Revista Información Científica

ISSN 1028-9933
Universidad de Ciencias Médicas de Guantánamo

March 2025 Volume 104 e4852
DOI: https://doi.org/10.5281/zenodo.14002901

ORIGINAL ARTICLE

Acute subdural hematoma in the emergency department of the Hospital Universitario "General Calixto García", Cuba

Hematoma subdural agudo en el servicio de Urgencia del Hospital Universitario "General Calixto García", Cuba

Hematoma subdural agudo no Serviço de Emergência do Hospital Universitario "General Calixto García", Cuba

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Receive: 17-10-2024 **Accepted:** 12-02-2025 **Published:** 10-03-2025

ABSTRACT

Introduction: it is estimated that the population exposed to head trauma has a 12% - 29% chance of developing an acute subdural hematoma. Mortality varies from 50% to 90%, depending on the series. **Objective:** to describe the characteristics of patients treated surgically for acute subdural hematoma at the University Hospital "General Calixto García" in Havana, Cuba, during 2023. **Method:** an observational, descriptive, cross-sectional study was carried out in a universe of 49 patients (N = 49) diagnosed with a cute subdural hematoma. The sample consisted of 44 patients (n = 44) who underwent surgical procedures. The variables studied were: sex, age, causes of the injury, Glasgow coma scale value, presence of imaging signs of poor prognosis, and procedure performed. A statistical analysis was performed using the Chi-square test. **Results:** the predominant sex was male (81.8%), with an average age of 60.2 years. The main cause of hematoma was falls (38.6%). The Glasgow Coma Scale values were between 3 - 8 points (61.3%). The absence of imaging signs of poor prognosis predominated (56.8%). The most commonly used surgical procedure was craniectomy (59.0%). **Conclusions:** the diagnosis is predominantly male, generally older adults with injuries caused by falls. Statistically significant relationships are demonstrated between the Glasgow Coma Scale, the presence of imaging signs of poor prognosis and the choice of surgical procedure, related to high values of the scale with the absence of signs and with the choice of craniotomy as the surgical method.

Keywords: acute subdural hematoma; traumatic brain injuries; traumatic intracranial hemorrhage; Glasgow Coma Scale; craniotomy; craniectomy

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Universidad de Ciencias Médicas de Guantánamo

RESUMEN

Introducción: se estima que la población expuesta a traumatismo craneoencefálico, tiene una posibilidad entre 12% -29% de desarrollar un hematoma subdural agudo. Su mortalidad varía de 50 % a 90%, según las series. **Objetivo:** describir las características de los pacientes tratados quirúrgicamente por hematoma subdural agudo en el Hospital Universitario "General Calixto García" de La Habana, Cuba, durante el 2023. **Método:** se realizó un estudio observacional, descriptivo, de corte transversal, en un universo de 49 pacientes (N = 49) diagnosticados con hematoma subdural agudo. La muestra estuvo conformada por 44 pacientes (n = 44) que fueron sometidos a procederes quirúrgicos. Las variables estudiadas fueron: sexo, edad, causas de la lesión, valor de la escala de coma de Glasgow, Presencia de signos imagenológicos de mal pronóstico y procedimiento realizado. Se efectúo un análisis estadístico con empleo de la prueba de Ji cuadrado. **Resultados:** el sexo predominante fue el masculino (81,8%), con una edad promedio de 60,2 años. La principal causa de aparición del hematoma fueron las caídas (38,6%). Los valores de la escala de coma de Glasgow estuvieron entre 3 - 8 puntos (61,3%). Predominó la ausencia de signos imagenológicos de mal pronóstico (56,8 %). El procedimiento quirúrgico más empleado fue la craniectomía (59,0%). **Conclusiones:** en el diagnóstico prevalece el sexo masculino, generalmente adultos mayores con lesiones causadas por caídas. Se demuestran relaciones con relevancia estadística entre la escala de coma de Glasgow, con la presencia de signos imagenológicos de mal pronóstico y con la selección del proceder quirúrgico, relacionado con altos valores de la escala con la ausencia de los signos y con la selección de la craneotomía como método quirúrgico.

