

SEVERITY OF BRAIN INJURY- INFLUENCE ON TREATMENT OUTCOME IN TRAUMA PATIENTS

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Traffic accidents are the most common causes of severe traumas. Severe craniocerebral injury, isolated or in polytrauma patients, requires serious treatment of the injured, the outcome of which is uncertain.

The aim of the paper was to examine how difficult severe head injuries affect the outcome and recovery of polytrauma patients.

A retrospective study covered a three-year period of treatment of patients with isolated severe head injury and severe head injury in polytrauma patients. The research was performed at the Department of Neurosurgery, Clinical Center Niš, in the period from the beginning of 2011 until the end of 2013.

For the assessment of the severity of head injury, Glasgow Coma Score (GCS) was used. Injuries with GCS lower than eight were treated as severe injuries.

In the observed three-year period, at the Clinic of Neurosurgery, an approximately the same number of the injured patients with isolated severe head injury as well as polytrauma patients was recorded. Traffic traumatism was the most common cause (42.74%) of these injuries. There was no statistically significant difference among the groups that fully recovered which included polytrauma patients with severe head injury and patients with isolated severe head injury.

Isolated severe head injuries as well as polytrauma injuries are usually the result of traffic accidents. The severity of head injury is an important factor for further prognosis and recovery of the injured, and it directly affects the occurrence of diseases, leading often to the lethal outcome in polytrauma patients. *Acta Medica Medianae* 2016;55(3):27-31.

Key words: severe head injury, polytrauma, Glasgow Coma Score

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Introduction

Traffic development has brought about a large number of both advantages and disadvantages. The cause of severe trauma is an injury caused by blunt force in more than 70% of cases, and it is usually the consequence of traffic accidents. Accidents in industry or agriculture, gunshot wounds, falls from height and fights are also the causes of severe traumas. These patients pose a considerable problem from the moment they get injured and demand an interdisciplinary approach under the supervision of an experienced team of experts. When administering the first aid

to the injured with multiple injuries, the most important thing is to clear the airways and provide the oxygen with a mask, or in more serious cases by an endotracheal tube. What is also important is to retain fluid and electrolyte balance. Polytrauma is defined as an injury to two or more organs or systems, with at least one of them being life-threatening (1).

Depending on the dominant type of injury, polytrauma can be divided into four big categories: dominant head trauma, chest trauma, abdominal trauma, and trauma to the skeletal and muscular system as well as the spinal column (2).

In polytraumatized patients, the symptoms of injuries to certain organs can be unclear or not visible enough. This is important when it comes to patients with head trauma who have lost the pain sensation or those who are injured but have not yet developed the signs of acute abdomen. A significant reduction in mortality and morbidity can be achieved in patients with traumatic brain injuries using management protocols. These protocols emphasize the early intubation, rapid transfer to intensive care unit (ICU), prompt resuscitation, early CT brain imaging, urgent evacuation of the

intracranial traumatic expansive lesion, followed by appropriate treatment in ICU (3).

The GCS scale is used during the clinical examination of patients with head trauma in order to determine the extent of injuries as well as his or her level of consciousness. It is a practical method of evaluating the changes based on the eye response as well as verbal and motor responses. It is scored with certain points for every response. The lowest score is 3 and the highest 15. Patients with a GCS score lower than 8 are treated as patients with severe craniocerebral trauma. Also, Brain Trauma Foundation issued recommendations for the routine monitoring of intracranial pressure after severe brain trauma (4). A severe craniocerebral trauma within polytraumas requires a serious treatment of the injured, with an uncertain outcome.

Aims

We wanted to examine how difficult severe head injuries affect the outcome and recovery in polytrauma patients.

Material and Methods

A retrospective study covered a three-year period of clinical evaluation and treatment of patients with severe craniocerebral trauma.

The research was conducted at the Neurosurgery Clinic in the Clinic Center Niš, from the beginning of 2011 until the end of 2013.

The GCS was used for the assessment of the craniocerebral trauma. Patients with GCS equal to or smaller than 8 were treated as those with severe head traumas.

CT scan was one of the most important diagnostic procedures used for the prognosis and treatment of patients with severe craniocerebral traumas, as well as polytraumatized patients.

Results

The number of injured patients shows that over a three-year period there was a statistically insignificant but evident increase (Table 1). Almost the same number of patients with isolated craniocerebral trauma as well as those with polytraumas was treated at the Intensive Care Unit of the Neurosurgery Clinic (Table 2).

