Original Article

Factors associated with long-term post-traumatic amnesia*

Fatores associados à amnésia pós-traumática de longa duração

Fatores asociados a la amnesia post-traumática de larga duración

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ABSTRACT

Objective: To identify factors related to post-traumatic amnesia of long duration. **Method:** A prospective, longitudinal study, with 187 victims of blunt head trauma, age ≥14 years, seen at a referral hospital for trauma. Independent variables included: age, sex, severity of head injury, location and type of injury, number of brain lesions, and use of medication with central nervous system activity or corticosteroids. **Results:** The logistic regression model adjusted by the variable area of injury (intra / extra-axial) showed: an initial Glasgow Coma Scale of ≤12 (OR = 20.17), Maximum Abbreviated Injury Scale / head of ≥3 (OR = 2.80) and use of phenytoin (OR = 2.60), midazolam (OR = 2.83) or both drugs (OR = 3.83). **Conclusion:** The use of midazolam and phenytoin, and the severity of head injury, were identified as related factors for long-term amnesia.

Keywords: Craniocerebral trauma; Head injuries, closed; Amnesia; Amnesia, transient global; Risk factors

RESUMO

Objetivo: Identificar fatores relacionados à amnésia pós-traumática de longa duração. **Método:** Estudo prospectivo, longitudinal, com 187 vítimas de trauma cranioencefálico contuso, idade ≥14 anos, atendidos em hospital de referência para trauma. As variáveis independentes foram: idade, sexo, gravidade do trauma cranioencefálico, local e tipo de lesão, número de lesões encefálicas e uso de medicação com atividade em sistema nervoso central ou corticoides. **Resultado**: O modelo de regressão logística múltipla ajustado pela variável área de lesão (intra/extra axial) evidenciou: Escala de Coma de Glasgow inicial ≤12 (OR=20,17); Maximum Abbreviated Injury Scale/cabeça ≥3 (OR=2,80) e uso de Fenitoína (OR=2,60), Midazolan (OR=2,83) ou ambas as drogas (OR=3,83). **Conclusão:** O uso do Midazolan e da Fenitoína, além da gravidade do trauma cranioencefálico, destacaram-se como fatores relacionados à amnésia de longa duração.

Descritores: Traumatismos craniocerebrais; Traumatismos cranianos fechados; Amnésia; Amnésia global transitória; Fatores de risco

RESUMEN

Objetivo: Identificar factores relacionados a la amnesia post-traumática de larga duración. **Método:** Estudio prospectivo, longitudinal, realizado con 187 víctimas de trauma craneoencefálico contuso, edad ≥14 años, atendidos en un hospital de referencia para trauma. Las variables independientes fueron: edad, sexo, gravedad del trauma craneoencefálico, local y tipo de lesión, número de lesiones encefálicas y uso de medicación con actividad en el sistema nervioso central o corticoides. **Resultado**: El modelo de regresión logística múltiple ajustado por la variable área de lesión (intra/extra axial) evidenció: Escala de Coma de Glasgow inicial ≤12 (OR=20,17); Maximum Abbreviated Injury Scale/cabeça ≥3 (OR=2,80) y uso de Fenitoína (OR=2,60), Midazolan (OR=2,83) o ambas drogas (OR=3,83). **Conclusión:** El uso del Midazolan y de Fenitoína, además de la gravedad del trauma craneoencefálico, se destacaron como factores relacionados a la amnesia de larga duración.

Descriptores: Traumatismos craneocerebrales; Traumatismos cerrados de la cabeza; Amnésia; Amnesia global transitória; Factores de riesgo

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** Study conducted in the "Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo" - USP – São Paulo (SP), Brazil*

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INTRODUCTION

Contusive cranio-encephalic trauma (CCET) is frequently followed by post-traumatic amnesia (PTA). This syndrome is characterized by a temporary state of confusion, disorientation and anterograde amnesia, in addition to behavioral disorders, among which are insomnia, psychomotor agitation, fatigue, confabulation and, occasionally, severe affective and psychotic symptoms[1-5].

PTA is considered to be an indicator of CCET severity and an important aspect to predict functional results[1-2,6-7]; the longer the period of amnesia, the poorer the functional result expected.

