ORIGINAL ARTICLE

Clinical and prehospital survival indicators in blunt trauma: a multivariate analysis*

INDICADORES CLÍNICOS E PRÉ-HOSPITALARES DE SOBREVIVÊNCIA NO TRAUMA FECHADO: UMA ANÁLISE MULTIVARIADA

INDICADORES CLÍNICOS Y PREHOSPITALARIOS DE SUPERVIVENCIA AL TRAUMA CERRADO: UN ANÁLISIS MULTIVARIADO

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ABSTRACT

The aim of the study was to identify the clinical and prehospital indicators associated to the survival of blunt trauma victims. The Kaplan Meier survival analysis and the Cox proportional hazards model were used to analyze the association of 33 variables to early and late death, proposing multivariate models. The final models until 48 hours post-trauma showed high rates of risk promoted by abdominal injuries, Injury Severity Score ≥ 25, advanced respiratory procedures and prehospital chest compressions. In the model up to 7 days, a systolic blood pressure in accident site lower than 75mmHg was associated with increased risk of death, and if absent it was associated with higher risk of death after 7 days. The prehospital volume replacement showed a protective effect in all periods. Results suggest that the magnitude of hypoxemia and hemodynamic instability due to bleeding had a significant influence on early and late death in this group of victims.

KEY WORDS

Multiple trauma.
Survival.
Proportional hazards models.
Accidents, traffic.

RESUMO

O objetivo do estudo foi identificar os indicadores clínicos e pré-hospitalares associados à sobrevivência de vítimas de trauma fechado. Foram utilizadas a análise de sobrevivência de Kaplan Meier, e de Riscos Proporcionais de Cox, para analisar a associação de 33 variáveis ao óbito precoce e tardio, propondo modelos multivariados. Os modelos finais até 48h pós-trauma evidenciaram altos coeficientes de risco promovidos pelas lesões abdominais, Injury Severity Score ≥25, procedimentos respiratórios avançados e compressões torácicas pré-hospitalares. No modelo até 7 dias, a pressão arterial sistólica na cena do acidente, se menor de 75mmHg, foi associada a maior risco de óbito e se ausente, foi associada ao mais elevado risco de óbito após 7 dias. A reposição de volume pré-hospitalar apresentou efeito protetor em todos os períodos. Os resultados sugerem que a magnitude da hipoxemia e da instabilidade hemodinâmica diante da hemorragia, influenciaram de forma significante o óbito precoce e tardio desse grupo de vítimas.

DESCRITORES

Traumatismo múltiplo.
Sobrevivência.
Modelos de riscos proporcionais.
Acidentes de trânsito.

RESUMEN

El objetivo del estudio fue identificar los indicadores clínicos y prehospitalarios asociados a la supervivencia de víctimas de trauma cerrado. Fueron utilizados el Análisis de Supervivencia de Kaplan-Meier y de Riesgos Proporcionales de Cox para examinar la asociación de 33 variables respecto de la muerte temprana y tardía, proponiéndose modelos multivariados. Los modelos finales hasta 48 horas post trauma mostraron altos coeficientes de riesgo promovidos por las lesiones abdominales, *Injury Severity Score* ≥ 25, procesos respiratorias avanzados y compresiones torácicas prehospitalarias. En el modelo hasta 7 días, la presión arterial sistólica en la escena del accidente, cuando resultó inferior a 75mmHg, se asoció con mayor riesgo de muerte y, en caso de ausencia, se asoció con el mayor riesgo de muerte posterior a 7 días. La reposición de volumen prehospitalario mostró un efecto protector en todos los períodos. Los resultados sugieren que la magnitud de la hipoxemia y la inestabilidad hemodinámica debida a la hemorragia influyeron de manera significativa en la muerte temprana y tardía en este grupo de víctimas.

DESCRIPTORES

Traumatismo múltiple.
Supervivencia.
Modelos de riesgos proporcionales.
Accidentes de tráfico.

