

Predictive Factors of Mortality of Chronic Subdural Hematoma in Adults in Antananarivo Madagascar

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ABSTRACT

Objective: To determine the poor prognostic factors of chronic subdural hematomas in the Neurosurgery Departments of the existing University Hospitals in Antananarivo, Madagascar.

Methods: This was a multicenter, retrospective, cross-sectional, descriptive and analytical study of 125 cases of chronic subdural hematoma.

Results: Poor prognostic factors for chronic subdural hematoma were age (OR: 4.4100; $p = 0.005$), male gender (OR: 4.354; $p = 0.008$), head injury (OR: 5.2250; $p = 0.001$), arterial hypertension (OR: 3.773; $p = 0.028$), ethylism (OR: 5.9639; $p = 0.035$), anticoagulant use (OR: 5.785; $p = 0.001$), altered general condition (OR: 3.4000; $p = 0.001$) and low Glasgow (OR: 14.444; $p = 0.001$).

Conclusion: Identification of these mortality risk factors would be beneficial in improving and implementing appropriate management.

Keywords: Chronic subdural hematoma, mortality factor, prognostic factors.

Submitted: March 12, 2025

Published: April 18, 2025

 10.24018/ejclinimed.2025.6.1.373

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1. INTRODUCTION

Chronic subdural hematoma (CSDH) is a frequent pathology, particularly in elderly patients with risk factors such as anticoagulant use and chronic alcoholism. CSDH is often associated with minor head trauma, although non-traumatic mechanisms may also be involved. While surgical management, particularly drainage, generally offers good results, complications and significant mortality are still observed in some cases [1].

Mortality associated with CSDH results from a number of factors, including underlying comorbidities, postoperative complications, as well as patient-related factors such as advanced age. A better understanding of these factors is essential to identify high-risk patients, optimize therapeutic management and reduce adverse outcomes [2].

In this article, we propose to study the risk factors associated with mortality in patients with HSDC in the Neurosurgery departments of Antananarivo Madagascar. By combining an analysis of clinical, radiological and biological data, our aim is to provide an overview of the

elements predictive of mortality and to propose recommendations for improving clinical practice.

2. MATERIALS AND METHODS

This is a retrospective, multicenter, cross-sectional, descriptive and analytical study over a 48-month period, from January 2019 to December 2022. The study was carried out in the neurosurgery and intensive care units of three university hospitals in Antananarivo, Madagascar (CENHOSOA, CHU HJRA and CHU Anosiala). We included patients who were 18 years and older, admitted with chronic subdural hematoma with complete and actionable medical records.

Several sources of documents were used to carry out this study:

- 1) Inpatient register listing all patients admitted to the department, their name, age, telephone number, medical file number, reason for admission and discharge diagnosis.



- 2) Patient medical records, which include personal information on each patient, detailed medical observations, treatment and monitoring records, and the results of any additional examinations carried out.
- 3) A surgical report book containing the patient's name and age, the surgeon's name, the type of operation, the progress of the procedure and a clinical summary.

The parameters studied are as follows:

- 1) Age and death,
- 2) Gender and death,
- 3) Antecedents: head trauma, chronic alcoholism, anticoagulant use, high blood pressure, diabetes, previous surgery and death,
- 4) Clinical factors: general condition the patient's general condition on admission assessed by the WHO performance status index (Good general condition: 0, Fair general condition: 1–2, Impaired general condition: 3–4), state of consciousness and death,
- 5) Paraclinical factors: mass effect, laterality and death,
- 6) Surgical management: type of surgery, delays in management and death, occurrence of recurrence in relation to type of surgery.

The obtained data was analyzed using WHO Epi-info version 3.5.4 and Excel 2016. To measure the relationship between two variables, we used the Chi-square statistical test with Odds ratio and 95% confidence interval. The threshold value of $p < 0.05$ was considered significant.

Prior to data collection, authorization was obtained from hospital directors and heads of the departments concerned. Respect for anonymity, confidentiality, personal and professional secrecy. The forms containing the information collected are kept in a safe place.

The current study has some limitations as well. First, this is a retrospective study, and therefore subject to the effects of confounding factors. Second, the sample size is small.

