Pawłowski Witold, Goniewicz Krzysztof, Goniewicz Mariusz, Czerski Robert. Cranio-cerebral injuries in road accidents: characteristics and clinical process. Journal of Education, Health and Sport. 2018;8(3):389-396. eISNN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.1205121
http://ojs.ukw.edu.pl/index.php/johs/article/view/5374
https://pbn.nauka.gov.pl/sedno-webapp/works/860263

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part b item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eissn 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 05.02.2018. Revised: 10.02.2018. Accepted: 21.03.2018.

Cranio-cerebral injuries in road accidents: characteristics and clinical process

Witold Pawłowski[1], Krzysztof Goniewicz[1,2], Mariusz Goniewicz[3], Robert Czerski[2]

[1] Medical University of Warsaw, Department of Disaster Medicine
[2] Polish Air Force Academy, Faculty of National Security and Logistics
[3] Medical University of Lublin, Department of Emergency Medicine

Abstract

The constant progress of civilization involves the mechanization of daily life, including in particular the use of motor vehicles, mainly cars and all sorts of two-wheelers. The rapid growth of the automotive industry in the world has brought a huge increase in traumatism.

The aim of the study was to characterize cranio-cerebral and to provide a substrate for further study provided within the subject. Injuries arising as a result of rotational forces in protected road users usually cause minimal damage to the exterior of very serious internal injuries. During the evaluation of the injured at the scene of the injury victims should receive occiput red color in the medical segregation

Key words: cranio-cerebral injuries, hospitalization, epidemiology

In developing countries, the number of vehicles grows much faster than the progressing development of road infrastructure [1]. In developed countries the situation is not much better: talk about injuries as a result of traffic accidents and their consequences as a social phenomenon, having the characteristics of the epidemic. Every year in the United States, about 2 million people suffer traumatic injuries to the brain, and approx. 500 000 are hospitalized [2]. Per year is 180-250 per 100 000 inhabitants in the US, 281 per 100 000 in France, 361 per 100 000 in South Africa, 322 per 100 000 in Australia, 430 per 100,000 in the UK and 235 100 000 on average in the EU European Union - the so-called free countries. New Union [3,4,5].

Because these injuries are mainly young people, they are extremely costly socially [6]. Related costs are estimated at US $ 100 billion each year and that they exceed the total cost of cardiac care and cancer in this country.

In Poland, injuries are the leading cause of death and disability in the population of people aged 40 years of age. The mortality rate for this reason, is one of the largest in Europe [7]. This is due in large measure to the increasing number of road accidents. Since the beginning of the nineties the number of vehicles registered in Poland is steadily growing. For example, motor vehicles in the period 1998- 2007 increased from the value of 12 709 244 in 1987 to 19 471 836 in 2007. In the number of cars has increased from 8 890 763 in 1998 to 14 588 739 in 2007. The location of our country in the center of Europe is the cause of a large transit traffic. According to data from the Border Guard Headquarters, in 2008 by the EU's external borders to Polish drove 8 977 117 vehicles, including 7 324 543 cars[8].

Number of road accidents due to many reasons and it varies to some extent from year to year, although it is always a serious number in Poland. In 2008 happened 49 054 road accidents. In comparison with 2006, when it happened46 876 accidents, the number increased by 2178 accidents (+ 4.6%), Although in comparison with 2007, in which occurred 49 536 accidents, the number fell by 482 Accidents (-1%). In 2008, as a result of road accidents killed 5437 people and injured 62 097 people. In the last decade, most fatalities consumed in 1999, while most road accidents and people injured was reported in 2000. Since 2001, a decline lasting up to 2006. In 2007, there was an increase in the number of accidents and casualties, and in 2008 recorded declines.

Poland since 2006 is on the first place among the countries of the European Union, in terms of the absolute number of people killed in accidents, therefore, ahead of more populous countries, such as Italy, Germany, France or Great Britain. As far as the number of wounded, our country invests in the middle of the pack. This indicates that relatively few victims of road accidents in Poland is experiencing them. In Poland, the ratio of dead to wounded in cases

dating back to 1:10 in the EU countries is about 3-5: 100. The decisive factor in this case is still poor quality of emergency medical services, the most important for saving lives in the so-called golden hour[10].