Table 1. The total number of the injured

Years	The number of the injured
2011	39
2012	41
2013	44
Total	124

The most common injuries in traffic accidents were head and chest traumas (15%), whereas in falls from height the most common were

limbs and spinal column injuries. Limbs were dominantly injured in fights (Table 3).

Table 2. Severe craniocerebral injury, associated and isolated

Years	Polytraumatized with severe head injury	Isolated severe head injuries
2011	19	20
2012	20	21
2013	21	23
Total	60	64

Table 3. The association between severe craniocerebral injury and injury to other organs

The association of injury to other organs	Number (percentage)
Thoracic injuries (TH)	19 (31.66%)
Violation of the abdomen (AB)	7 (11.66%)
Violation of the extremities (EXT)	22 (36.66%)
Violation of the thoracic or lumbar spine (S)	5 (8.33%)
Cervical spine injuries (CS)	2 (3.33%)
Associated injury with multiple organ	5 (8.33%)
Total	60

Table 4a. The mechanism of injury in isolated severe head injury

Type of injury	Isolated severe head injury
Traffic accidents	28
Fall from height	14
Fight	22
Total	64

Traffic accidents were usually the cause of trauma, in almost 42.74%, in both injured having a severe craniocerebral trauma and those with polytraumas (Tables 4a and 4b).

An important statistical difference between polytraumatized patients with severe craniocerebral trauma and those with isolated craniocerebral trauma was not noted in groups that fully recovered. What was noted was a statistically important difference in polytraumatized patients when it comes to fatal outcome (Table 5). There was no statistically significant difference between the compared groups in which there was complete recovery; $t=0.36$ and less than 1.96 ($P=0.05$).

There was a statistically significant difference as far as lethal outcome is concerned; $t=5.014$, which was higher than 1.96 for $p=0.05$, and is more common in patients with multiple trauma.

Discussion

Craniocerebral traumas are among the leading health problems in the world. They include a variety of different head structure traumas and the visible trauma to the head is usually inversely

Table 4b. Type of injury in polytrauma patients

Type of injury	GK TH	AB AB	EKS EXT	KS S	CKS CS	Multiple organs	Total
Traffic accidents	9	2	8	2	2	2	25
Fall from height	7	4	3	3	0	3	20
Fight	3	1	11	0	0	0	15
Total	19	7	22	5	2	5	60

proportional to traumas to the endocranial structure. After the initial trauma, secondary lesions develop in the brain parenchyma due to the increases intracranial pressure (ICP), edema and bleeding (5). In the USA, about 60 million people are injured each year and 50% of them require medical care and 12% require hospitalization (6).

Table 5. Treatment outcome

Treatment outcome	Polytraumatized with severe head injury	Isolated severe head injuries
Complete recovery	34	42
The residual neurological deficit	8	10
Vegetative state	2	3
Lethality	16	9
Total	60	64

It is often the case that head trauma leads to morbidity and sometimes to mortality. When combined with trauma to another organ or a system, the survival rate drops. Today, traumas are the leading cause of mortality and invalidity in the age group of 1 to 44 year-olds (7). In the total number of injured, polytraumatized patients account for 3%, and the mortality rate is high, ranging between 16 and 22% (8). Polytraumas dominate in regards to their frequency and severity (9).

Esparza and associates note in their paper that traffic accidents are the most common cause of trauma, and that those who are 30-60 years old are usually injured (10).

In the observed period of three years, we had 51.61% of the injured with isolated severe craniocerebral trauma, and 48.38% of those who, apart from having a severe craniocerebral trauma, also had injuries to other systems and organs. It was often the case that severe craniocerebral trauma was accompanied by chest and limb trauma, whereas abdominal and spinal column traumas were somewhat less common. A small injury in terms of stretching cervical spine, without traumatic lesions on bone structures, can sometimes lead to serious damage to the neurovascular elements (11). Regal and associates also claim that head trauma was usually accompanied by limb trauma and chest trauma was accompanied by limb trauma as well, whereas there was a fewer number of combined injuries including the abdomen (12).

CT diagnostics represents the golden standard of giving the precise diagnosis of the extent of injury in polytraumatized patients. This diagnostic procedure enables prioritizing the treatment of injured organs, as well as the follow up treatment of polytraumatized patients. The importance of radiological examination is described in the paper by Pinto and his associates (13). What follows is the adequate surgical treatment of certain injuries prioritized in relation to urgency. Injuries threatening the vital functions directly are treated first: acute intracranial hemorrhage, cardiac tamponade, tension and massive hemopneumothorax, extensive external hemorrhage, perforation of hollow intra-abdominal organs, etc. (14).