3. RESULTS

The number of patients selected was 125: 28 patients in surgical intensive care units (35%) and 97 patients in neurosurgical units (65%). The majority of patients underwent surgery under general anaesthesia, i.e., 96% (120 patients). Age over 70 is a risk factor for mortality, and the higher the age, the greater the risk (OR = 4.4100; $p = 0.005$) (Table I).

As demonstrated by the data in Table II, male gender is a risk factor for mortality in patients with HSDC, with an OR of 4.3542 [1.4320–13.3226] and a p of 0.008. Head trauma is significantly associated with mortality in patients with chronic subdural hematoma OR: 5.2250 [1.6601–16.4456]; $p = 0.001$. There was a significant association between chronic alcohol intake and death from chronic subdural hematoma OR: 5.9639 [1.5298–6.2856]; $p = 0.035$. Anticoagulant use is a risk factor for OR mortality: 5.7857 [1.6128–16.0207]; $p = 0.001$. Hypertension is significantly associated with mortality in chronic subdural hematoma OR: 3.7733 [1.5939–9.2952]; $p = 0.028$. There was no association between previous surgery and poor prognosis of chronic subdural hematoma OR:

1.250 [0.3731–4.1881] $p = 0.717$. There was no association between patient diabetes and mortality from chronic subdural hematoma OR: 1.5120 [0.5155–4.4346]; $p = 0.41$.

Impaired general condition on admission is a risk factor for mortality in patients with chronic subdural hematoma OR: 3.4000 [1.0872–11.9210]; $p = 0.001$. Glasgow scores below 8 and between 13 and 8 are risk factors for mortality from chronic subdural hematoma. The lower the score, the higher the risk of mortality OR: 14.444 (3.969–52.6360); $p = 0.001$. There was no association between the occurrence of mortality and the existence of the mass effect OR: 1.3478 [0.7901–6.9770]; $p = 0.118$. There was no significant association between mortality and bilateral hematoma OR: 1.3478 [0.9901–5.9770]; $p = 0.058$.

As demonstrated by the data in Table III, a delay in management of more than 5 days is a risk factor for mortality in DCSH, with a 95% OR CI of 4.7230 [1.6242–13.7188] and a p -value of 0.002. Of the 120 patients who underwent surgery, the enlarged trepan hole technique was used in 65% (78 patients), and the mini-flap technique with trephine was used in 35% (42 patients). There was no association between the occurrence of mortality and surgical technique, with an OR: 0.5264 [0.1828–1.5543], $p = 0.237$ for the enlarged trepan hole and an OR: 1.9172 [0.6568–5.6437], $p = 0.237$ for the mini-flap with trephine. There was no association between the occurrence of recurrence and the enlarged trephine hole surgical technique OR: 0.5276 [0.1034–2.7010], $p = 0.429$ nor with the mini-flap technique with trephine 1.9243 [0.3763–4.9876], $p = 0.429$.

4. DISCUSSION

According to the results of this study, there is a significant association between age over 70 and the occurrence of death from chronic subdural hematoma.

The higher the age, the greater the risk, with an OR CI of 4.4100 [1.3872–12.9210] and a p of 0.005, with a mortality rate of 17%. This is in line with a study carried out by Martial [3] in Limoges, which showed that all patients who died were over 60, with a death rate of 15%. A study carried out in Spain by Delgado *et al.* [4] on the early prognosis of chronic subdural hematomas. Multivariate analysis of 137 cases showed that advanced age tended to increase the risk of mortality (OR: 1.104), but did not reach statistical significance ($p = 0.0654$). Miranda *et al.* [1] in their study in the USA, in a multivariate analysis of chronic subdural haematoma in the elderly showed that age was a predictor of death after hospital discharge (OR = 1.06, $p = 0.02$). In his study of chronic subdural haematomas as a cause of morbidity and mortality in India, Ramachandran and Hedge [2] noted a death rate of 6%, which was significantly associated with advanced age ($p = 0.003$). Mortality is linked to the frailty of the elderly, who are more exposed to complications.

