The treatment of multiple injuries: prehospital emergency aid

Algimantas Pamerneckas, Andrius Macas[1], Algirdas Blazgys[2], Giedrius Pilipavičius, Vytautas Toliušis

Clinic of Orthopedics and Traumatology, [1]Clinic of Anesthesiology, [2]Clinic of Neurosurgery, Kaunas University of Medicine Hospital, Lithuania

***Key words**: high-energy blunt trauma, multiple injury, injury severity, prehospital period, Advanced Trauma Life Support.*

***Summary.** Objective. To evaluate initial (prehospital) assessment and management of high-energy blunt polytrauma patients.*

Material and methods. Prehospital assessment and management of high-energy blunt polytrauma patients was analyzed. The extent of initial assessment and management was compared with Advanced Trauma Life Support recommendations.

Results. Altogether, 101 (63.05%) of 159 polytrauma patients (mean Injury Severity Score was 28.04) were admitted to Kaunas University of Medicine Hospital by the Emergency Aid Service after motor vehicle traffic accidents. In comparison with Advanced Trauma Life Support recommendations initial assessment (ABCDE) reached 14% and management reached 10.6%.

Conclusions. Initial assessment of high-energy blunt polytrauma patients reached 14% and management reached 10.6% of that recommended by Advanced Trauma Life Support.

Introduction

According to data of the World Health Organization (WHO), in 2001 the death rate from motor vehicle traffic accidents (MVTA) was 21.5 deaths per 100,000 population in Lithuania. It is the second highest mortality rate from traffic accidents after the "leader", Latvia (23.5/100,000), among 51 countries in WHO European Region (1).

Ministry of Health Care of Lithuania approved the Program of Health in 1996. It aimed to decrease the mortality rate and to increase the mean of life expectancy at birth as well as to reduce rates of mortality and the number of disability cases caused by traumas or fatal accidents for 30% up to 2010 (2).

Accordingly, the Government of Lithuania has approved the resolution No. 423 as "The National Prevention Program of Traumatism for 2000–2010" (signed on April 14, 2000). It also aimed to reduce the traumatism by 30%.

The Annual Report of the National Health Council (2002) presented as "Lithuanian inhabitants' traumas, accidents and other public health problems" has emphasized the inadequacy between the strategy proposed in "The National Prevention Program of Traumatism for 2000–2010" and actual strategy, as far as the effectiveness of current processes has been insufficient, and the extent of health care problems has increased (3). Therefore, the chairman of Lithuanian National Health Council, Prof. J. Pundzius, has emphasized that Lithuanian health care system should correspond to the principles and minimal requirements of the quality of services in the expanded infrastructure of European Union (4).

Material and methods

The patients who met following criteria were included in study:

1. The type of injury was high-energy blunt trauma (downfall or motor vehicle traffic accidents).
2. The pathology was a severe multiple injury (Injury Severity Score (ISS) >16).
3. One of the injuries was the shaft fracture of long bones of the lower limb.
4. Patients were immediately transported to multiprofile hospital.

The exclusion criteria were:

1. Critically severe head injury (Abbreviated Injury Scale (AIS)=5).
2. Parallel severe pathology of cardiovascular or respiratory systems (decompensation) before the injury.

A total of 159 patients met the inclusion criteria. From overall, 101 patients were carried to University Hospital directly from the place of accident by efforts

Correspondence to A. Pamerneckas, Clinic of Orthopedics and Traumatology, Kaunas University of Medicine Hospital, Eivenių 4, 50009 Kaunas, Lithuania. E-mail: alpa@kmu.lt

of Emergency Aid Service (EAS), and information on medical services and time period was documented in EAS medical files (mandatory form certified by the Ministry of Health Care).

The data of research from medical files were collected prospectively and evaluated retrospectively. Local injury severity was measured by Abbreviated Injury Scale, and total injury severity was assessed by Injury Severity Score (5). The data of the primary survey of patient's health condition and resuscitation gathered by Emergency Aid Service personnel during prehospital period were compared with recommendations of primary survey and resuscitation defined by Advanced Trauma Life Support (ATLS).

According to ATLS rapid primary evaluation constitutes the ABCDE of trauma care:

A – airway maintenance with cervical spine protection;

B – breathing and ventilation;

C – circulation with hemorrhage control;

D – disability: neurological status;

E – exposure (6).