PTA has been studied for more than 70 years; however, there are still many gaps in the study of this syndrome and in the relationships among cognitive functions[2]. It is believed that new studies identifying factors associated with long-term PTA can bring more information that clarifies the physiopathology involved in the post-traumatic cognitive recovery process, especially that of memory[6].

In previous studies, PTA duration was associated with certain factors: severity, type and location of brain injury[6,8], age[6] and use of corticoids and drugs acting on the central nervous system (CNS)[6,9].

The importance of identifying factors associated with PTA duration can also translate into the need to simplify its measurement. PTA duration measurements are not as simple as they seem. Daily PTA assessment can be necessary for many days; the period of hospitalization is the one most viable for daily assessments, although PTA duration can be longer than this period; there are many conditions during the hospitalization of CCET victims that prevent verbal communication and make memory assessment impracticable[10].

Taking these difficulties into consideration, the development of new methods that enable PTA duration to be established is thought to be essential. The identification of factors associated with this duration can help to decrease the frequency of assessments and enable the construction of safe models to estimate PTA duration, an important parameter in guidance and decisions involved with the rehabilitation process[7].

In view of the gaps of knowledge about PTA and the difficulties in measuring its duration, the present study aimed to identify the factors associated with long-term PTA among the characteristics shown by CCET victims in the acute stage of treatment.

METHODS

A longitudinal prospective study with a correlational, descriptive and quantitative approach was conducted, using data from the acute stage of treatment (post-traumatic hospitalization).

This study was conducted in the *Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo* (HCFMUSP – São Paulo University School of Medicine Clinical Hospital), a governmental institution situated in the city of São Paulo, SP, Brazil, a reference center to treat trauma victims.

This investigation was conducted with CCET victims aged more than 14 years, cared for in the HCFMUSP's Central Institute Emergency Department, in the first 12 hours after a traumatic event, and subsequently hospitalized at the same location, between December 2006 and October 2007. Victims with a history of dementia or cranio-encephalic trauma were excluded from the study.

This research project was approved by the HCFMUSP's Research Ethics Committee, before data collection began (Protocol 1050/06). The inclusion of victims in the study only occurred in cases when consent was obtained from them or their family members and when the Informed Consent Form was signed.

Search for CCET victims, cared for in the HCFMUSP's Central Institute Emergency Department in the first 12 hours after traumatic event and subsequently hospitalized, was conducted daily. Medical records of patients hospitalized in this sector were checked every day and information was requested from nurses and doctors to identify these victims. The Glasgow Coma Scale (GCS) was applied daily to the target victims of this study, while the GCS and Galveston Orientation Amnesia Test (GOAT) were applied sequentially to those with whom verbal contact could be made, the latter test being used to assess PTA[8,11]. The results of such assessments were recorded in an instrument designed for this purpose, as was the remaining information about hospitalization in the acute stage of trauma.

Assessments were made until victims were discharged, transferred to another hospital or deceased, or when their PTA period ended, indicated by a minimum GOAT score of 75 for two consecutive days[2,6]. The application and calculation of total GOAT score followed the recommendations of the authors of this test[8].

Patients included in the present study were located and followed daily in the Emergency Department or other HCFMUSP sectors to where they were transferred, until they met the criteria of end of follow-up.

Data were collected and subsequently stored in a computerized database. The SPSS for Windows 12.0 and Stata 8.0 software programs were used in the analyses.

To achieve the objective proposed in this study, the following variables were categorized as independent: age group, sex, CCET severity, presence of temporal lobe or diffuse injury, type and area of injury, number of injuries

diagnosed as a result of CCET and use of medication acting on the CNS or corticoids.

With regard to CCET severity, two indicators were analyzed, one was physiological and the other anatomical. The GCS was used as physiological indicator, whereas the predominant anatomical indicator was the Maximum Abbreviated Injury Scale for the head region (MAIS/head)[12].

In this study, the GCS score used to characterize CCET severity was obtained from the records of the neurosurgery team's first assessment, conducted in the hospital's emergency department, usually after the victim's respiratory and hemodynamic stability. GCS scores between 13 and 15 points are considered as an indicator of mild trauma; between 9 and 12 points, moderate trauma; and scores equal to or lower than 8 points, severe trauma[11].

