages in its substance	1			
8/42	Cervico-occipital injury with fractures of the body of the 1st cervical vertebra with spinal cord injury	1			
9/44	Avulsion fracture between the 7th cervical and 1st thoracic vertebrae	1			
10/13	Avulsion fracture between 2-3 cervical vertebrae with spinal cord detachment	1			
11/35	Avulsion fractures between 5-6 cervical and 9-10 thoracic vertebrae with spinal cord injuries	1			
	Altogether	11			

Table No1 shows that spinal cord and spinal cord structural injuries (LVCP) were observed in 11 (out of 50) Lasetti drivers and in 8 (out of 69) Nexia drivers, the spinal cord and spinal cord structure injuries were most often characterized by avulsion fractures (8 out of 14) mainly in the cervical spine (5 out of 38), respectively between C_1-C2 or C5-C6, as well as in combination with avulsion fractures of the thoracic spine (3 out of 38). The drivers of the Lasetti car had cervico-occipital trauma (CRT) in some cases and 3 of the deceased drivers had fractures of the body, either C_2 (1) and spinous processes Thc 6 to 12 (1).

The nature of fractures of the spinal structures indicates that avulsion fractures are the result of extensor-flexion movements of the spine at the time of the accident, and individual compression fractures of the spine probably formed as a result of rotation or compression of the spine in the 1st and 2nd phases of the accident.

The nature, localization, volume, and frequency of injuries on the body of persons injured in an injury inside the cabin of a modern passenger car has become significantly different from those formed in the cabin of moving cars of old models. These circumstances have significantly influenced the traditional nature of forensic diagnostics of injuries observed in traffic accidents in drivers and passengers of modern cars [Fetisov V.A., Gusarov A.A., Smirenin S.A. 2016].

Equipping modern cars with a variety of means of active and passive protection has significantly affected the nature, volume, localization, frequency and morphological characteristics of injuries on the body of persons who have suffered from a car injury, which has led to the difficulty of diagnosis in the process of examination of this injury. In this regard, the previously developed qualitative and quantitative indicators of injuries for this type of injury do not meet the new

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diagnostic requirements. until recently, which were considered typical and characteristic of a car injury, have become less common [Sarkisyan B.A., Pankov I.V., 2019].

The effectiveness of forensic medical examination (SME) in car injuries has significantly expanded in recent years due to the study of the characteristics and features of the formation of injuries in persons who have suffered from various types of road accidents involving modern cars [Fetisov V.A., Smirenin S.A., Nesterov A.V., Khabova Z.S., 2014, etc].

Pigolkin Yu.I. et al. (2016) in another report notes that in cases of fatal injuries inside the passenger car, the driver of the vehicle has a predominant incidence of fractures of the cervical, thoracic and lumbar vertebrae. In the front and rear seats, these injuries are minimally expressed. The multi-level and multiplicity of fractures of various parts of the spine in the driver of a vehicle is associated with more intense flexion and extension of the spine in this type of injury. The incidence of fractures of the lower cervical vertebrae in the front seat passenger is more common, while in the passengers of the rear left seat, the upper cervical vertebrae were more often injured. Passengers in the rear left seat are characterized by a lower frequency of injuries to the thoracic spine and most of the injuries of the cervical and lumbar spine. Passengers of the rear center seat with an in-cabin injury are characterized by a significant frequency of traumatization of the thoracic spine, and passengers of the right seat are characterized by injuries to the lumbar spine [Pigolkin Yu.I., Dubrovin I.A., Sedykh E.A., Mosoyan A.S.,2016].

As noted above, injuries to the spine and spinal cord in an in-cabin car injury are very diverse. The main diagnostic value for establishing the location of the victims is lesions of the ligamentous apparatus and bone structures of the spine, the degree of their severity and the level of location. In cases of frontal collisions, the frequency of fractures of the cervical, thoracic and lumbar vertebrae prevails in drivers, and in passengers such injuries are less pronounced (except for the sacral vertebrae) [Пиголкин Ю.И., Дубровин И.А., Седых Е.А., Мосоян А.С. 2016; Дубровин И.А., Седых Е.П., Мосоян А.С., 2018].

Solokhin A.A. (1968) observed injuries of the vertebrae in passengers 2 times more often than in drivers during injuries in the car of previous years. According to the author**,** vertebral injuries occur as a result of direct impact of traumatic force in the back area (hitting the back against part of the cab, against the door). As a rule, it is of a compression nature. As a result of excessive flexion or extension, fractures occur more often in the thoracic region (IV-VIII thoracic vertebrae), less often in the lumbar and cervical regions. The spinal cord and its membranes do not always occur in spinal trauma, hemorrhages under the membranes are more often observed [Solokhin A.A.1968].

FINDINGS

1. Cervico-occipital trauma (CRT) and fractures of the body C_2 and spinous processes Thc 6 to 12 were most often observed in drivers. or crushing and contusion of the spinal cord at the level of fractures, which was the direct cause of death of the victims at the scene of injury;
2. More typical for drivers injured in road accidents were the formation of spinal injuries, mainly in the form of avulsion fractures, with predominant traumatization of the cervical spine, in particular in the form of cervico-occipital trauma and whiplash fractures.
3. The nature of fractures of the spinal structures in drivers indicates that avulsion fractures are the result of extensor-flexion movements of the vertebra at the time of the accident, and some

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compression and other types of spinal fractures were probably formed as a result of rotation or compression of the spine in the 1st and 2nd phases of the accident.

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