Open Journal of Modern Neurosurgery, 2025, 15(4), 280-288
https://www.scirp.org/journal/ojmn
ISSN Online: 2163-0585
ISSN Print: 2163-0569

Traumatic Intracerebral Hematomas in Adults: Treatment Outcomes at CNHU-HKM

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How to cite this paper: Thierry, A., Abdias, G., Adorelle, N., Luphin, H. and Martial, A.P. (2025) Traumatic Intracerebral Hematomas in Adults: Treatment Outcomes at CNHU-HKM. *Open Journal of Modern Neurosurgery*, **15**, 280-288.
https://doi.org/10.4236/ojmn.2025.154029

Received: August 15, 2025
Accepted: October 20, 2025
Published: October 23, 2025

Abstract

Introduction: Traumatic intracerebral hemorrhagic lesions are common in head trauma. Here we report the results of the management of traumatic intracerebral collections at the CNHU-HKM University Neurosurgery Clinic. **Materials and Methods:** This was a descriptive cross-sectional study with retrospective data collection from January 1, 2020, to December 31, 2022. All patients over the age of 15 with traumatic intracerebral hemorrhage (TICH) were included. **Results:** During the study period, traumatic intracerebral hematoma accounted for 43.4% of intracranial hemorrhagic collections and 31.1% of head injuries. Men were overrepresented (113M/12F) with a mean age of 38.72 ± 15.28 years. Road traffic accidents were the cause of TICH in 118 patients (94.40%). Among them, 39.2% had a Glasgow Coma Scale score of less than 8/15. Anisocoria was present in 14.4% of cases. The hematoma was single, superficial, and frontal in 51.2%, 89.60%, and 31.2% of cases, respectively. Twenty-seven patients (21.6%) underwent surgery with a mean delay of 6.6 days. Decompressive craniectomy without hematoma evacuation was performed in 17 patients (62.9%). Thirty-seven patients (29.6%) died within an average of 13.4 days. Death was significantly associated with neurological status on admission ($p < 0.001$) and the presence of ACSOS. **Conclusion:** TBI is a reality at CNHU-HKM. Its management is still hampered by delays in diagnosis and treatment, and mortality remains high.

Keywords

Traumatic Brain Injury, Traumatic Intracerebral Hematoma, Surgery, Secondary Systemic Cerebral Insults (SSCI), CNHU-HKM

1. Introduction

Traumatic brain injuries (TBIs) remain a heavy burden on healthcare systems worldwide due to their frequency, the severity of the brain damage they cause, and the costs associated with their treatment [1]-[3]. Mild TBIs are no exception [4] [5].

These TBI frequently cause intracranial blood collections, including traumatic intracerebral hematomas (TICH), whose more or less rapid expansion can contribute significantly to the poor prognosis of these TBI [6] [7].

Early surgery for TICH appears to influence the prognosis in some patients, but its beneficial role has not yet been clearly established given the mixed results in terms of more or less severe neurological sequelae, despite the significant therapeutic efforts made [6] [8].

In Benin, in 2017, HICTs accounted for nearly 32% of intracranial hematomas, with a mortality rate of 19% [4]. Here we report on the overview and results of the management of traumatic intracerebral blood collections treated at the CNHU-HKM University Neurosurgery Clinic.

2. Methods

This was a descriptive and analytical cross-sectional study with retrospective data collection covering the period from January 1, 2020, to December 31, 2022. All patients aged 15 years and older with traumatic intracerebral hemorrhage (TICH) on CT scan and followed up at CNHU-HKM were included.

Patient records and medical files, as well as interviews with patients or their families, were used as data sources. Data were collected using the Enketo Express Kobo Toolbox software and analyzed using STATA software, version 15.1. The chi-square or Fisher's exact test was used for comparisons of qualitative data. The difference was considered significant for a p-value ≤ 0.05.

3. Results

During the study period, 1,078 cases of head trauma were collected. Among them, 402 patients underwent brain CT scans, with intracranial hemorrhagic collection present in 288 cases. HICT accounted for 43.4% (125 patients) of intracranial hemorrhagic collections and 31.1% of head injuries (**Table 1**). Men were overrepresented (113M/12F) with a sex ratio of 9.42. The average age was 38.72 ± 15.28 years, with extremes of 15 and 80 years. Road traffic accidents were the cause of SAH in 118 patients (94.4%).

Table 1. Frequency of patients with intracranial hematomas and traumatic brain injuries by year.