The problem is so serious that it was decided to establish the structures of the Police Headquarters special cells - Traffic Department - organizing a centralized facility and coordinating actions to improve road safety.

Increasingly, we are dealing with accidents that involve more victims, thus exhibiting characteristics of disasters. This describes the event. which occurs as a result of death, injury or property damage in such intensity that for limiting the effects of such an event routine is not enough strength, resources and operation, and control the situation required for the support of local emergency assistance from outside. In medicine, for the concept of disasters accident myeloma, mass disasters and industrial. While in the case of a multiple accident often enough local forces and means, in the case of mass they are always insufficient [11].

At the time of the accident myeloma or mass, difficulty to rescue the direct result of a large number of victims and the number and severity of injuries suffered by them. This situation causes an imbalance between the needs of victims, and the possibilities to help. Some serious traffic accidents may meet the definition of a case of multiple or even (in the case of rail transport) - the mass. In the event of a collision dozens of vehicles, or a few, but a large number of victims (eg. Bus) and serious injuries (multiple trauma internal organs) are revealed problems: supply at the site, transport the injured, providing places in hospitals, availability of blood etc.

A routine procedure, as is usually the case in a single patient, in case of multiple conditions, and more mass, it is not possible. Many years of experience of military health care in securing a large number of medical injuries have become the basis for developing methods of action in emergency situations in peacetime. Benefiting from the experience of military medicine of catastrophes in order to develop such procedures, to optimize always inadequate medical care in mass events, including, in particular, to minimize the risk of unnecessary death - the so-called. "Death to avoid".

Mortality posttraumatic can be divided into three categories: occurring immediately after injury, early and late. Immediate death, occurring immediately after the injury is the result of hemorrhage from damaged large arteries, heart, lungs, sudden airway obstruction, intracranial extensive damage. Early death within a few hours after injury, the result of more serious bleeding, intracranial rise tightness until fecal cerebellum with the core extended at the foramen magnum of

the skull, deepening respiratory failure and cardiac functions. Late mortality after days or weeks, the result of long-term effects of injury or multi-organ infections.

Mortality traumatic largely results from head injuries which occur in 75% of cases, multiple organ injury. About 40% of head injury, refers to the temporal bone, with serious consequences for the hearing, balance, facial and cranial structures [12-15].

The most serious and permanent functional deficits in convalescent pose serious problems in daily functioning [16].

A huge number of injuries and their various consequences are not only a problem of emergency medicine, but also the various disciplines of medicine and surgical conservative psychological problem as well as the legal and economic. This makes the injuries, especially the communication can be defined as a problem of a social nature.

According to the WHO injuries are one of the major health problems of these times. Annually, 8 to 15% of the population of the world is all kinds of injuries and post-traumatic disability percentage reaches 10-30%.In the US, this is the cause of approx. 150 000 deaths (the third item after cardiovascular diseases and cancer) annually. In about 75% of multiple organ injury occurs head injury[17].

Cranio-cerebral trauma determined lacerations soft skull bone skull or its contents. Statistically, the incidence of cranio-cerebral injuries in industrialized countries is about 200/100 000 population per year. They constitute approx. 7% of all injuries. In Poland, cranio-cerebral suffers every year about 10 000 victims. Very extensive and severe injuries are associated with a high mortality rate (up to 50% at the accident site, and about 40% during hospitalization). The highest incidence of injuries observed in young people under 30 years of age. Twice or several times they occur more frequently in men than in women, while men are often heavier injuries [18].