MAIS/head was determined using the Abbreviated Injury Scale (AIS)[12]. The AIS is a system with a primarily anatomical basis, designed in the form of a manual in which injuries are listed and their severity is indicated by an ordinal scale that varies from one, mild injury, to six, most severe injury. According to this scale, injuries with a score equal to or higher than three have been considered important injuries, in the sense that they pose a risk to life, differently from injuries with a score equal to one or two, which are not life-threatening.

The highest AIS code obtained from the patient for the head region was considered to determine the MAIS/head. This single code was used to describe the global severity of injuries in this region.

PTA longer than 24 hours was considered to be long-term, because a period longer than 24 hours is indicative of a relevant injury, i.e. a moderate to severe trauma, according to PTA duration, in the CCET severity classification[13].

Descriptive statistics were performed for all variables, aiming at the general characterization of study participants.

In the analysis of factors associated with long-term PTA, Pearson's chi-square test was used to verify the association between independent variables and PTA duration, categorized into ≤24 hours and >24 hours.

Logistic regression was used to determine risk factors of PTA in study patients. In the first stage, univariate logistic regression was conducted for each of the study variables. The stepwise forward method was used to construct the multiple logistic regression model. Variables with a value of $p \leq 0.20$ in the univariate analysis were incorporated into the model, one by one, following the order from highest to lowest significance.

Adequacy of the model was assessed with the Hosmer-Lemeshow test. Statistical tests were made, considering a first-order error of 5%.

RESULTS

During data collection, 278 CCET victims met the inclusion criteria established in the present study. Of these 278 victims, 32.7% had no GOAT application, because they did not have conditions to verbally communicate during their hospital stay (Table 1). Thus, the remaining 187 (67.3%) were submitted to GOAT and included in the analysis of this study. PTA duration was ≤24 hours in 64 cases (34.2%) and longer than this in 123 cases (65.8%).

Table 1. Victims who met the inclusion criteria in this study (n=278), according to the possibility of applying GOAT during the follow-up and occurrences that prevented the application of this instrument. HCFMUSP, 2006-2007.

Application of GOAT during follow-up	n	(%)
No		
Deceased	49	17.6
Transferred to another service	34	12.2
Discharged without clinical conditions for GOAT to be used	8	02.9
Subtotal	91	32.7
Yes	187	67.3
Total	278	100.0

The majority of victims (86.2%) were males, aged between 14 and 35 years (53.9%), while those aged >60 years totaled 12.9%. Mean age of the group analyzed was 38 years and standard deviation was 16.6 years, with a median of 35 years.

According to the GCS, mild CCET predominated (61.5%), although individuals without change in consciousness in the first neurosurgery assessment (GCS=15) totaled 23.5% of cases. Victims who had an indication of severe CCET (21.4%) were concentrated between the scores of 3 and 6 of GCS (7.5% and 7%, respectively). With regard to the MAIS/head score, 50.8% of victims had a score of 3, while the remaining participants were distributed similarly, showing a value lower (23%) or higher than 3 (26.2%) in this scale.

Among all cases, 50.8% of victims had a temporal lobe or diffuse injury; nonetheless, lack of description of area of injury was frequent (20.3%), causing analyses associated with this variable to become fragile. Diffuse injuries included brain swelling, cerebral edema and diffuse axonal injury and they were present in 10.7% of the victims analyzed.

The majority of patients had multiple injuries in the head region, as a result of CCET (66.3%). In addition, victims who only had extra-axial injuries were more frequent (56.1%) than those who had intra-axial injuries or both (43.9%).

Of all cases, 137 patients (73.3%) used, after CCET, medications acting on the CNS or corticoids. Phenytoin (Hidantal®) or Midazolam Maleate (Dormonid®) were used in 67.4% of cases, and Phenytoin was the one most frequently used, including 31.6% of victims, when administered individually, and 18.2%, when combined with Midazolam. The other drugs administered were as follows: Dexamethasone (Decadron®), Fentanyl (Fentanil®), Tiopental (Thionembutal®), Propofol (Diprivan®), Diazepam, Carbamazepine (Tegretol®), Haloperidol (Haldol®), Succinylcholine (Quelicin®) and Dexmedetomidine Hydrochloride (Precedex®).

The use of corticoids was observed in 22 (11.7%) victims, while one or more of the above mentioned drugs were used in 18 (9.6%) cases.

