SEVERE HEAD INJURY ASSOCIATED WITH MULTISYSTEM INJURIES

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ABSTRACT

The incidence of severe head injury (SHI) varies between 20-30/100000. In the developed countries, the SHI contributes for over 50% of the dead outcomes among the trauma patients. Many investigations statistically prove that associated with SHI multisystem injuries negatively affect the outcome. In the present study we aim to investigate which organs and system having concomitant injury with SHI have a maximal negative influence to the outcome. We also aim to systematize the influencing factors, also to revise the treatment strategy. Our investigation is based on a cohort of 57 consecutive patients with dead outcome admitted to "St. Anna" Hospital for the period 2004 - 2006 year. The patients are classified according the localization of the associated injuries. A clinico-therapeutic classification was also made based on the severity of the patient's condition, also according to the necessary urgent management.

Key words: severe, head, multisystem, injury, classification, management, outcome

INTRODUCTION

The incidence of severe head injury (SHI) varies between 20-30/100000. In the developed countries, the SHI contributes for over 50% of the dead outcomes among the trauma patients (2,5,13). In the USA 25% of all hospitalized trauma patients are patients with SHI. Furthermore over 60% of the dead outcomes among trauma patients in the hospitals is related to SHI (2,16).

Many investigations statistically prove that associated with SHI multisystem injuries negatively affect the outcome (4). In recent days multiple factors and mechanisms that are involved in the secondary brain damage were identified (11). The majority of them are as a result of concomitant injury to other organs and systems, that specifically trigger a chain of pathologic events that cause brain edema ischemia hypotonia, hypoxemia, hypercapnia, etc. (2,5,11,15).

In the present study we aim to investigate which organs and system having concomitant injury with SHI have a maximal negative influence to the outcome. We also aim to systematize the influencing factors, also to revise the treatment strategy.

MATERIAL AND METHODS

Our investigation is based on a cohort of 57 consecutive patients with dead outcome admitted to "St. Anna" Hospital for the period 2004 - 2006 year. On admission patients are with SHI - GCS < 8 p. and concomitant injuries to other organs and systems.

Patient's records, imaging, perative protocols and pathologoanatomical findings are analyzed. In the investigated group 38 (67%) are men and 19 (33%) are women with mean age 49,5 (4-88).

In the first 24 hours 23 (40%) of the patients died, while 15/23 (65,2%) died due to asphyxia because of chest injury or aspiration of blood or gastric contents. The average hospitalization period is 6.33 days (0-84). Among the most common reasons for polytrauma are acceleration - deceleration - car accidents - 34 (59,6%), falls from height - 15 (26,3%), also everyday life trauma - 8 (14,1%).

The patients are classified according the localization of the associated injuries, respectively "C" for cerebrum, "T" for thorax, "A" for abdomen and "O" for orthopedic.

Tabl. 1.

Bi-regional	Tri-regional	Quad-regional
CT n=23	CTA n=7	CTAO n=7
CA n=10	CTO n=3	
CO n=7		
70%	17,%	12,5%

The most common are the bi-regional injuries - 40 cases (70%): CT - 23; CA - 10; CO - 7; Next come the tri-re-

gional - 10 cases (17,5%): CTA - 7; CTO - 3. Finally come the quadri-regional- CTAO - 7 (12,5%) (Tabl.1.).

A clinico-therapeutic classification was also made based on the severity of the patient's condition, also according to the necessary urgent management.

- I. Immediate - 24 cases with impaired vital functions necessitating imperious medical treatment - asphyxia, pulmonary aspiration, pneumothorax, haemothorax
- II. Urgent - 21 cases that necessitated operative treatment within 1 hour after the trauma - massive intracranial haematomas, hemorrhages, etc.
- III. Pressing - 7 cases that necessitated operative treatment within 4 hour after the trauma - fractures of big bones, acute ischaemias, ruptured internal organs, etc.
- IV. Postponed - treatment procedures that are necessary but that could be postponed until the condition of the patient is stabilized - facial fractures, urethral ruptures, fractures of small bones etc.