Aggressive resuscitation and management of life-threatening injuries, as they are identified, are essential to maximize survival in patients with multiple injuries. The airway should be protected in all patients and secured when the potential for airway compromise exists. Every injured patient should receive supplemental oxygen. A minimum of two large-caliber intravenous catheters should be established (6).

All statistical tests were accomplished using the SPSS for Windows version 12.0. Data are expressed as mean±SD. Differences between percentages were analyzed using χ^2 statistics. Mann-Whitney U test was used to check the hypothesis of mean differences. Values of $p<0.05$ were considered significant.

Results

We analyzed the data of 159 patients who met the inclusion criteria and were treated for the severe multiple injuries at Kaunas University of Medicine Hospital from January 1988 to June 2004. There were 71.7% of males (n=113) and 28.9% of females (n=46) ($p<0.001$). The mean age of patients was 43.9±1.4 years (males – 40.9±1.5 years and females – 51.3±3.1 years; $p<0.01$). A total of 132 patients were injured in motor vehicle traffic accidents, of whom 62.9% were pedestrians, 24.2% – drivers, and 12.9% – passengers.

The mean ISS was 28.04 (minimum – 16, maximum – 57). There were 62 patients with moderate injuries (ISS=16–24), 91 patients with severe injuries (ISS=25–49), and 6 patients with critical injuries (ISS=50–75) (Fig. 1).

Fifty-eight patients were transferred from regional hospitals, and complete data on primary survey and resuscitation were not available. They were excluded from the study. Altogether, 101 patients attended by a physician or paramedic were carried to University Hospital directly from the place of accident by emergency ambulance. The mean injury severity of these patients (n=101) was 28.04±0.98 according to ISS. The prehospital time elapsed from the registration of trauma to admission to University Hospital was in an average of 47.7±2.81 min.

The mortality rate in the group (n=101) of polytrauma patients was 22.8% (n=23). The mean age of dead patients was 56.79 years, and the ISS was 40.42. No patient with moderate injury (ISS=16–24) has died; 30.8% of patients in the severe injury group have died, and 83.3% of critically injured patients in have died. Contingency coefficient was – F=2.3; $p<0.05$.

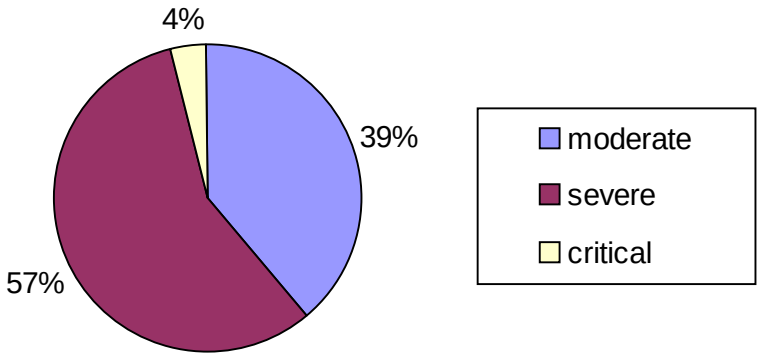

Fig. 1. **The injury severity in patients (n=101) according to Injury Severity Score**

Primary survey

There was no evidence about cases of airway maintenance and cervical spine protection (A in ABCDE of trauma care).

Breathing and ventilation (B in ABCDE of trauma care) were assessed in 7.9% of cases (n=8).

The circulatory system (C in ABCDE of trauma care) in 46.5% of cases (n=47) was not assessed at all. The pulse rate was measured in 40.6% of cases (n=41), and mean pulse rate was 92.46±2.96 beats/min. The arterial blood pressure was measured in 52.5% of cases (n=53), and mean systolic blood pressure was 109.15±4.00 mmHg. Consequently, the shock index (ratio of heart rate to systolic blood pressure) for assessed patients was 0.85 (preshock). In 14.8% of cases (n=15) during prehospital assessment the shock index was more than 1 (patient with shock).

The consciousness level (D in ABCDE of trauma care) was evaluated in 8.9% of cases (n=9).

There were no evidence in medical files of Emergency Aid Service about case of patient exposure (E in ABCDE of trauma care) and environmental control.

The overall extent of prehospital primary survey of study group (n=101) was 11.48% in comparison with ABCDE of trauma care recommended by ATLS (Fig. 2).

Resuscitation

No one patient received supplemental oxygen by intubations or oxygen mask, and there were no evidence about airway or cervical spine protection.