Complete data for mechanical damage to the brain and spinal cord mainly come from the USA. The statistics of the National Health Surveillance (National Health Interview Survey), it is known that the incidence of hospitalization due to mechanical damage of the brain in 1990 amounted to 373 000 in the US, of which 75 000 died. These data also indicate that approximately 50% of deaths from trauma and mechanical damage in the body is the cause of irreversible damage of the central nervous system. About 10% of fatal central nervous system damage includes damage to the spinal cord. Facts Trauma Research, covering data from 1992 showed that about 50 000 American adults admitted to hospital each year due to mechanical trauma of the brain as the main cause of hospitalization, of which 75 000 -90 000 of them die. Among the convalescent similar number (70 000 - 90 000) shows severe neurological deficits

/ neuropsychological, and about 2,000 vegetate in a coma. Acute trauma of the brain is responsible for about 40% of deaths from traumatic causes in the US [19]. A typical victim with a head injury is a young man of 15-24 years of age., Entering in active life and career. More than 1/3 of survivors of moderate or severe head trauma, says a long-term / permanent neurological and psychological consequences. The economic costs of head injuries are very serious. Same losses on future work incapacity victims of cranio-cerebral injuries are estimated to be more than 8 billion dollars. Based on indicators of morbidity, mortality and economic losses associated with head injury, it is called".

On the European data shows that the population of a large city of Cologne (population approximately 1 million) in the period: 1990-1996 Overall mortality due to mechanical damage of the brain was 46.6%, and 60% of deaths occurred before the adoption of to the hospital. With the German federal data shows that 250 000 patients in 1998, in whom the diagnosis of disease included brain injury and skull fracture, died 8000. Half of these deaths occurred in the prehospital period [21].

Traumatic brain are the main causes of death and acquired neurological disorders in children also. Cranio-cerebral children show some specificities due to the different mechanical properties of the skull (increased flexibility) and high capacity for adaptation and recovery in young children [22-26].

The most common cause of head injuries in children between 2 and 5 years of age are falls and car accidents. Most of the victims of heavy injuries are inadequately protected during transport small children. Children aged 6-12 years are frequent victims, in turn, deductions for vehicles, either as pedestrians or as cyclists. The most severe head injuries in children are a major cause of traffic accidents: the cause of 2/3 of the temporal bone fractures in small children be offset by a car, and a group of teenagers among the victims of traffic accidents occur at the drivers of vehicles [27].

Every year in the USA of 600 000 children reported to the chambers of admissions due to head trauma and 250 000 of them are hospitalized. Mortality in the course of mechanical damage of the brain in this group is different according to the data from 9 to 35%. Generally, damage to the brain is in the United States the most common cause of death of children due to injury (approx. 25 000 children per year) [28].

References:

1. Rabinowitz, Amanda R., and Douglas H. Smith. "Traumatic brain injury and rationale for a neuropsychological diagnosis of diffuse axonal injury." Genes, Environment and Alzheimer's Disease. 2016. 267-293.
2. Rosenblum, W. I. (2015). Immediate, irreversible, posttraumatic coma: a review indicating that bilateral brainstem injury rather than widespread hemispheric damage is essential for its production. Journal of Neuropathology & Experimental Neurology, 74(3), 198-202.
3. Armin S.S., Colohan A.R., Zhang J.H.: Traumatic subarachnoid hemorrhage: Our current understanding and its evolution over the past half century. Neurol. Res. 2006, 28, 445–452.
4. Wong, G., Brinkman, A., Benefield, R. J., Carlier, M., De Waele, J. J., El Helali, N., & Misset, B. (2014). An international, multicentre survey of β-lactam antibiotic therapeutic drug monitoring practice in intensive care units. Journal of antimicrobial chemotherapy, 69(5), 1416-1423.
5. Barth J.T., Gideon D.A., Sciara A.D. et al.: Forensic aspects of mild head trauma. J. head Trauma Rehabil. 1986, 12, 63-70.
6. Bastos P., Sun X., Wagner D.P. et al.: Glasgow coma sale score Ii the evaluation of outcome in the intense care unit: findings from the acute physiology and chronic health evaluation study. Crit. Care Med. 1993, 21, 212-215.
7. Blissitt P.A.: Care of the critically ill patient with penetrating head injury. Crit. Care Nurs. Clin. N. Am. 2006, 18, 321–332.
8. Boake C, Diller L.: History of rehabilitation for traumatic brain injury. in High W.M., Sander A.M., Struchen M.A., Hart K.A.(eds.): Rehabilitation for Traumatic Brain Injury. Oxford University Press, Oxford 2005.
9. Gavett, Brandon E., Robert A. Stern, and Ann C. McKee. "Chronic traumatic encephalopathy: a potential late effect of sport-related concussive and subconcussive head trauma." Clinics in sports medicine 30.1 (2011): 179-188.
10. Gardner, Raquel C., and Kristine Yaffe. "Epidemiology of mild traumatic brain injury and neurodegenerative disease." Molecular and Cellular Neuroscience 66 (2015): 75-80.
11. Brands D.W.A., Boverdeerd P.H.M., Wismans J.S.: On the potential importance of non-linear viscoelastic material model ling for numerical prediction of of brain tissue response: test and application. Stapp. Car Crasch J. 2002, 46, 103-121.
12. Breslau, Naomi. "Epidemiology of posttraumatic stress disorder in adults." The Oxford Handbook of Traumatic Stress Disorders. Oxford University Press: New York (2012): 84-97.