Palabras clave: hematoma subdural agudo; lesiones traumáticas del encéfalo; hemorragia intracraneal traumática; escala de coma de Glasgow; craneotomía; craniectomía

RESUMO

Introdução: estima-se que a população exposta a traumatismo cranioencefálico tenha chance entre 12% - 29% de desenvolver hematoma subdural agudo. Sua mortalidade varia de 50% a 90%, dependendo da série. **Objetivo:** descrever as características dos pacientes tratados cirurgicamente de hematoma subdural agudo no Hospital Universitario "General Calixto García" de Havana, Cuba, durante o ano de 2023. **Método:** foi realizado um estudo observacional, descritivo e transversal em um universo de 49 pacientes (N = 49) com diagnóstico de hematoma subdural agudo. A amostra foi composta por 44 pacientes (n = 44) submetidos a procedimentos cirúrgicos. As variáveis estudadas foram: sexo, idade, causas da lesão, valor da Escala de Coma de Glasgow, presença de sinais de imagem de mau prognóstico e procedimento realizado. A análise estatística foi realizada por meio do teste Qui-quadrado. **Resultados:** o sexo predominante foi o masculino (81,8%), com média de idade de 60,2 anos. A principal causa do aparecimento do hematoma foram as quedas (38,6%). Os valores da Escala de Coma de Glasgow ficaram entre 3 - 8 pontos (61,3%). Predominou a ausência de sinais de imagem de mau prognóstico (56,8%). O procedimento cirúrgico mais utilizado foi a craniectomia (59,0%). **Conclusões:** o sexo masculino prevalece no diagnóstico, geralmente ido SOS com lesões causadas por quedas. São demonstradas relações com relevância estatística entre a Escala de Coma de Glasgow, com a presença de sinais imagiológicos de mau prognóstico e com a seleção do procedimento cirúrgico, relacionadas com valores elevados da escala com a ausência de sinais e com a seleção da craniotomia como método cirúrgico.

Palavras-chave: hematoma subdural agudo; lesõescerebrais traumáticas; hemorragia intracraniana traumática; Escala de Coma de Glasgow; craniotomia; craniectomia

How to cite this article:
Avila Anido JA. Acute subdural hematoma in the emergency department of the Hospital Universitario "General Calixto García", Cuba. Rev Inf Cient [Internet]. 2025 [cited Access date]; 104:e4852. Available at: https://revinfcientifica.sld.cu/index.php/ric/article/view/4852

INTRODUCTION

The origin of a subdural hematoma (SDH) lies in the partial or total rupture of the superficial veins of the brain which, given its anatomical location and in conjunction with its parasagittal topography, define its susceptibility to the forces present in violent acceleration/deceleration injuries; cranioencephalic trauma is its first cause of occurrence.[1,2]

Trauma has an overall incidence in developed countries of about 200 per 100,000 inhabitants per year. In the United States, 1.7 million people suffer traumatic brain injury (TBI) each year and about 100,000 patients per year require neurosurgical treatment for TBI, with an annual loss of $37 billion.[3]

The standard neuroimaging techniques for evaluation of patients with SDH are plain computed tomography (CT), CT with intravenous contrast, and MRI. Classification based on CT presentation it is by the time elapsed between the time of the lesion and the onset of symptoms: acute, subacute or chronic. However, special situations generate specific nuances such as isodensity due to anemia, heterogeneity and layering effect due to bleeding at various times and hematocrit effect due to anticoagulants or due to rebleeding in a chronic subdural hematoma, which can make diagnosis difficult.[4]