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INTRODUCTION

Countless variables interfere in the survival result of blunt trauma patients. These involve the severity of the trauma event, the victims' clinical conditions and injuries suffered, in addition to the emergency and intra-hospital care models of the received care[1-3].

This multiplicity of factors makes it difficult to statistically demonstrate the association between the result and one or more variables and, therefore, to determine prognostic indicators of blunt traumas, mainly indicators of the emergency phase, which relate to a very short care period[2].

In the attempt to determine this association, the use of mortality analysis as a statistical method is common[4-5], although this type of analysis privileges the dichotomous result *living or dying* and does not permit observing the variables' impact over time, until the result.

The use of survival analysis can permit this observation, as the dependent variable becomes the time until death, while independent variables are the different factors that can interfere in the occurrence of this event over time[6-9]. Through this approach, the prognostic indicators related to early or late death can be evidenced according to certain time periods, depending on scientific interest.

In trauma research, this type of analysis has been used to assess the results of patients with head and brain traumas[6-7] and severely traumatized patients[8]. In these studies, though, except for intubation at the accident scene, interventions or variables related to the victim's assessment in the prehospital care period were not taken into account.

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This research aims to identify the factors that influenced the survival of a group of blunt trauma victims attended within the same prehospital and intra-hospital care model, using the statistical technique of survival analysis, with a view to favoring evidence about the impact of clinical and emergency care variables over time after the trauma, proposing a multivariate model that explains these victims' survival and reveals the mortality risk.

METHOD

Retrospective and longitudinal research, using data from the prehospital and intra-hospital care phases related to 175 transportation accident victims in São Paulo City/Brazil, between April 1999 and March 2003 and authorized under process 274/2002/CEP/EEUSP and letter 015/2003/CEP by the São Paulo Municipal Health Office. All victims were between 12 and 65 years old, with a Revised Trauma Score for screening (RTSt) ≤11 at the accident scene, and were attended and transported by an advanced life support team (ALS) from the municipal prehospital care service (PHC) to a tertiary hospital.

Data were collected from ALS records, from the victims' hospital files and, when necessary, from autopsy reports. Criteria to include the victims in this research were established to compose a study group with a similar trauma mechanism, physiological alteration detected as early as the prehospital care phase and who, because they needed more medical and technological care resources, received ALS care and were forwarded to tertiary hospitals.

The variables analyzed in terms of the victims' survival time were:

a) **Clinical variables**: gender, age, trauma mechanisms (victim's vehicle, victim's position in the vehicle and type of impact), physiological repercussion at the accident scene and trauma severity.

b) **Prehospital care variables**: time consumed in different ALS phases (response time, scene time and total time) and procedures performed. The following ALS procedures were considered:

- Basic respiratory support: oxygen therapy, Guedel airway and aspiration;
- Immobilizations: cervical collar, long board and limbs immobilization;
- Basic circulatory support: cardiorespiratory reanimation (CPR) and dressings;
- Advanced respiratory support: orotracheal intubation (OTI), percutaneous transtracheal ventilation (PTV), thoracic puncture and/or drainage;
- Advanced circulatory support: venous access, crystalline solution infusion for volume replacement (> or ≤ than 1000 ml) and drugs administered.

Time intervals were analyzed considering cut-off points at 10 minutes of response or scene time and intervals of 30 and 60 minutes of total time.

The physiological repercussion of the trauma at the accident scene was assessed through the total (ranging from 0 to 12 points, with zero as the worst result and scores ≤10 as critical) an partial RTSt, (systolic blood pressure, respiratory frequency and Glasgow Come Scale) and through the fluctuation in these parameters until the hospital unit (subtracting the score upon arrival at the scene from the score upon arrival at the hospital). Positive fluctuations were considered a sign of improvement in the victim's physiological condition during the ALS phase. If negative, the fluctuation appointed worsening in the initial condition. The absence of fluctuation was considered as maintenance of the condition.