Table 2. Victims assessed with GOAT (n=187), according to their characteristics and PTA duration. HCFMUSP, 2006-2007

Characteristic	Post-traumatic amnesia				P value*
	Short		Long		
	n	%	n	%	
Age group					
< 60 years	60	93.8	103	83.7	0.052
> 60 years	4	6.3	20	16.3	
Sex					
Female	13	20.3	17	13.8	0.251
Male	51	79.7	106	86.2	
1st GCS assessment					
≤ 12	4	6.3	68	55.3	<0.001
> 12	60	93.8	55	44.7	
MAIS/head (1)**					
< 2	24	37.5	19	15.4	0.001
> 3	40	62.5	104	84.6	
MAIS/head (2)**					
1-2	24	37.5	19	15.4	
3	37	57.8	58	47.2	<0.001
4-5	3	4.7	46	37.4	
Temporal lobe + Diffuse injury					
Yes	28	43.8	67	54.5	
No	21	32.8	33	26.8	0.379
Without specification	15	23.4	23	18.7	
Type of injury					
Diffuse	4	6.3	16	13.0	0.156
Localized	60	93.8	107	87.0	
Number of injuries					
Single	21	32.8	42	34.1	0.855
Multiple	43	67.2	81	65.9	
Area of injury					
Intra-axial or both	22	34.4	60	48.8	0.060
Extra-Axial	42	65.6	63	51.2	
Use of medications (1)**					
No	23	35.9	27	22.0	0.040
Yes	41	64.1	96	78.0	
Use of medications (2)**					
Did not use	23	35.9	27	22.0	
Phenytoin/ Midazolam	35	54.7	91	74.0	0.024
Others/corticoids	6	9.4	5	4.0	
Use of medications (3)**					
Did not use/Others/cort.	29	45.3	32	26.0	
Phenytoin	17	26.6	42	34.1	0.066
Midazolam	9	14.1	24	19.5	
Phenytoin/ Midazolam	9	14.1	25	20.3	

* Pearson's chi-square test
** Variable analyzed according to different categorizations.

Data in Table 2 show that there was strong statistical evidence of the association between PTA and variables, GCS (p<0.001) and MAIS/head (p=0.001 and p<0.001). When GCS results were analyzed, the majority of short-term PTA victims (93.8%) were found to have a score >12. In addition, the score in this assessment varied between 10 and 15 in this group. Victims with short-term PTA had a higher percentage of MAIS/head ≤2 (37.5%), when compared to cases of long-term amnesia (15.4%). All victims with MAIS/head = 5 had long-term PTA. The three short-term PTA victims who were categorized in the interval between 4 and 5 of MAIS/head had a score of 4 according to this severity classification.

Results of statistical analyses shown in Table 2 pointed to an association between use of medication and PTA (p=0.040). Considering the type of medication, there was a significant association with PTA (p=0.024), when "Phenytoin/ Midazolan", "other medications acting on CNS/corticoids" and "did not use medication" were used as categorization.

Table 3. Univariate logistic regression for study variables. HCFMUSP, 2006-2007

Characteristic	OR	P value	(CI95%) OR
Age group (ref: <60 years)			
> 60 years	2.91	**0.061**	0.95-8.92
Sex (ref: Female)			
Male	1.59	0.254	0.72-3.56
1st GCS assessment (ref: ≤12)			
>12	0.05	**<0.001**	0.02-0.16
MAIS/head (ref: <2)			
>3	3.28	**0.001**	1.63-6.64
MAIS/head (ref: <2)			
3	1.98	**0.066**	0.96-4.11
4-5	13.37	**<0.001**	5.21-72.06
Temporal lobe + diffuse injury (ref: No)			
Yes	1.52	0.241	0.75-3.08
Type of injury (ref: Localized)			
Without specification	0.98	0.955	0.42-2.29
Diffuse	2.24	**0.165**	0.72-7.02
Number of injuries (ref: Single)			
Multiple	0.94	0.855	0.49-1.79
Area of injury (ref: Extra-axial)			
Intra-Axial or both	1.82	**0.061**	0.97-3.40
Use of medications (ref: No)			
Yes	1.99	**0.042**	1.03-3.88
Type of medications (ref: Does not use)			
Phenytoin/ Midazolan	2.21	**0.022**	1.12-4.37
Others/corticoids	0.71	0.608	0.19-2.63
Type of medications (ref: Does not use/Others/ corticoids.)			
Phenytoin	2.24	**0.036**	1.05-4.76
Midazolan	2.42	**0.059**	0.97-6.04
Phenytoin Midazolan	2.52	**0.047**	1.01-6.27

ref = reference

Data in Table 3 show univariate logistic regression results for each study variable and highlight variables with a p value ≤0.20 in bold, which were selected for

the multiple logistic regression model test.