The intravenous fluid therapy was initiated in 12.9% (n=13) patients. For 18.8% of patients (n=19) analgesics were administrated. The infusion-therapy and the analgesics together were used in 8.9% of cases (n=9).

The beginning of the resuscitation time was not registered, and the patient's condition was not repeatedly examined.

The overall extent of prehospital resuscitation of study group (n=101) was 4.3% in comparison with ATLS recommendations (Fig. 3).

Discussion

Abraham Lincoln once remarked, "To save a man's life is the most a person can do for another" (7).

The life of the trauma patient depends on how well the traumatologist can accomplish the primary goal of trauma care: optimal care within an optimal time frame to save the life (7).

The treatment of the seriously injured patient requires rapid assessment of the injuries and institution of life-preserving therapy. Because time is of the essence, a systemic approach is desirable. The patient's vital

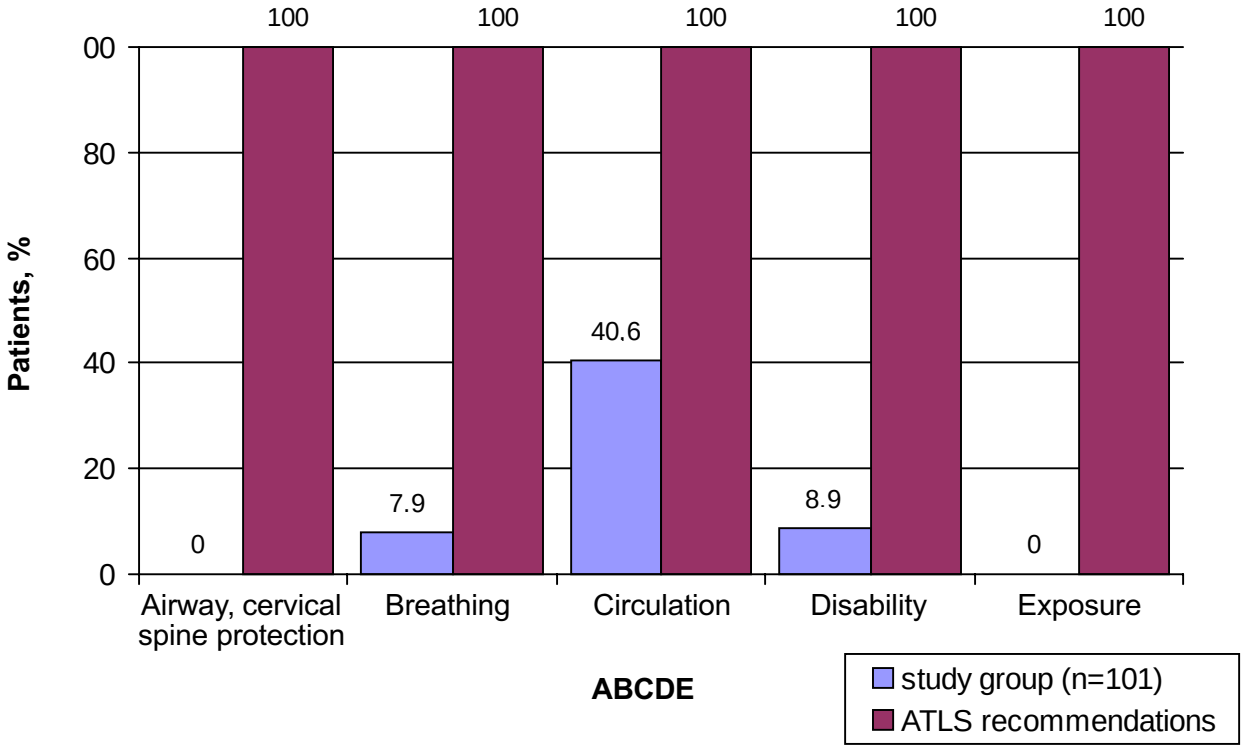

Fig. 2. **The comparison of EAS primary survey rate with ATLS recommendations**
ATLS – Advanced Trauma Life Support; EAS – Emergency Aid Service.