	TBI	Intracranial hematomas	HICT	HICT/intracranial hematomas (%)	HICT/TBI (%)
2020	128	86	32	37.20	25.00
2021	140	101	47	46.53	33.53
2022	134	101	46	45.54	34.33
Total	**402**	**288**	**125**	**43.40**	**31.10**

On admission, 39.2% of patients had a Glasgow Coma Scale score of less than 8/15. This score was between 9 and 12 in 30.4% of patients. Headaches and agitation were present in 10.4% and 7.2% of cases, respectively. Anisocoria was noted in 14.4% of patients. The neurological picture also included motor deficits, convulsions, and speech disorders in 5.6%, 0.8%, and 3.2% of cases, respectively. Secondary systemic cerebral insults (SSCI) were present, including hyperthermia (14.4%), hypotension (2.4%), anemia (41.6%), hypoxia (22.4%), and hyperglycemia (30.4%). Twenty-nine patients (17.6%) had thrombocytopenia and 3 patients (2.4%) had thrombocytosis. In 9 patients (7.2%), the prothrombin time (PT) was low and 3 (2.4%) had an extended Kaolin cephalin time (KCT). The average time to perform the CT scan was 2.21 ± 2.1 days (4.33 hours and 9 days). The hematoma was single, superficial, and frontal in 51.2%, 89.60%, and 31.2% of cases, respectively (**Table 2**). Other craniocerebral injuries accompanying intracerebral blood collection (**Table 3**) were skull fracture (38.4%), acute subdural hematoma (34.4%), and subarachnoid or ventricular hemorrhage (38.4%).

Table 2. Distribution of HICT cases according to hematoma topography N = 125.

	Number	Percentage
Number of hematomas		
= 1	64	51.2
≥2	61	48.8
Location		
Supratentorial	120	96.0
Infratentorial	6	4.8
Location		
Superficial	118	94.4
Deep	11	8.8
Site of hematoma		
Frontal	39	31.2
Temporal	14	11.2
Parietal	06	4.8
Occipital	02	1.6
Basal ganglia	06	4.8
Brain stem and cerebellum	06	4.0

Table 3. Distribution of other types of associated intracranial lesions (N = 95).

	Number	Percentage
Subdural hematoma	43	45.26
Extradural hematoma	23	24.21
Subarachnoid hemorrhage	35	36.84

Continued

Intraventricular hemorrhage	13	13.68
Contusion	15	15.79
Simple fracture	34	35.79
Embarrure	03	3.16
Embarrure fracture	11	11.58
Other	17	17.89

In terms of treatment, twenty-seven patients (21.6%) underwent surgery with a mean delay of 6.6 days (22 hours to 37 days). Decompressive craniectomy without hematoma evacuation was performed in 17 patients (62.9%). Thirty-seven patients (29.6%) died within an average of 13.4 days (15 hours to 125 days). Death was significantly related to neurological status on admission ($p < 0.001$) and the presence of ACSOS (blood pressure, blood sugar, anemia, hypoxia). There was no significant link between death and age (Table 4). The average hospital stay was 15.45 ± 14.46 days (0 - 68 days).

Table 4. Correlation between death and age, Glasgow score and SSCI.

	N	Death		OR	CI 95% OR	p-value
		n	%			
Glasgow Score						**<0.001**
3 - 8	49	27	55.10	20.25	4.37 - 93.92	
9 - 12	38	08	21.05	4.40	0.87 - 22.38	
13 - 15	35	02	05.71	1		
Pupil status						**<0.001**
Myosis	15	06	40.00	2.33	0.73 - 7.43	
Normal	81	18	22.22	1		
Anisocoria	18	10	55.56	4.38	1.51 - 12.72	
Bilateral reactive Mydriasis	02	01	50.00	3.50	0.21 - 58.77	
Age						0.10
15 - 24	22	4	18.18	1		
25 - 34	37	8	21.62	1.24	0.32 - 4.72	
35 - 44	25	6	24.00	1.42	0.34 - 5.89	
45 - 54	16	7	43.75	3.50	0.81 - 15.16	
55 - 64	15	7	46.67	3.94	0.89 - 17.37	
≥65	9	5	55.56	5.63	1.02 - 30.90	
Gender						0.18
Female	12	6	50.00	1		
Male	113	31	27.43	0.38	0.11 - 1.26	

Continued

			Blood pressure			**0.04**
Hypotension	9	2	66.67	5.62	0.48 - 65.22	
Hypertension	26	12	46.15	2.41	0.96 - 6.03	
Normal	80	21	46.15	1		
			SpO_2			**0.02**
Hypoxia	28	14	50.00	2.80	1.14 - 6.88	
Normal	76	20	26.32	1		
			Temperature			0.68
Hyperthermia	18	7	38.89	1.27	0.41 - 4.00	
Normal	42	14	33.33	1		
			Blood glucose			**0.04**
Hyperglycemia	38	19	50.00	3.00	1.03 - 8.71	
Normal	28	7	25.00	1		
			Hemoglobin			0.82
Anemia	52	18	34.62	1.13	0.41 - 3.11	
Normal	25	8	32.00	1		

Pressure ulcer complications were present in 6 patients (4.8%): pressure sores (4) and aspiration pneumonia (2). An infectious complication was present in 15.2% of patients. Motor deficits and speech disorders were present in 14.4% and 4.2% of cases at discharge, respectively. One year after the trauma, 25 patients were reviewed; sequelae included post-traumatic epilepsy or persistent headaches in 3 patients, memory and concentration disorders in 4 patients, speech and behavioral disorders, and motor deficits in 2 patients.

4. Discussion

Socio-demographic data, circumstances of the trauma, and treatment delays are broadly similar across sub-Saharan Africa [9] [10].