Table 4. Multiple logistic regression model for long-term PTA*. HCFMUSP, 2006-2007.

Characteristic	Adjusted OR	P value	(CI95%) OR
1st GCS assessment (ref: > 12)			
≤12	20.17	<0.001	6.67 - 61.04
MAIS/head (ref: <2)			
>3	2.80	0.029	1.11 - 7.06
Types of medications (ref: Does not use/Others/Corticoids)			
Phenytoin	2.60	0.043	1.03 - 6.58
Midazolan	2.83	0.057	0.97 - 8.27
Phenytoin/ Midazolan	3.83	0.015	1.29 - 11.37

*Adjusted for the "Area of injury" variable (Intra/Extra-Axial)
Hosmer-Lemeshow test = 7.84 (p=0.4490)

Data in Table 4 show the following variables as risk factors for long-term PTA: GCS ≤12; MAIS/head ≥3; and use of Phenytoin, Midazolan and both drugs combined, adjusted for "Intra/Extra-axial area of injury". Patients with GCS ≤12 were 20 times more likely to have long-term PTA than victims with a score >12. Considering MAIS/head, patients with a score ≥3 were almost three times more likely to have long-term PTA than those with lower values. Use of Phenytoin combined with Midazolan resulted in a risk that was four times higher than that of individuals who did not use these two medications. In addition, the individual use of Phenytoin increased the chance of long-term PTA by 2.6 times, while Midazolan increased it by 2.83 times.

In the final model, the confidence interval for GCS was very wide, with a lower limit of 6.67 and an upper limit of 61.04. Although the confidence interval of the remaining variables was lower, providing a more accurate estimate of the true odds ratio (OR) value, the GCS was the model variable that showed the OR lower limit most distant from 1.0 and, as a result, it was the model variable which was the most distant from indicating no effect on long-term PTA.

DISCUSSION

The present study sought to identify the factors associated with long-term PTA and the results revealed that these were CCET severity and use of medications acting on the CNS.

In the literature, the criteria used to establish CCET severity are the GCS score, MAIS/head and PTA duration[13]. These three criteria, although aimed at measuring CCET severity, analyze different expressions of severity of this injury: change in consciousness; anatomical injury caused by trauma; and cognitive change, especially that of anterograde memory, which occurs after CCET.

In this perspective, the strong association observed between long-term PTA and the GCS and MAIS/head variables pointed to a convergence in the measurement of CCET severity. In addition, PTA>24 hours with a GCS≤8 and MAIS=5 showed long-term PTA, thus emphasizing the convergence of results of assessments of severe CCET victims.

However, discrepancies in the indication of CCET severity by these three indicators were also observed: a higher frequency of mild CCET with the GCS (61.5%), and with the MAIS/head (23%); victims with a value higher than 12 in the GCS were substantially present in the long-term PTA group, 44.7% (table 2); victims with MAIS/head ≥3 totaled 62.5% of the group with short-term PTA (Table 2).

A study that compared AIS and Injury Severity Score (ISS) values with GCS concluded that, although GCS was associated with the patient's survival and functional results, this correlation was weak and inconsistent; in addition, only when a combination of GCS and AIS/ISS was used was there an improvement in the correlation with functional results. The improvement in this relationship surpassed any of the indices individually. Moreover, the same study emphasizes the limitation of GCS for sedated patients or those with a neuromuscular blocker[14].

In the present study, when CCET severity indicators were applied, patients with a maximum or close-to-normal initial GCS score, who were not able to recall previous facts when asked, could be observed.

Researchers who correlated trauma severity with PTA duration found a weak relationship between these variables and showed that the GCS only explained the variation in PTA duration of approximately 30% of the cases analyzed[15].

The final multivariate analysis model (Table 4), adjusted by the "intra/extra-axial area of injury" variable, showed that initial GCS stood out among the risk factors for long-term PTA, when ≤12 (OR=20.17). The result strengthened the association between PTA and GCS, in view of the MAIS/head results (OR=2.80), and it emphasized the most traditional definition of PTA, which is based on the assumption that this post-traumatic state is the initial stage of recovery, after an interval of decreased level of consciousness[2,6].