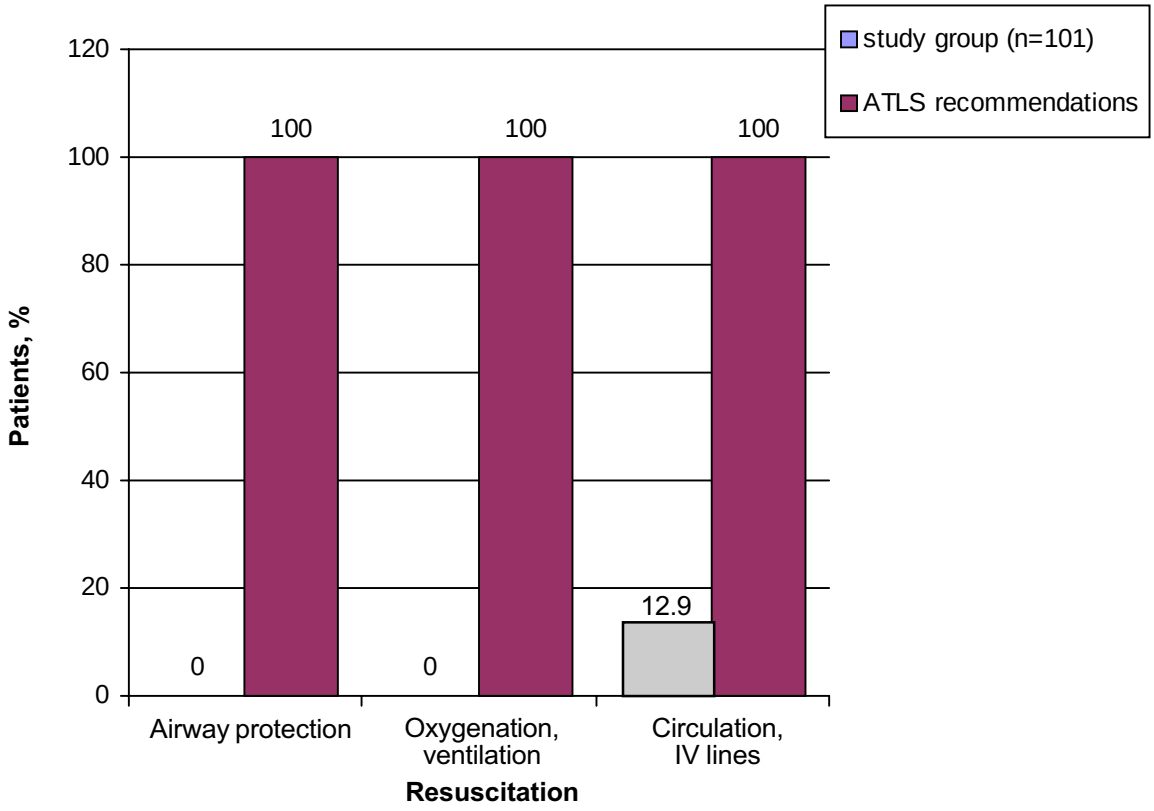

Fig. 3. **The comparison of EAS resuscitation rate with ATLS recommendations**
ATLS – Advanced Trauma Life Support; EAS – Emergency Aid Service.

functions must be assessed quickly and efficiently (6).

There were little studies on the extent of prehospital health care services related to the trauma patients and their quality in Lithuania. In the prospective study of 264 trauma patients by D. Vaitkaitis, the urban Emergency Aid Service performed 49.4% and the rural EAS 40.2% of the *demanded procedures* (term by author) including the treatment with analgesics (33.8 and 20.2% of cases, respectively), cervical spine protection (69 and 59% of cases) and intubations (0% of cases) (8). In this prospective study only some aspects of the resuscitation (airway protection by "S" tube, oxygen mask inhalation, intubations, pain-killing) or body immobilization (extremities, cervical and thoracic-lumbar spine protection) were assessed. The information on primary survey was not collected. A retrospective study of 42 patients with the high-energy blunt polytrauma and cervical spine injury performed by D. Vaitkaitis, R. J. Kalesinskas, E. Kontautas found that during prehospital period only in 5% of cases cervical spine of patients was protected with the rigid neckband (9). It was also indicated in this study that the time from receiving a call to the transfer to hospital was approximately 18.5 min in the city and 51.2 min in the rural areas.

It seems to be the marked difference between prospective and retrospective analysis of data about pre-hospital medical procedures performed. The data received from the disclosed prospective 2-week study (the personnel of EAS knew about data collecting, filled in the special card files and then returned them directly to investigators) showed that the urban EAS protected 69% of the trauma patients with the rigid neck collar while the rural EAS – 59% of patients. However, the retrospective study of patients with the high-energy polytrauma and cervical spine injury (reviewing the standard archival documentation) indicated that only in 5% of cases patient's neck was immobilized (8, 9). Our data are very close to this.