Hemo and/or pneumothorax is considered the most common thoracic trauma (15) and requires immediate thoracic drainage. Thoracic drainage was administered to 9 patients in our case.

Bronchopneumonia was recorded in eleven (18.33%) polytraumatized patients, and it was recorded in almost the same percentage (15.62%) in patients with isolated craniocerebral trauma. Berrouane and associates (16) reported bronchopneumonia appearing in patients on mechanical ventilation in 26.2%, whereas Marjanović and associates (17) record a significantly higher percentage of 43.06%, but only in patients with GCS score below 8. It is our conclusion, as well as the conclusion of aforementioned authors, that this complication did not arise from the accompanying chest trauma, but from the extent of the craniocerebral injury which required longer application of the mechanical ventilation.

A statistically significant difference between the duration of treatment of polytraumatized patients with severe craniocerebral trauma and those with isolated craniocerebral trauma was not noted. Polytraumatized patients were on average hospitalized for 15.5 days, while those with isolated craniocerebral trauma spent in hospital for 13.1 days.

The duration of hospitalization was determined by the severity of craniocerebral trauma. A statistically important difference was not found in groups that fully recovered between polytraumatized patients and those with isolated craniocerebral injury. A study by Nikolić and associates also shows that there is not a statistically significant difference between the aforementioned groups. The most important factors when it comes to prognosis for survival are age, patient oxygen saturation, GCS as well as changes on the brain CT (18).

Differences between groups were not noted in regards to the fatal outcome. This means that the severity of the craniocerebral trauma itself plays a significant role in the patient's recuperation.

Conclusion

The research has shown that both isolated craniocerebral trauma and polytrauma are usually the consequences of traffic accidents. The GCS is a method of evaluating the severity of injuries and

the basis of the follow up treatment of an injured person. CT screening is one of the most important diagnostic procedures for the prognosis and treatment of polytraumatized patients as well as those with isolated severe craniocerebral trauma. It is the basis for the appropriate surgical treatment of certain injuries in order or priority. The head trauma severity is an important factor in the prognosis and recuperation of the injured; it also affects the appearance of morbidity and it more often leads to mortality of the injured as a part of the polytrauma.

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UTICAJ TEŽINE POVREDE GLAVE NA ISHOD LEČENJA TRAUMATIZOVANIH BOLESNIKA

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Uzroci teških trauma su najčešće saobraćajni udesi. Teška kraniocerebralna povreda, izolovana ili u sklopu politraume, zahteva ozbiljan tretman povređenog, pri čemu je ishod bolesnika neizvestan.

Cilj rada bio je da se ispita koliko teška kraniocerebralna povreda utiče na ishod i oporavak politraumatizovanih bolesnika.

Retrospektivnom studijom obuhvaćen je trogodišnji period lečenja bolesnika sa izolovanom teškom kraniocerebralnom povredom i teškom karaniocerebralnom povredom u sklopu politraume. Ispitivanje je vršeno na Klinici za neurohirurgiju Kliničkog centra Niš, u periodu od početaka 2011. do kraja 2013. godine.

Za procenu težine kraniocerebralne povrede pri kliničkom pregledu je korišćena Glazgov koma skor (GCS). Sa teškom povredom glave određivani su bolesnici sa GCS manjim od 8.

U pratećem trogodišnjem periodu zabeležen je približno isti broj povređenih sa izolovanom kraniocerebralnom povredom kao i politraumatizovanih koji su lečeni na Klinici za neurohirurgiju. Saobraćajni traumatizam je u najvećem procentu (42,74%) bio uzrok ovih povreda.

Nije nađena statistički značajna razlika u grupama kod kojih je došlo do potpunog oporavka između politraumatizovanih sa teškom kraniocerebralnom povredom i onih sa izolovanom karaniocerebralnom povredom.

Izolovane kraniocerebralne povrede, kao i politraume, najčešće su posledice saobraćajnih udesa. Težina povrede glave je bitan faktor za dalju prognozu i oporavak povređenog i direktno utiče na pojavu morbiditeta, a u sklopu politraume češće dovodi do mortaliteta povređenih. *Acta Medica Medianae 2016;55(3):27-31.*

Ključne reči: kraniocerebralna povreda, politrauma, Glazgov koma skor

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