The observation that all victims with a GCS d" 8 and MAIS/head= 5 had long-term PTA, in addition to the remaining observations related to associations among these three parameters, could help to establish new directives in the assessment of PTA duration and also improve the role of these variables in the prediction of results.

Concerned about the difficulties in establishing PTA duration, Australian researchers identified a group of variables that can contribute to this task in a reliable way. However, as these researchers worked with a group of patients during their rehabilitation stage, proposals were not included in the set of independent variables in their current study, with the exception of age[7]. In the multiple logistic regression analysis, the "use of medication acting on the CNS" variable remained in the final model. The risk of victims having long-term PTA was higher among individuals who had been medicated with Phenytoin (OR=2.60), Midazolan (OR= 2.83) or a combination of both drugs (OR=3.83), when compared to those who had not used such drugs.

A study on amnesia conducted in 1993 stated that Benzodiazepines such as Midazolan are drugs that lead to amnesic syndromes, because they cause depression of limbic neural activity[16].

Other studies[6,9] also evidenced that PTA duration is dependent on the use of sedatives and Phenytoin. These drugs change the result of this parameter, overestimating its value. In this relationship, it is necessary to clarify the cause of this association: is there an increase in time only, due to the period of drug action, or do these drugs also hinder cognitive recovery after CCET? New studies are necessary in this sense, once the use of such drugs, especially their combined use, must be reassessed, in case they hinder cognitive recovery. This is because the association of two drugs increases the probability of the victim having long-term PTA; two combined drugs show an OR= 3.83, while their individual use shows OR= 2.60 and OR= 2.83.

In this study, a better logistic regression model adjustment was obtained when the "area of injury" variable (intra/extra-axial) was considered. Another study assessed two groups of patients, one with skull fractures (extra-axial injury) and the other with brain injuries (intra-axial), and showed that only the group with brain injuries was significantly associated with older age of patients, lower initial GCS, longer PTA duration, and poorer functional result, according to the Glasgow Outcome Scale[17].

Contrary to results of studies that associate temporal lobe injuries with changes in learning and memory, hippocampal lesions with memory disorders and diffuse axonal injuries with PTA[5-6,18], the present study showed that variables related to skull injuries, except for area of injury, were not associated with PTA duration.

In this discrepancy, possible differences in neuroimaging equipment or in the method of the studies conducted should be taken into consideration; experiments with animals or confirmed diagnoses in surgical situations add details to this information. Moreover, in clinical practice, records of extension and type of injury have been given priority, when compared to their location, resulting in 20.3% of cases without the description of area of injury in this study.

The "age group" independent variable, although not having achieved the level of significance established in this study and remained in the final model, showed similar results that indicate the need for other analyses related to this association. In the literature on this theme, studies emphasize age as a risk factor for PTA[6,19], although results that indicate lack of such association are also observed[20].

Finally, certain limitations to the present study should be mentioned. The frequency of lack of description of area of injury (20.3%) was high; thus, the contribution of this study is limited in terms of the association between area of injury and PTA duration.

The GOAT, an instrument used to assess PTA, shows many orientation items, when compared to the few items that assess anterograde memory (PTA's main characteristic). As a result of this characteristic of such instrument, there is the possibility of a high total score being obtained as a result of responses to the items related to orientation, although the patient has amnesia[21].

During data collection, GOAT could be applied to the majority of victims, 6 hours after trauma. In this way, it was not possible to identify victims with a PTA duration shorter than one hour. In the assessment of CCET severity by PTA duration, the majority of authors classify individuals with less than one hour of amnesia as mild trauma and between one and 24 hours as moderate trauma[13].

FINAL CONSIDERATIONS

The use of Midazolan and Phenytoin, in addition to CCET severity, stand out as factors associated with long-term amnesia. With regard to PTA physiopathology, results emphasize the association between changes in consciousness and this syndrome.

The convergence used to indicate severe CCET of victims with GCS ≤8 and MAIS/head=5 corroborates the assumption of a relationship between PTA and trauma severity and it can contribute, together with the model resulting from multiple logistic regression, to propose alternative methods to establish PTA duration.

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