Acute subdural hematomas (ASDH) usually appear as a crescent-shaped hyperdense collection between the inner surface of the skull and the convexity of the underlying brain parenchyma, often accompanied by edema.[5]. Their most common locations are usually the frontotemporoparietal convexities, but also at the base of the cranial fossae. It is difficult to diagnose when they occur in the posterior fossa. Similarly, they may develop in the tentorial and sickle regions of the brain and at the spinal level.[4]

These hematomas are associated with high kinetic energy impacts and may be isolated or associated with another type of intracranial injury. Mortality is high, varying from 50% to 90% depending on the series,[6] although conservative studies record figures of between 35%-50%. It is estimated that the population exposed to cranioencephalic trauma has a 12%-29% chance of developing an acute subdural hematoma and if the trauma is severe, this probability rises up to 50% [7].

The clinical manifestations may vary, which depends on the severity of the trauma and in relation to the assessment and scoring by the Glasgow Coma Scale (GCS). It can be 8 or less, and have the patient in coma or even cases with a “lucid interval”, which progresses to a transient loss of consciousness, then a period of neurological normality, followed by progressive deterioration and finally coma. This sequence of events is more frequent in those patients in whom neurocritical or neurosurgical management is delayed.[8]

The neurosurgical management of these patients is established by several factors: age, comorbidities, initial assessment (presence of stem reflexes such as pupillary, palpebral, cough, among others), pupillary diameter, initial ECG score, physical examination, tomographic findings and intracranial pressure in patients with monitoring.[8]

The older the patient, the greater the probability of urgent surgical interventions, but in the elderly, emergency surgery is accompanied by a high rate of complications and death. Acute traumatic intracranial hematomas are primary lesions, more frequent in patients with severe craniocerebral trauma. Among them, acute subdural hematoma is the most frequent in the elderly and generally requires urgent surgical treatment.[9]

Treatment consists of a craniotomy or craniectomy to evacuate blood clots and achieve adequate decompression of the brain parenchyma. Despite surgical treatment, those who survive may be left with functional limitations.[7]

Although the primary cause of acute subdural hematoma is traumatic events, it can also be caused by aneurysmal rupture, hypertensive etiology, neoplastic and even secondary to hematologic disorders.[8]

Given the high incidence and lethality of this type of injury, it is necessary to collect all available information on patients treated for this disease, in order to know this population and subsequently improve the quality of diagnostic and therapeutic measures taken to this. Thus, this research is carried out with the objective of characterizing the patients treated surgically for acute subdural hematomas at the University Hospital “General Calixto García”, during the year 2023.

METHOD

An observational, descriptive, cross-sectional, cross-sectional study was conducted in patients attended at the Neurosurgery Ward of the University Hospital “General Calixto García”, between January 1 and December 31, 2023.

The universe were the 49 patients with ASDH diagnosed in the studied period (N = 49). A non-probabilistic purposive sampling was performed with the inclusion criteria: patients undergoing neurosurgical procedures following the diagnosis of HSDA and sufficient data available in the medical records of the hospital archives, with a final sample of 44 patients (n = 44).

The primary method of data collection was the review of medical records as well as emergency department charge sheets. In addition, empirical methods such as the review of secondary bibliographies and theoretical methods; such as the historical-logical and the analysis-synthesis methods were used.

The variables studied were:

- Sex: biological sex of the patient: female, male
- Age: 10-year intervals: 30 - 39, 40 - 49, 50 - 59, 60 - 69, 70 - 79
- Causes: traffic accidents, falls, violent altercations and others
- ECG value: severity of trauma based on score at admission. Scale: 3 - 8 points (severe), 9 - 13 points (moderate), 14 - 15 points (mild)
- Presence of imaging signs of poor prognosis: displacement of midline structures greater than 5mm, hematoma thickness greater than 15mm, signs of hyperacute bleeding and association with other hemorrhagic collections
- Procedure performed: surgical procedures applied in patients in their treatment: craniectomy, craniotomy

The variables were dumped into a table in Excel 16.0 (2016) to make up the database. The information stored in the database was analyzed using IBM SPSS Statistics 29.0.10.