To determine the patients' global severity, the Injury Severity Score (ISS)[10] and the Maximum Abbreviated Injury

Scale (MAIS)[11] were used. The ISS was categorized as 1 to <16 (mild trauma), 16 to <25 (moderate trauma) and ≥25 (severe trauma). The MAIS[11] according to body region (face, head, neck, thorax, abdomen, spine, upper limbs, lower limbs and external surface) was used to express the injuries' global severity per body region. Any injury of MAIS≥3 was considered severe; injuries of MAIS=2 were moderate and MAIS=1 mild.

The dependent variable was survival time after the accident, analyzed according to the intervals of interest: within 6 hours, up to 12 hours, up to 24 hours, up to 48 hours, up to 7 days and until hospital discharge if superior to 7 days. Deaths occurred after discharge from hospital were not taken into account.

Kaplan Meier's Survival Analysis (KMSA) was used to determine the variables associated with survival in each interval (Log rank test, $p \leq 0.05$). *Event* was considered as death by trauma and *censored data* were related to patients who were alive or discharged until each of the intervals under analysis[9].

The variables selected by KMSA were submitted to multivariate analysis using Cox' Proportional Hazards Regression Model[9] (CPHRM), (Wald test, $p \leq 0.05$), which estimates the effect of an independent variable on survival after being adjusted by the estimated effect of other variables, so as to estimate the mortality risk of a group of people when different prognostic variables are present[9].

Forward selection was used as a modeling process, starting with procedure and RTS-related variables, followed by modeling with trauma severity-related variables. The variables were removed from the model when they did not reach a statistically significant association. The final model presented the best statistical significance and clinical clarity. SPSS 10.0 was used for statistical analysis.

The retrospective analysis used in this research imposes some limitations, such as wrong or inexistent notes, which cannot be minimized, mainly in the emergency care phase, when the scene is inhospitable and leads to difficulties to make notes, as well as loss of patients who, even after three systematic searches, were not located in any of the study phases.

RESULTS

The total group comprised 175 patients, 86.9% of whom were male, mostly between 20 and 39 years of age (61.1%), with a mean age of 31.9 years (sd 11.3; med 30); 45.1% of victims were pedestrians, 30.9% motorcycle drivers and 18.9% were in vehicles. Among patients who were in some kind of vehicle, 36.4% received a frontal impact and 27.1% a lateral impact; other types of impacts were less frequent.

On the average, ALS response time was 8.6 min (sd 6.3min), scene time 20.2 min (sd 11.7 min) and total time 41.0 min (sd 17.7 min), with 84.6% of the victims reaching the destination hospital within less than 60 minutes after the trauma.

Among Basic Life Support procedures, immobilizations were the most frequent (98.9%). Oxygen therapy was needed in 96.0% of the victims. Thoracic compression maneuvers were executed in 16 victims (9.2%). Peripheral venous punctures for volume replacement or medication were the most frequent Advanced Life Support procedures (92.0%), and isotonic crystalloid solutions with volumes of less than 1000ml were the most frequent option for volume replacement, 70.7% (Ringer's lactate 57.9%). Medication use was described in only 33.1% of the victims, with psychoactive drugs and sedatives as the most common medicines (16.0%). Advanced airway procedures were performed in 38.2% of the victims, with OTI as the most frequent intervention.

The mean RTSt at the scene was 8.8 (sd 3.2; med 10). Victims with RTSt≤10 corresponded to 57.1%. RTSt fluctuations were observed in 54.3% of the victims (39.4% with positive fluctuation). The Glasgow Coma Scale (m 9.2; sd 4.2; med 9) showed the largest number of victims with positive (19.4%) and negative (12.0%) fluctuations.

As for the ISS, (μ 19.4, sd 14.1; med 17; min 1; max 57), victims with ISS <16 corresponded to 39.4% and severe trauma victims (≥25), 37.2%.

The most frequently affected body segments were the head, lower limb and external surface (Table 1). MAIS scores 4 and 5 were observed in victims with head, thorax and abdominal injuries and lower limb.