There have been some essential conceptual aspects of organizing the trauma care. The discussion about the organization of prehospital trauma care defined two main trends: so-called "scoop and run" and "stay and play" strategies (7, 10).

There are no doubts about stress in prehospital trauma care priority in our Emergency Aid Service activities. The only clear and official medical request is the preliminary diagnosis of injury. The data about patient's condition and treatment activities are not requested in obligatory. Thereby, prehospital primary survey and resuscitation for trauma victims are not requirement for Emergency Aid Service. There are

no any official guidelines and algorithms for that. Organization of trauma care in prehospital period is left for health care professionals. Concept of "scoop and run" is still realized.

If compare to German system of prehospital emergency aid, supposed to be one of the best, nearly 81% of patients with severe chest injuries (AIS>3) as well as nearly 90% of patients with severe head injuries (Glasgow Coma Scale <9/15) are treated by intubation in the place of accident. The average time of prehospital emergency aid (including the primary survey, resuscitation, and transportation) was approximately 60 min (11).

In the study of 12,208 trauma patients by J. S. Sampalis *et al.* logistic regression analysis demonstrated the association among the time, treatment, and outcome. The authors stated that for every additional minute of out-of-hospital time, the risk of dying (in these major trauma patients) increased by 5% (12).

Conclusions

Since there are no any official guidelines and algorithms for organization of trauma care in prehospital period, it seems that the primary survey and resuscitation are left for health care professionals. The only medical request indicated for prehospital Emergency Aid Service is the preliminary diagnosis of injury. The data on patient's condition and treatment activities are not requested in obligatory. Thereby, it looks like prehospital primary survey and resuscitation for trauma victims are not requirement for Emergency Aid Service. Concept of "scoop and run" is still realized. In summary, patients with multiple injuries do not receive proper personal health care services from Emergency Aid Service during the prehospital period.

Dauginės traumos gydymas: pradinės būklės įvertinimas ir ligonio gaivinimas ikihospitaliniu laikotarpiu

Algimantas Pamerneckas, Andrius Macas[1], Algirdas Blazgys[2], Giedrius Pilipavičius, Vytautas Toliušis

Kauno medicinos universiteto klinikų Ortopedijos ir traumatologijos klinika, [1]Anesteziologijos klinika, [2]Neurochirurgijos klinika

Raktažodžiai: didelės energijos buka trauma, dauginis sužalojimas, sužalojimo sunkumas, ikihospitalinis laikotarpis, ATLS (angl. *Advanced Trauma Life Support*).

Santrauka. *Darbo tikslas.* Įvertinti greitosios medicinos pagalbos medikų atliekamo pirminio būklės įvertinimo ir didelės bukos energijos sužalotų ligonių gaivinimą.

Tyrimo medžiaga ir metodai. Analizuotas didelės bukos energijos traumuotų ir universitetinėje ligoninėje gydytų ligonių pirminis būklės įvertinimas bei gaivinimas. Ligonių būklės įvertinimo ir gaivinimo apimtys palygintos su ATLS rekomendacijomis.

Rezultatai. 101 ligonis, patyręs dauginius sužalojimus (ISS (angl. *Injury Severity Score*) lygus 28,04±0,98), hospitalizuotas į universitetinę ligoninę po traumos. Nuo iškvietimo užregistravimo iki hospitalizavimo praėjo vidutiniškai 47,7±2,81 min. Lyginant su ATLS rekomendacijomis, ligonių pirminis būklės įvertinimas siekė 11,5 proc., o gaivinimas – 4,3 proc. apimties.

Išvados. Greitoji medicinos pagalba prastai įvertina ligonių, patyrusių didelės bukos energijos traumą su dauginiais sužalojimais, būklę bei netinkamai juos gaivina palyginus su ATLS rekomendacijomis.

Adresas susirašinėti: A. Pamerneckas, KMUK Ortopedijos ir traumatologijos klinika, Eivenių 4, 50009 Kaunas
El. paštas: alpa@kmu.lt

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Received 1 August 2005, accepted 15 May 2006
Straipsnis gautas 2005 08 01, priimtas 2006 05 15