Descriptive statistics were used with the use of absolute frequencies and percentages. The mean, median and mode were used as measures of central tendency. Statistical analysis was performed using the Chi-square test to evaluate the relationship between the given ECG score with the causes of trauma, the presence of imaging signs of poor prognosis and the surgical procedure chosen. A p value of less than 0.05 was considered statistically significant.

The international ethical guidelines for health-related research on human beings were respected, consisting in this research, in the safeguarding, care and confidentiality of the documents that were examined, as well as the non-disclosure of personal data that would allow the identification of the patients.

RESULTS

In Table 1, the mean age of the patients was approximately 60.2 years: the most frequent ages were between 60 - 69 years, which represented 38.6 % of the total (27.2 % male; 11.3 % female). The predominant sex was male with 81.8 %, compared to 18.1 % of the female sex.

Table 1: Age groups according to sex

Age groups	Male		Female	
	No.	%	No.	%
30 - 39 years	4	9,0	-	-
40 - 49 years	4	9,0	-	-
50 - 59 years	7	15,9	2	4,5
60 - 69 years	12	27,2	5	11,3
70 - 80 years	9	20,4	1	4,5

Source: medical records available at the Archives of the University Hospital "General Calixto García"

The main cause of hematoma was falls (38.6 %) with a higher incidence in the age range 70 - 80 years (20.4 %), followed by traffic accidents, behaving in the same way for ages 50 - 59 years and 60 - 69 years, with 11.3 % (Table 2). By age, a greater number of cases of traffic accidents can be observed between 30 - 59 years of age, more than other causes in this interval.

Table 2: Age groups according to cause of injury

Causes	30 -39 years		40 - 49 years		50 - 59 years		60 - 69 years		70 - 80 years	
	No.	%	No.	%	No.	%	No.	%	No.	%
Traffic accidents	3	6,8	1	2,2	5	11,3	5	11,3	1	2,2
Falls	-	-	-	-	1	2,2	7	15,9	9	20,4
Violent altercations	1	2,2	2	4,5	2	4,5	3	6,8	-	-
Others	-	-	1	2,2	1	2,2	2	4,5	-	-

Source: medical records available at the Archives of the University Hospital "General Calixto García"

Table 3 shows a predominance of ECG scores between 3 - 8 points of 61.3 %, classifying them as severe TBI. The largest number of patients with this classification corresponded to traffic accidents, with 27.2 %. There was no predominance among accidents or falls with ECG scores of 9 - 13, which accounted for 4.5% of the total. In mild TBI defined by values of 14 - 15 points, falls were the most common cause accounting for 13.6 %, while motor vehicle accidents in this range accounted for only 2.2 %. It could be observed in the contingency table with Chi-square test that the relationship between the causes and the ECG value had statistical significance with a p=0.021.

Table 3: Causes and severity of trauma as defined by Glasgow Coma Scale score on admission.

Causes	Valor de la GCS					
	3 - 8 points		9 - 13 points		14 - 15 points	
	No.	%	No.	%	No.	%
Traffic accidents	12	27,2%	2	4,5%	1	2,2%
Falls	9	20,4%	2	4,5%	6	13,6%
Violent altercations	6	13,6%	-	-	2	4,5%
Others	-	-	-	-	4	9,0%

Source: medical records available at the Archives of the University Hospital "General Calixto García"

The predominance of poor prognosis imaging signs was absent in 56.8 % of the cases, which included all patients with ECG scores between 14 - 15 points (29.5 %). (Table 4) Cases in which imaging signs of poor prognosis were identified accounted for 43.1 % of the total, in which patients with ECG scores between 3 - 8 points predominated for 38.6 %. The relationship between ECG value variables and the presence of imaging signs of poor prognosis was statistically significant with p=0.0007.