Considering the association between injuries in different body segments, additional analysis showed 22 victims with head and brain injuries associated with abdominal trauma (mortality rate 81.8%) and 26 cases of head and brain injuries together with thoracic trauma (with 80.7% of deaths), besides 11 victims with head, thorax and abdominal injuries (with 100% of deaths).

Table 1 - Distribution (No. and %) of victims according to presence of injuries and MAIS, considering the body segments included in the AIS - São Paulo - 1999/2003

Variable	MAIS 1 and 2		MAIS 3		MAIS 4 and 5		Non-specific		Subtotal (Presence of injuries)		Subtotal (Absence of injuries)		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Head	23	13.1	17	9.7	63	36.0	-	-	103	58.8	72	41.2	175	100.0
Face	57	32.6	1	0.5	-	-	-	-	58	33.1	117	66.9	175	100.0
Neck	1	0.5	1	0.5	-	-	1	0.5	3	1.5	172	98.5	175	100.0
Thorax	5	2.9	21	12.0	27	15.4	-	-	53	30.3	122	69.7	175	100.0
Abdomen	18	10.3	20	11.4	14	8.0	-	-	52	29.7	123	70.3	175	100.0
Lower limbs	40	22.8	35	20	4	2.3	-	-	79	45.1	96	54.9	175	100.0
Upper Limbs	55	31.5	6	3.4	-	-	-	-	61	34.9	114	65.1	175	100.0
Spine	10	5.7	3	1.7	-	-	1	0.5	14	7.9	161	92.1	175	100.0
External Surface	70	40.0	-	-	-	-	-	-	70	40.0	105	60.0	175	100.0

Table 2 shows that, of all victims in the sample, 63 (36.0%) died, 32 deaths (50.8%) during the first 6h and 13 (20.6%) more than 7 days after the accident. Seven deaths (11.1%) occurred up to the first hour after the accident.

In the KMSA applied to the 33 variables described (Table 3), 11 emergency and 5 clinical variables showed a statistically significant association with survival at all intervals under analysis; 3 variables were associated with specific intervals and 14 were not statistically associated with survival. Statistically associated variables were selected for modeling, using the CPHRM technique.

Table 4 shows that the final models involved 3 emergency care and 3 other clinical variables.

Table 2 - Distribution of victims (No. and %), according to exit condition and time until death after the trauma event - São Paulo - 1999/2003

Exit condition	N	%
Death within 6h	32	18.3
Death between 6h and <12h	5	2.9
Death between 12h and <24h	4	2.3
Death between 24h and <48h	3	1.7
Death between 48h and <7 days	6	3.4
Death within more than 7 days	13	7.4
Subtotal – Deaths	63	36.0
Hospital discharge	108	61.7
No Information*	4	2.3
Total	**175**	**100**

Table 3 - Distribution of variables according to KMSA result - São Paulo - 1999/2003

Associated with survival in all time intervals*	Associated with survival in specific time intervals*	Not associated with survival
• Basic circulatory procedures • Advanced respiratory procedures • Replaced volume • Drugs • RF, SBP and initial GCS • Total RTS • Fluctuation in total RTS • Fluctuation in RF and GCS • ISS • MAIS thorax, abdomen, lower limbs and External surface	• Basic respiratory procedures (at intervals between 6 and 12h) • Advanced circulatory procedures (at all intervals up to 7 days) • MAIS head (at interval after 7 days)	• Gender • Age • Accident mechanisms (vehicle and victim's position, type of impact) • Response time, scene and total • Fluctuation in SBP • Immobilization procedures • MAIS face, neck, spine, upper limbs

* Descriptive significance level according to Log Rank test <0.05

Table 4 - Cox' proportional hazard regression coefficients according to variable and predetermining category, selected for the model and according to studied interval - São Paulo - 1999/2003