The severity of the patient's condition is evaluated with GCS. Patients with GCS less than 8 are considered as SHI. All of the clinical diagnosis are confronted with the pathologoanatomical diagnosis and with the therapeutic approach.

RESULTS

In the investigated cohort of 57 cases, 23(40%) died within the first 24 hours after the trauma due to ARDS following chest trauma, asphyxia, aspiration of blood or gastric contents, primary brain stem contusion. Between the first and seventh day died 30(52,6%) of the patients due to large brain contusions, severe brain edema, brain stem dysfunction, circulation or/and respiration failure. After the 15th day died 4 with myocardial infarction or pulmonary trombembolism, etc.

In the followed cohort we found 30 combined fractures of the calvaria and the skull base, 13 skull base fractures, 6 calvarial fractures. In 8 of the cases the diagnostic imaging did not reveal skull fractures.

The CT-Scans revealed 32 massive supratentorial brain contusions, 21 brain stem contusions and 4 contusions of the pineal gland. All of the CT-Scan findings were subsequently confirmed with pathologoanatomical diagnosis.

Managing the patients included in the present study we performed 27 craniotomies for evacuation of intracranial haematomas causing acute brain compression - Marshall type IV, extended hemorrhagic contusions, dislocated and causing brain compression skull fractures.

In 86% of the cases the neurosurgical interventions precede the surgical interventions treating trauma consequences in other organs and systems. In the rest of the cases the impaired vital functions are treated before the neurosurgical treatment.

The most common - 23 cases (40%), are bi-regional associated lesions (CT) that require immediate treatment at the place of the accident, during the medical transportation, also in the emergency unit.

DISCUSSION

Many authors emphasize a tendency of significant decrease of the mortality among the patients with SHI (8). However they often exclude patients with severe associated lesions, also these that reach the intensive care units with a big delay (14).

Kuhne et al. (6) study the dead outcome among the patients with SHI, so they found increased risk of mortality in the age above 55 years. This subgroup of patients has twice as big risk of multi-organ injuries if compare with the patients less than 55 years old.

In the group of patients that we investigated, 62% are in the age of 55 years, even though the patients that are less than 55 years old have more extended brain damage, also more severe associated multisystem lesions.

Tepas et al. (12) attribute the increased mortality among the elderly patients to the concomitant morbidity.

Based on this some authors (1,4,7) create prognostic models, finding relation between factors as age, GCS, CT, associated lesions, arterial hypotension, intracranial hypertension, coagulopathy, etc. on the one hand and mortality on the other.

It is noticeable that in the group that we investigated 40% died within 24 hours and almost all SHI have been combined with chest trauma or asphyxia. The period of the first 24 hours after the trauma is the most important period for the injured patients. It is comprised of prehospital resuscitation, stabilization of the vital parameters, diagnostic process in emergency care unit, neurosurgical procedures followed by admission in intensive care unit. Hence, it is extremely necessary a complex clinical-therapeutic plan for treatment of patients with SHI to be worked out. Furthermore it should include the whole period of treatment from the place of the accident to the admission in the specialized clinic.

Respecting the management of SHI, two main methodologies that present the modern conventional good medical practice, were published in the last 10 years - the European (EBIC) (10) and the American (Brain Trauma Foundation) (3).

Regardless some unessential differences, we also support the idea that the neurosurgical evaluation and specific treatment should be started immediately after the vital functions are stable. The complex treatment of these patients should be put in to practice by well trained team under supervision of neurosurgeon following appropriate algorithm.

CONCLUSION

1. Stabilization of the vital functions should treating the patients with SHI and associated multisystem injuries be considered should be considered as an absolute priority.
2. The treatment of such patients should be done in specialized for intensive care units by well trained teams under supervision of neurosurgeon.

3. Regardless of the severity of the injury, patients in the age over 55 years have increased risk of dead outcome if compare to the patients under 55.

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