Table 4: Patients according to Glasgow Coma Scale score on admission in relation to the presence of imaging signs of poor prognosis

ECG value	Imaging signs of poor prognosis			
	Yes		No	
	No.	%	No.	%
3 - 8 points	17	38,6	10	22,7
9 -13 points	2	4,5	2	4,5
14 -15 points	-	-	13	29,5

Source: medical records available at the Archives of the University Hospital "General Calixto García"

Craniectomy predominated as the main surgical procedure in 59.0 % of the cases, more frequent in patients between 3 - 8 ECG points, for 47.7 % of the total. Craniotomies represented 40.9 % of the cases analyzed, being more frequently used in patients with values of 14 - 15 points, for 25.0 % of the total. The relationship between the surgical procedure performed and the ECG score was statistically significant with p=0.0006 (Table 5).

Table 5: Patients according to the surgical procedure performed in relation to the Glasgow Coma Scale score.

ECG Value	Surgical procedure			
	Craniectomy		Craniotomy	
	No.	%	No.	%
3 - 8 points	21	47,7	6	13,6
9 -13 points	3	6,8	1	2,2
14 -15 points	2	4,5	11	25,0

Source: medical records available at the Archives of the University Hospital "General Calixto García"

DISCUSSION

This study shows a predominance of male over female sex, with a ratio of 9:2 (81.8% male) patients. This does not differ much from other descriptive studies on TBI in populations, which was the cause of occurrence of ASDH in all cases analyzed in this study.

Vergara et al.[3] in a study conducted in Argentina between 2014 and 2015, determined that out of 1496 trauma cases, 76 % corresponded to the male sex. Another study focused on HSDA cases during 2023, by Delgado Jurado et al.[8] similarly shows 76.3 % of male patients. Likewise, it determines an average age of 53.5 years, which does not differ significantly from the present study. The last study[5] carried out in this same institution showed a 73.3% male predominance, with an average age of 61.8 years, being only significant an increase in the number of registered cases.

Studies focused on TBI in general, usually show lower age averages since they record several types of lesions, such as that of Mosquera Betancourt et al.[9] where HSDA represent around 25%. The explanation for this characteristic derives from the natural process of brain atrophy that comes with aging. This loss of encephalic mass extends the communicating veins, making them more prone to tearing, even in the face of minor trauma.[5] That is why for the average age of 60.2 years in the present study, the main cause of hematoma formation was falls, which do not usually constitute high-impact injuries for the development of hematoma.

Delgado Jurado et al.[8] reported in their study on ASDH a predominance of falls as the cause of hematoma origin, but these represented 50% of the cases, a value above that obtained in our study. In studies focused only on TBI, such as those of Vergara, et al.[3] and Rodríguez Venega et al. [10] the most common cause of injury was traffic accidents, followed by falls. However, these studies had a predominance of ages below 40 years and analyzed injuries with a more diverse age distribution, unlike those focused on HSDA[3-10] but these data coincide with the most frequent cause of injury in our study when considering ages below 60 years, where motor vehicle accidents also predominate.

In the present study, ECG values of 3 - 8 points predominated. Arrese-Regañón[11] corroborates this by stating that 37 - 80 % of SDH present ECG scores of less than 9, although this is not limited to ADHS, but includes all types of SDH. Again Delgado Jurado et al.[8] agrees with ECG values of 8 or less points in 52.6 % of their cases, although with somewhat lower figures than those obtained in this study. In comparison, the study previously performed at this institution yielded these values for 60% of the cases, obtaining almost the same results as the current study.[5]

A statistical significance was described between the cause of injury and the ECG value, so that traffic accidents constituted the most severe cause of trauma. This may be related to the high-impact nature of the trauma, which usually implies a worse prognosis. Mild trauma was dominated by falls, impacts of lesser intensity. In addition to the previously established association between falls and older adults, more prone to develop hematomas, these may have a better presentation and prognosis if diagnosed early, given that the atrophied brain of an older adult allows the accumulation of hematomas of greater volume in its subdural space before beginning to manifest symptoms of increased intracranial pressure.[5]