Variable and category	Within 6 hours	Up to 12 hours	Up to 24 hours	Up to 48 hours	Up to 7 days	Until hospital discharge
Advanced respiratory procedures						
Performed	8.8 *p<0.001*	8.8 *p<0.001*	9.2 *p<0.001*	10.1 *p<0.001*	10.9 *p<0.001*	5.2 *p<0.001*
Not performed*	1	1	1	1	1	1
Basic Circulatory Procedures						
Thoracic pressure with or without compressive dressing	6.7 *p=0.004*	6.6 *p=0.003*	4.1 *p=0.014*	3.2 *p=0.034*	-	-
Compressive dressing	1.0 *p=0.928*	1.5 *p=0.398*	1.0 *p=0.851*	0.9 *p=0.999*	-	-
Not performed*	1	1	1	1		
Replaced volume						
Crystalloid Sol. <1000ml	0.1 *p=0.003*	0.1 *p=0.002*	0.04 *p< 0.001*	0.04 *p<0.001*	0.1 *p<0.001*	0.1 *p=0.002*
Crystalloid Sol. >1000ml	0.1 *p=0.013*	*0.1* *p=0.005*	*0.05* *p<0.001*	*0.05* *p<0.001*	*0.1* *p=0.001*	*0.1* *p=0.005*
Not performed*	1	1	1	1	1	1
MAIS Abdomen						
1 and 2	4.2 *p=0.033*	3.1 *p=0.073*	4.8 *p=0.004*	4.8 *p=0.002*	3.6 *p=0.006*	2.6 *p=0.019*
3	9.7 *p<0.001*	11.0 *p<0.001*	10.3 *p<0.001*	11.2 *p<0.001*	8.0 *p<0.001*	3.9 *p=0.002*
4 and 5	7.4 *p=0.001*	9.1 *p<0.001*	13 *p<0.001*	16.7 *p<0.001*	6.2 *p=0.002*	3.6 *p=0.016*
No injuries*	1	1	1	1	1	1
ISS						
1 to <25 *	1	1	1	1	1	1
≥25	4.2 *p=0.014*	4.0 *p=0.008*	4.5 *p=0 .002*	3.0 *p=0.008*	3.3 *p=0.004*	3.7 *p<0.001*
Initial SBP in Emergency Life Support						
0=Absent	-	-	-	-	6.7 *p<0.001*	6.5 *p<0.001*
1 and 2= 1 to 75mmHg	-	-	-	-	3.1 *p=0.041*	2.2 *p=0.108*
3=76 to 89mmHg	-	-	-	-	2.1 *p=0.086*	1.7 *p=0.128*
4= > 89mmHg *	-	-	-	-	1	1

(a) Descriptive significance level according to Wald test (*) Baseline category (-) Not selected for the interval model.

The final models for intervals of up to 48h comprised the same prognostic variables and evidenced the growing importance of the abdominal segment during this period through the highest death risk coefficients. In this phase, high death risk levels also stood out for victims who needed advanced respiratory procedures or thoracic compressions in the ALS phase, as well as the importance of global trauma severity and the protective effect of volume replacement.

In the interval of up to 7 days, thoracic compressions lost significance in the adjusted model and another circulatory component was included: the SBP at the accident scene. If lower than 75mmHg, this was associated with greater mortality risk in this interval and, if absent, this was associated with higher death risk after 7 days. Volume replacement maintained its protective effect in all periods.

Victims submitted to advanced respiratory procedures showed an 8.8 times higher risk of death in relation to other victims within 12 hours after the transportation accident. After this period, the need to perform advanced respiratory procedures continuously increased the risk of death up to the first week after the accident, when it was 10.9 times higher.

In the final models for the period up to 48h, victims with abdominal injuries of MAIS≥3 showed a growth trend of the regression coefficients. Victims with MAIS 1 and 2 presented significant coefficients only as from intervals of up to 24h.

The adjusted death risk coefficients of the ISS variable presented significance during the entire analysis period. The maximum coefficient was reached in the interval of up to 24h (p=0.002).

DISCUSSION

As presented in this study, since 1983, the *Trimodal Trauma Mortality Distribution*[12] already appoints the importance of considering the time between the trauma and death when determining the factors associated with this result.