Concerning our patients' care pathway, only 37.29%, or just over a third of patients, were able to have a brain CT scan. This low rate is due to the inaccessibility of imaging for a certain category of patients with very limited financial resources; the cost of a CT scan is still expensive. In addition, the retrospective nature of the study led to missing data, such as the Masters classification [11], which would have enabled us to determine the proportion of patients requiring a cerebral CT scan, and who would or would not have undergone one. These various reasons certainly lead to a bias in the selection of patients presenting with HICT.

The clinical data reported in our series are consistent with those found in the literature. Patients with moderate or severe head trauma and intracerebral hematoma may require intensive care unit treatment due to the possible occurrence of secondary systemic cerebral insults (SSCI). These SSCI can worsen the prognosis of these HICTs and must be prevented or treated effectively [12] [13]. The outcome is even more negative when there is a combination of several of these secondary aggressions. These systemic attacks can occur before the patient arrives at the hospital, during transfer, or during their stay in intensive care units. Prevention of hypoxia requires earlier protection of the airways and more systematic administration of oxygen to trauma patients. Arterial hypotension has even more dramatic consequences in cases of severe head trauma. It has been shown that even short periods of hypotension can induce severe cerebral ischemia. Treatment must be immediate and aggressive [12]. In our series, fatal outcomes were significantly associated with the presence of SSCI. This fact is commonly reported in the literature. The prevention of SSCI is therefore a challenge that must be addressed during prehospital care.

The patients with moderate or severe head trauma and intracerebral hematoma should be admitted to an intensive care unit for monitoring and aggressive correction of SSCI, but also undergo surgery when indicated [14].

Patients with large parenchymal lesions and signs of progressive neurological deterioration related to the lesion, intracranial hypertension refractory to medical treatment, or signs of mass effect on computed tomography (CT) should be treated surgically [15]. For ICH involving the cerebral hemispheres, American surgical guidelines recommend evacuation if the hemorrhage exceeds 50 ml, or if the GCS score is 6 to 8 in a patient with a frontal or temporal hemorrhage greater than 20 ml with midline shift of at least 5 mm and/or cisternal compression on CT. Surgical evacuation of a HICT in the posterior fossa is also recommended when there is a significant mass effect (compression of the brainstem and/or fourth ventricle, effacement of the basal cisterns, or obstructive hydrocephalus) [6] [8] [14]. In the presence of malignant edema or associated intracranial lesions, decompressive craniectomy may be indicated [16]-[18]. It is a valuable therapeutic tool in the management of intracranial hypertension that is refractory to medical treatment. It can be performed with or without evacuation of the hematoma, depending on its location.

In our center, there has been a change in surgical management; in 2015, no HICTs were operated on [4], compared with 21.6% for this series. Craniotomy with evacuation of the hematoma, when accessible, is the standard surgical procedure in our series of HICTs, but this treatment is subject to very specific indications in terms of location, volume, the compressive effect of the hematoma, and also the time to treatment [6].

For our patients, the surgical decision was based on the following criteria: voluminous and compressive hematoma, neurological deterioration and at most 72 hours after the trauma, given the admission delay. We perform decompressive craniectomy alone in the presence of intracranial hypertension, without hematoma evacuation when it is deeply located.

Minimally invasive hematoma evacuation also has its indications [19]. Endoscopic techniques appear to be innovative and safe, allowing hematoma evacuation through a small incision with fewer comorbidities than conventional craniotomy. To our knowledge, the first description of this technique was made in 2015 [20] [21]. The same applies to hematoma evacuation using conventional stereotaxy or stereotaxy assisted by a surgical robot, which has the advantage of improving the effectiveness of evacuation and reducing the length of hospital stay without increasing the risks. These procedures are based on the same principle as minimally invasive evacuation of spontaneous intraparenchymal hematomas. Although their long-term neurological benefits have yet to be studied, the results of these techniques highlight their potential as a safe and effective minimally invasive approach to the management of HICT [22]-[24].

Given the technical limitations of our center, we do not yet perform these minimally invasive techniques.

In terms of post-treatment outcomes, as in our series, mortality remains high in cases of HICT and therefore head trauma worldwide, ranging between 25 and 30% [2]. The authors, as in our series, also report a significant link between death and neurological status on admission and therefore the severity of brain injuries [25] [26]. Some authors have found a link between mortality and age as well as length of hospital stay [25].

For our series, age had no influence on mortality. For other authors, neurosurgical intervention, admission to intensive care, the presence of complications during hospitalization, cognitive disorders, post-traumatic headaches, post-traumatic seizures, or the presence of significant behavioral disorders are predictive of an unfavorable outcome ($p < 0.05$) [27] [28].

5. Conclusion

TBI is a reality at CNHU-HKM. Its management is still hampered by delays in diagnosis and treatment, and mortality remains high. Investments must be made to upgrade technical facilities in order to implement minimally invasive techniques. Nevertheless, the team strives to provide the best possible care for TBI patients.

Ethical Advice

Ethical advice was required for this study.

Conflicts of Interest

The authors declare that they have no conflict of interest with this study.

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