13. Khoury, Lamya, et al. "Substance use, childhood traumatic experience, and posttraumatic stress disorder in an urban civilian population." Depression and anxiety 27.12 (2010): 1077-1086.
14. Brown A.W., Elovic E.P., Kothari S., Flanagan S.R., Kwasnica C.: Congenital and acquired brain injury. 1. Epidemiology, pathophysiology, prognostication, innovative treatments, and prevention. Arch. Physical Med. Rehabil. 2008, 89 (3 Suppl. 1): 3–8.
15. Roberts, Andrea L., et al. "Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States." Psychological medicine 41.1 (2011): 71-83.
16. McLaughlin, Katie A., et al. "Childhood adversity, adult stressful life events, and risk of past-year psychiatric disorder: a test of the stress sensitization hypothesis in a population-based sample of adults." Psychological medicine 40.10 (2010): 1647-1658.
17. Pietrzak, Robert H., et al. "Prevalence and Axis I comorbidity of full and partial posttraumatic stress disorder in the United States: results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions." Journal of anxiety disorders 25.3 (2011): 456-465.
18. Bryc S.: Rentgenodiagnostyka następstw urazów czaszkowo-mózgowych, Ann. Univ. M. Curie-Skłodowska sectio D 1990, 45, 83-94.
19. Amstadter, Ananda B., et al. "Potentially traumatic event exposure, posttraumatic stress disorder, and Axis I and II comorbidity in a population-based study of Norwegian young adults." Social psychiatry and psychiatric epidemiology 48.2 (2013): 215-223.
20. Caffo M., Germanò A., Caruso G., Meli F., Calisto A., Tomasello F.: Growing skull fracture of the posterior cranial fossa and of the orbital roof. Acta Neurochir. (Wien) 2003, 145, 201-208.
21. Cohen, Judith A. "Practice parameter for the assessment and treatment of children and adolescents with posttraumatic stress disorder." Journal of the American Academy of Child & Adolescent Psychiatry 49.4 (2010): 414-430.
22. McLaughlin, Katie A., et al. "Trauma exposure and posttraumatic stress disorder in a national sample of adolescents." Journal of the American Academy of Child & Adolescent Psychiatry 52.8 (2013): 815-830.
23. Goniewicz, Krzysztof, et al. "Epidemiology of road traffic accidents in adults. A systematic review." Journal of Education, Health and Sport 7.7 (2017): 92-100.
24. Goniewicz, K., et al. "Road accident rates: strategies and programmes for improving road traffic safety." European journal of trauma and emergency surgery 42.4 (2016): 433-438.

25. Ciuffreda, Kenneth J., et al. "Acquired brain injury." Visual diagnosis and care of the patient with special needs. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins (2012): 95-100.
26. Moore Sohlberg, McKay, et al. "Evaluation of attention process training and brain injury education in persons with acquired brain injury." Journal of clinical and experimental neuropsychology 22.5 (2000): 656-676.
27. Gil-Gómez, José-Antonio, et al. "Effectiveness of a Wii balance board-based system (eBaViR) for balance rehabilitation: a pilot randomized clinical trial in patients with acquired brain injury." Journal of neuroengineering and rehabilitation 8.1 (2011): 30.
28. Park, Norman W., and Janet L. Ingles. "Effectiveness of attention rehabilitation after an acquired brain injury: A meta-analysis." Neuropsychology 15.2 (2001): 199.