To describe the Trimodal distribution, the author[12] presented the results for a sample of trauma victims of different etiologies with fatal results, submitted to mortality analysis, concluding that deaths were distributed in three time intervals. The first peak referred to deaths occurred during the first minutes, while still at the accident scene, due to severe brain, heart, thorax or aorta injuries (45%). Deaths occurred within 60 minutes after the trauma constituted the second peak with 34% and were associated with the occurrence of hemopneumothorax, pelvic and abdominal organ injuries, extra and subdural hematoma or long bone fractures. Deaths after several days or weeks due to infections or multiple organ failure represented the third peak, with about 20% of all deaths[12].

Despite the similarity in the proposal and involvement of abdominal and thoracic injuries, though, in this research, the association between head injuries and deaths was found in the late post-trauma phase (7 days) only and, even when considering that the head was the most affected segment in percentage terms, with the common occurrence of MAIS 4 and 5 injuries in this segment (36%), this did not affect the variable's inclusion in the final model in any interval.

Head and brain injuries' later involvement with deaths and thorax, abdominal, lower limb and external surface injuries' involvement with deaths since the earliest phase until late post-trauma periods were already demonstrated in other studies that used the statistical strategy of survival analysis[6,8], alerting about the probable association between hemorrhagic causes and negative results until late phases. Researchers[1] affirm that patients with head and brain injuries can benefit from stabilization at the accident scene, particularly from procedures to optimize oxygenation and circulation, which help to prevent secondary injuries due to hypoxia or cerebral edema, delaying death.

Time is a critical factor in care delivery to trauma victims[1-2,4], but the time consumed in the emergency care phase was not associated with survival in Kaplan Meier's univariate analysis in any of the intervals (Table 3), even when considering internationally accepted cut-off points like the *Platinum ten minutes* at the scene[1] or the thirty[1] and sixty-minute intervals of total time, called the *golden hour*[13]. The more homogeneous composition of the group, already justified in the methods section, may have contributed to this result, favoring the statistical association of other variables of greater clinical interest.

In general, the multivariate models presented in this research reflect the synergistic relation between the occurrence of hypoxemia, hemodynamic instability and hemorrhage and deaths, confirming that these factors and their repercussions constitutes trauma victims' main enemies[14].

In the final models, the *advanced respiratory procedures* and *basic circulatory procedures*, i.e. OTI and external thoracic compression maneuvers in the emergency care phase, resulted in high death risk coefficients.

Other studies[1-2,4] already demonstrated low survival rates among victims submitted to OTI, but did not justify the abandonment of this procedure. Early OTI permits correct lung expansion and avoids intra-pulmonary shunt, delaying the adverse effects of hypoxia[3]. The clinical interpretation of this variable in the model is that the victim needed the procedure due to the repercussion of the trauma and it is this need that entails risk, instead of the accomplishment of the procedure. OTI should be acknowledged as a prognostic factor that indicates high risk of death, given its indication in already complex situations, ratifying that hypoxia and hypoperfusion provoked by severe trauma represent high death risks, even in cases of intervention.

Nevertheless, it needs to be taken into account that the high mortality rates after OTI can also be related with intubation difficulties at the accident scene, delays to perform the procedure or even badly accomplished and/or aggressive ventilation post-OTI, with hyperventilation[3] and, therefore, against international care parameters[13]. The analysis of OTI procedure difficulties and decision making to perform the procedure, as well as the ventilation technique after OTI and its implications, represent an interesting perspective for further research.

In the sample under analysis, two out of 16 cardio-respiratory arrest victims submitted to CPR procedures on scene survived (12.5%). Although international guidelines[13] do not recommend emergency CPR in blunt trauma victims due to their low viability and the risk for professionals, the results presented here and results from another recent study[15] demonstrated a significant percentage of survivors, reviving discussions on this recommendation. In clinical practice, these results indicate that, except in cases of obvious death, teams should incorporate investments in on scene CPR procedures into their protocols, attempting to maximize the survival of blunt trauma victims.

The practical value of ISS or MAIS to guide therapy is limited. The use of these scales, however, permitted knowledge about the body segments related to survival and this recognition can change protocols to treat these patients.