The association between male gender and poor prognosis of chronic subdural hematoma was significant in this study, with an OR of 4.3554 [1.4320–13.3226] and a p of 0.008. In the literature, male gender is considered a factor in the occurrence of mortality from chronic subdural hematoma. Indeed, a study carried out in Korea by

TABLE I: PREDICTIVE FACTORS OF MORTALITY ACCORDING TO SOCIO-DEMOGRAPHIC PARAMETERS

Variables	Deceased (n = 21)	Live (n = 104)	OR IC [95%]	p-value
Age				
30–50	3	16	1	
50–70	6	56	3.7116 [1.2082–10.4322]	0.001
>70	12	32	4.4100 [1.3872–12.9210]	0.005
Gender				
Female	9	14	1	
Male	12	90	4.3542 [1.4320–13.3226]	0.008
Head trauma				
No	2	20	1	
Yes	19	84	5.2250 [1.6601–16.4456]	0.001
Ethyl				
No	4	45	1	
Yes	17	59	5.9639 [1.5298–6.2856]	0.003
Previous surgery				
No	15	88	1	
Yes	6	16	1.250 [0.3731–4.1881]	0.717
Diabetes				
No	18	92	1	
Yes	5	12	1.5120 [0.5155–4.4346]	0.41

TABLE II: PREDICTORS OF MORTALITY BASED ON CLINICAL AND PARA CLINICAL PARAMETERS

Variables	Deceased (n = 21)	Live (n = 104)	OR IC [95%]	p-value
General condition				
Good	3	26	1	
Fairly good condition	7	69	0.6759 [0.1818–2.512]	Not significant
Impaired general	11	9	3.4000 [1.0872–11.9210]	0.001
Glasgow				
15/15	3	69	1	
Between 8 and 13	8	32	6.3333 [1.4334–13.1003]	0.001
Less than 8	10	3	14.444 [3.969–52.6360]	0.001
Mass effect				
No	4	13	1	
Yes	17	91	1.3478 [0.7901–6.9770]	0.118
Laterality				
Unilateral	11	77	0.6867 [0.2967–1.6213]	0.395
Bilateral	10	27	1.3478 [0.9901–5.9770]	0.058

TABLE III: PREDICTIVE FACTORS OF MORTALITY ACCORDING TO THERAPEUTIC PARAMETERS

Variables	Deceased (n = 21)	Live (n = 104)	OR IC [95%]	P
Time from diagnosis to surgery				
≤5 days	13	92	1	
>5 days	8	12	4.7230 [1.6242–13.7188]	0.002
Type of surgery				
Mini shutter with trephine	5	37	1.9172 [0.6568–5.6437]	0.237
Enlarged drill hole	16	62	0.5264 [0.1828–1.5543]	0.237

Sim *et al.* [5], showed that the male gender is more exposed to CSHD due to its natural behavior characterized by overwork, high-risk work but also brutality, recklessness and delinquency which are observed in almost all cases of trauma whether cranioencephalic or general.

For Sim *et al.* [5] in Korea, in a comparative study between two groups over time which showed a rate in the recent group 15.7% significantly higher than in the distant groups which is 8.2%. This may be due to the current widespread use of anticoagulants, which may have changed the incidence of CSHD anticoagulants, recently

considerably developed for the prevention of cardiovascular events. The results of this study also found a significant association between the mortality factors.

In Spain, Villagrasa *et al.* [6], in a retrospective statistical study analyzing prognostic factors in adults with chronic subdural hematoma, found that anticoagulant use was an independent factor in poor prognosis (OR: 7.2; 95% CI 3.9 to 9.5; $p = 0.01$). Diamond *et al.* [7], in England, assumed from a series of 22 patients with anticoagulant-associated subdural hematoma that the clinical course in patients on

anticoagulants was more rapid than in those not on anticoagulants. A history of anticoagulant use would increase the risk of death in subdural hematoma.