Regarding the presence of imaging signs of poor prognosis, the results were very similar to the previous study carried out at the center, in which these patients represented 40%.[5] The study also described a statistical relevance to the relationship between the ECG value, with values of 3 - 8 points, and the presence of imaging signs of poor prognosis. Likewise, all mild trauma patients, according to the Glasgow score, did not present these signs.[11]

Several studies have tried to define the relationship between CT parameters and prognosis. Except for the study by Brink et al.[12] in which no relationship was found between hematoma volume, midline shift and basal cistern status in relation to prognosis, the majority of studies have found such a relationship.[11]

As for midline displacement, each millimeter increase probably increases morbidity and mortality. Kerezoudiset al.[12] demonstrated worsening outcomes from no displacement to displacements between 1-5 mm, which worsens with displacements between 6 - 10 mm. The results of the study by Servadei, et al. and Zumkelleretal.[14,15] indicated a worse prognosis when the thickness of the hematoma progressively increased.[5]

With respect to hyperacute bleeding, it is represented by imaging signs of a heterogeneous mixed collection of difficult interpretation, which may reflect the existence of one or more underlying hemorrhagic events. In a hyperacute phase, a dense, swirling collection (whirling sign) may be seen due to the combination of active bleeding, serum and clot.[16]

ASDH are frequently combined with epidural hematomas and with foci of contusion.[4] In Servadeiet al.[14] the rate of favorable outcome ranges from 57 % for patients with isolated HSDA to 37 % for those with multiple associated cerebral contusions.[5] Mosquera Betancourt et al.[9] observed an association between HSD and intraparenchymal hematomas in 28 % of their patients.[9]

The aforementioned imaging signs make it possible to evaluate the severity of the lesion, as does the ECG, which has been validated as an index of severity on numerous occasions. Therefore, it is not surprising that this study describes a relationship between both variables.

The literature recommends limited craniotomy in patients with previous deficient clinical conditions, in cases of localized intracranial hematomas, without other associated lesions with mass effect greater than five millimeters. Here the juxta-dural hematoma causes the displacement of the midline structures, so it is a surgical technique with the fundamental objective of evacuating space-occupying lesions. If in the tomographic study these lesions are not demonstrated and there is evidence of mass effect of more than 5 mm, it is not suggested to apply this technique and instead, the performance of a decompressive craniectomy that can be unilateral, bilateral or bifrontal, depending on the findings of the imaging studies.[9]

Craniectomy was mostly used in patients with ECG scores of 3 - 8 points, a value whose relationship was determined with the presence of imaging signs as described in the literature; similarly, in the opposite case, craniotomy was chosen in patients with scores of 14 - 15 related to the absence of these signs.

The high frequency of infection in craniotomies and craniectomies may be conditioned by the prolonged surgical time and the extensive dissection and exposure of tissues required by these procedures.[17]

CONCLUSIONS

Among the patients treated surgically for acute subdural hematomas analyzed, there was a predominance of males, generally older adults, with injuries caused by falls. A statistically significant relationship was shown between the Glasgow Coma Scale score obtained at admission and the cause, which implies a lower value of the scale in trauma derived from traffic accidents. Likewise, a statistically significant relationship is shown between the Glasgow coma scale with the presence of imaging signs of poor prognosis and with the selection of the surgical procedure, related to high values of the scale with the absence of signs and with the selection of craniotomy as the surgical method.

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ISSN 1028-9933
Universidad de Ciencias Médicas de Guantánamo

Conflicts of interest:
The author declares that there are no conflicts of interest.

Financing:
No funding was received for the development of this article.

Complementary file (Open Data):
Base de datos empleada en Hematoma subdural agudo en servicio de Urgencia del Hospital Universitario "General Calixto García", Cuba