Considering the analysis of clinical variables with the multivariate technique, in this sample, the commitment of the abdominal region seems to have been preponderant for negative results, as well as ISS with a cut-off point $\geq$25, producing good adjustment of the models. This combination of clinical variables seems to have better expressed the severity of the clinical situation, to the detriment of the physiological repercussion expressed by the RTSt and injuries to other specific body segments like the head.

In transportation accidents, abdominal injuries result from rapid speed changes, which can lead to vein and organ ruptures and bleedings of different intensities(13). In multiple trauma victims, the discrete signs of physiological alteration this bleeding provokes can impair, delay or sublimate the diagnosis of abdominal injuries until late periods(13). Therefore, for care delivery to abdominal trauma victims, it is key to maintain high levels of suspicion of this type of injury(13).

Although deaths due to abdominal traumas are considered avoidable(13,16), the noteworthy involvement of the abdominal segment in the present models may be related exactly to the lack of recognition that injuries exist, the presence of hemorrhage and the absence of appropriate interventions for the diagnosis, treatment and control of its complications. Among complications, shock and abdominal compartment syndrome stand out, very common in the very aggressive volume replacements that happen in the initial phase of care and affect survival results in the late phase(17).

The use of crystalloid solution in volume replacement is strongly emphasized in the early treatment of trauma victims as a form of combating shock, although this resource does not correct the systemic inflammatory event provoked by hypoperfusion(13,18) .

The final regression models demonstrated that both volume categories replaced in the emergency care phase were related to lower mortality risks in all intervals. This protective and linear effect indicates that the benefit this procedure generates can influence the results for longer periods.

The approach of the relation between the volume replaced in the ALS phase and trauma patients' survival is not very clear yet(13) although nowadays, for blunt trauma victims, there is an international trend to support the use of smaller volumes for emergency volume replacement until surgical treatment is possible, with a view to preventing new bleedings and hemodilution, which are clinical conditions that favor shock(1-2,5,13,16).

The inclusion of the initial SBP variable (at the accident scene) in models for the last two intervals ratifies the hypothesis that hemodynamic instability as early as at the accident scene can commit the long-term evolution of the situation, constituting an important severity indicator.

Researchers(19) have already demonstrated that mortality associated with hemodynamic instability detected early is related with multiple organ failure due to the production of a great variety of chemical mediators that result in a state that favors coagulation and influences mortality among multiple trauma patients. Like in this research, the authors demonstrated that mortality caused by this instability can appear in a bi-modal distribution, with a first peak during the first three days and a second peak between the fifth and seventh day, justifying the variable's inclusion in the model after 48h and its permanence until later periods.

Nowadays, international researchers(17-19) have defended more aggressive protocols to treat shock in blunt trauma victims, in the emergency care phase as well as upon arrival to the emergency care unit, so as to avoid hypoperfusion and its devastating and acknowledged determining effects for survival.

The incorporation of minimally invasive shock monitoring technologies, reserved for ICUs today, has been stimulated at emergency care units, with a view to the early detection o hypoperfusion(17-19). These technologies involve the serial measurement of hemodynamic parameters to assess the progress of the systemic dysfunction, including arterial gasometry; measurement of hemoglobin and arterial lactate, prothrombin and thromboplastin time, central venous pressure, urinary debit and arterial and venous saturation.

This diagnostic monitoring, associated with surgical and interventionist radiology techniques, has improved survival results in developed countries and its early implementation can represent an important change in the shock approach strategy and a technical and political challenge for developing countries(16-18).

CONCLUSION

The results suggest that the magnitude of hypoperfusion and its persistence were the factors that significantly influenced early and late deaths in this group of blunt trauma victims with physiological repercussions at the accident scene. The multivariate models demonstrated that only the intervention variables most strongly related with life maintenance and the categories related to the severity of the situation served as prognostic indicators, indicating that the variables interact synergistically in determining the result. These results can help in the elaboration of intervention protocols with a view to a better approach of blunt trauma for the sake of better survival results.

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