In France, Decaux *et al.* [8] showed a 50% association between chronic alcoholism and CSHD. In Korea, Sim *et al.* [5] found a history of alcoholism in 21% of patients who underwent surgery for CSDH. The results of this study also demonstrated that long-term alcohol consumption is a poor prognostic factor for CSHD OR: 5.9639 [1.5298–6.2856] $p = 0.003$. Diallo *et al.* [9] in a retrospective analytical study in Senegal concerning the fate of alcohol-associated chronic subdural hematoma, found 14.9% with a history of alcoholism. They also noted that alcoholism is most often a poor prognostic factor in the management of CSHD, with 50% (5 out of 11 patients) having neurological sequelae. However, no deaths were reported, which differs slightly from our results. This poor prognosis may be linked to the fragility of the vessels induced by long-term alcohol consumption, and increases the risk of acute recurrence of the haematoma [10].

The results of this study showed that comatose state had a significant relationship with the occurrence of mortality in HSDC, with an OR: 14.444 [3.969–52.6360] and $p = 0.001$. Miranda *et al.* [1] in the USA, in their 2012 study, showed that the only predictor of in-hospital death was neurological status on admission (OR: 2.1, $p = 0.02$); in India, Ramachandran and Hedge [2] also demonstrated that when the Glasgow score was below 8, the risk of death was 35%, and this result was statistically significant ($p < 0.001$). Kim *et al.* [11] in Korea, in a study concerning prognostic factors in patients with chronic subdural hematoma, described that a low Glasgow score is an indicator of strong negative prognostic outcomes in CSHD ($p < 0.001$). According to several studies, the Glasgow score is a factor determining prognosis: the lower it is, the higher the mortality [1]. Fragile terrain with altered consciousness may explain this mortality.

In the present study, there was a significant association between the occurrence of CSHD-related mortality and a delay in management of more than 5 days, with a [95%] OR CI of 4.7230 [1.6242–13.7188] and a p -value = 0.002. To reduce mortality, it is important to perform surgery as soon as possible. Surgery is the mainstay of treatment for CSHD, and consists of evacuation of the subdural hematic collection, followed by flushing to remove the anticoagulant and fibrinolytic contents. All of this helps to ensure cerebral decompression and a return to normal local hemostasis [11]. The procedure is generally performed under general anesthesia, depending on the patient's clinical condition. All our patients had undergone surgery under general anaesthesia: 65% were operated on using an enlarged trepan hole (78 patients), and the mini-flap technique with trephine was used in 35% of cases (42 patients). Several studies have reported results in line with these findings, notably Olodo's [12] study in Senegal, in which trepanation was virtually the most commonly used technique (96.15%), with only one patient requiring a flap. Dongmo *et al.* [13] in Cameroon noted almost the same proportions, with 77.5% trepanation and 22.5% cranial flap with trephine.

Depending on the surgical procedure, mortality is 20.5% for craniotomy and 1.6% for trepan hole [14]. In this series, there was no significant association between the occurrence of mortality and surgical technique, with an OR: 0.5264 [0.1828–1.5543], $p = 0.237$ for the enlarged trephine hole and an OR: 1.9172 [0.6568–5.6437], $p = 0.237$ for the mini-flap with trephine. In the USA, Miranda, *et al.* [1] noted that the type of intervention, whether or not surgery was performed, did not affect long-term or short-term mortality (OR: 0.24, $p = 0.01$).

Surgical technique has no influence on mortality, and each center has its own technique, according to its own practice. The results of this study also showed that there was no association between the occurrence of recurrence and the enlarged trephine surgical technique OR: 0.5276 [0.1034–2.7010], $p = 0.429$ nor with the mini-flap technique with trephine 1.9243 [0.3763–4.9876], $p = 0.429$. In contrast to the study carried out by Bencherif *et al.* [14] in Algeria, recurrence was mainly due to non-re-expansion of the brain, which in turn was related to the choice of surgical technique. They noted a recurrence rate of 11.62%, which is slightly higher than the result of that study.

5. CONCLUSION

It is important to identify these predictive factors of mortality, so as to improve and implement appropriate care. Elderly people and those around them should avoid situations and workplaces where there is a risk of trauma, respect traffic regulations to reduce the number of accidents on public roads, combat modifiable risk factors (chronic alcoholism, trauma, self-medication with antiplatelet agents, dehydration), guide elderly people in their movements to avoid falls, consult a doctor after a trauma, however minor.

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

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