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Research Article

Spontaneous Intracerebral Hematoma Operated in Two Neurosurgical Centers in Madagascar

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Abstract

Primary spontaneous intra-parenchymal haematomas are associated with high morbidity and mortality and are rarely operated on. The aim of this study is to report the characteristics of primary intra-parenchymal haematomas operated in two neurosurgical centres in Madagascar.

This is a retrospective descriptive and analytical transversal study over a period of 5 years. We collected 32 patient files. The average age was 51.6 years. The sex ratio was 1.66. All patients were hypertensive. The Glasgow score was between 8 and 14 in 56.3%. Motor deficit was identified in 84.4%. Brain MRI was performed in 6.2% and no arteriography was performed. The haematoma was sustentorial in 84.4% and subtentorial in 15.6%. Hydrocephalus was found in 31.2%. The volume of the haematoma was greater than 30 ml in 75%. For cerebellar haematomas, craniectomy with evacuation of the haematoma after a CSF shunt is used. Craniotomy with evacuation of the hematoma for sustentorial hematoma. The mortality rate was 40.6%. The mRS score was 0-2 at 3 months in 29.4%. Preoperative GCS greater than 8 was associated with low mortality (p = 0.001).

There is still no consensus on the surgical indication. The decision for surgery must be considered on a case-by-case basis.

Keywords: Cerebral Haemorrhage; Hypertension; Surgery; X-Ray Computed

Introduction

Spontaneous intracerebral hematoma (ICH) is defined as the occurrence of hemorrhage into the brain parenchyma. In most cases, it is primitive or primary when no underlying cause is found [1,2].

ICH represents 78 to 88% of ICH (Intracerebral Hematoma). It accounts for 9 to 14% of strokes [1,3].

ICH is a serious pathology because of the severe neurological sequelae it causes. It is associated with a high mortality rate of approximately 40% at 1 month [2,4].

In a meta-analysis of 36 studies worldwide, the incidence of ICH is 24.6 per 100,000 people per year, and the rate was significantly higher in Asian and older populations. Few data are available in developing countries such as Africa.

Spontaneous ICH is rarely surgical. Several studies have demonstrated the absence of beneficial effects of surgery compared to medical treatment except in certain cases [2,4].

This study focuses only on spontaneous ICH patients who received treatment at two neurosurgical centers in Madagascar. The

objectives of this study are to report the socio-demographic, clinical, radiological, and therapeutic profile, the evolutionary profile, and to determine the factors related to death.

Methodology

This is a retrospective descriptive and analytical cross-sectional study conducted in the neurosurgery department, and Intensive Care Unit of CENHOSOA Antananarivo Madagascar and in the neurosurgery department ,and Intensive Care Unit of CHU PZAGA Androva Mahajanga. During a period of 5 years from 01 January 2017 to 31 December 2021.

We included patients aged 18 years and older with spontaneous intra parenchymal hematoma (without underlying vascular malformation) with or without ventricular invasion, having received surgical treatment.

Study parameters were

- Age, gender, personal history including high blood pressure (HBP), diabetes, stroke
- Glasgow score at admission, presence or absence of motor deficits, language disorders, pupil status
- The preoperative Glasgow score (at the time of the surgical indication)
- The existence or not of a decrease in the Glasgow score between admission and the time of the surgical indication
- The characteristics of the hematoma (location, side, distance of the hematoma on imaging (depth in relation to the cortex, volume in ml, presence of mass effect or not, ventricular invasion with or without hydrocephalus)
- The delay of the surgery in relation to the admission
- The medical treatment (osmotherapy or not)
- The type of surgical treatment (evacuation of the hematoma by craniotomy or enlarged hole/LCS bypass/decompressive craniectomy with or without evacuation of the hematoma)
- Length of hospitalization, length of stay in the intensive care unit.
- Glasgow score and deficit at discharge, mode of discharge (return home/death) mortality rate
- Modified Rankin Score (mRS) at 3 months after hospital discharge.
- Analysis of the association between the socio-demographic profile, the preoperative GCS score (at the time of the surgical indication), the fall in GCS between admission and at the time of the surgical indication, the delay of the surgery in relation to the ictus and death

Results

We collected 32 records of patients with primary spontaneous ICH operated during the study period. The mean age of the patients was 51.6 ± 9 years. The sex ratio of men to women was 1.66. All patients were hypertensive, 50% were under treatment, and 74.9% had grade 2 and 3 hypertension. 18.7% had diabetes and 9.4% had a history of stroke. The majority of patients had a Glasgow score between 8-14, i.e., 56.3% (Table 1). Eighty four percent (84.4%) of patients had motor deficit and language disorder in 37.5%, anisocoria in 25% at admission.

	Effective (n = 32)	Rate (%)
Glasgow at admission		
15	10	31,3
8-14	18	56,3
<8	4	12,5
Glasgow before surgery		
15	1	3,1
8-14	19	59,4
<8	12	37,5
Decrease of Glasgow*	23	71,9

Table 1: Distribution of patients according to the Glasgow score at admission, the Glasgow score at the time of the surgical indication.

* Decrease in GCS score between admission and time of surgical indication.

All patients had a CT scan, magnetic resonance imaging (MRI) was performed in 6.2% and no cerebral arteriography was performed.

At the end of the imaging examinations

- The hematoma was localized sustentorially in 84.4% (n = 27), including 16 deep hematomas (basal ganglia and capsular) and 11 lobar hematomas
- The hematoma was located subtentorially in 15.6% (n = 5), including 4 cerebellar hemispheric hematomas and one brain stem hematoma (mesencephalic hematoma associated with hydrocephalus on ventricular invasion)

The volume of the hematoma is more than 30 ml in 75% of cases with extremes of 6.8 ml and 132 ml (Figure 1). The distance of the hematoma from the cortex was between 10-20 mm in 51.8% (Figure 2).

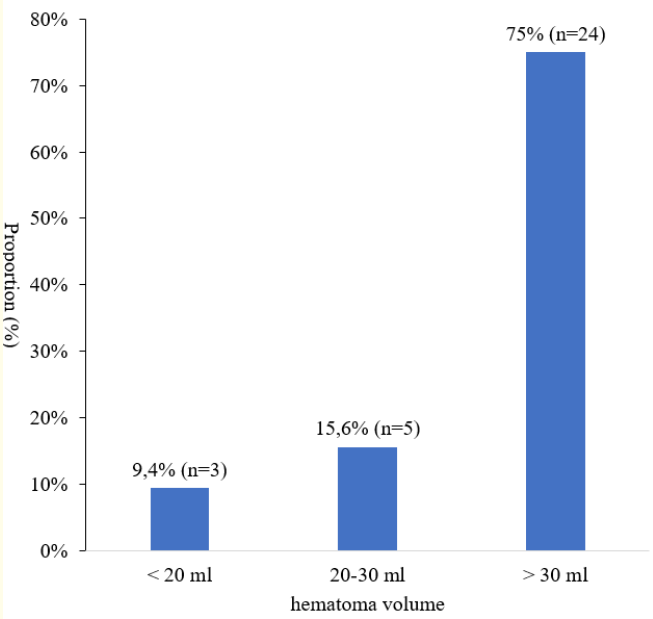

Figure 1: Distribution by volume of hematoma.

The mass effect was present in 84.4% of patients. Acute hydrocephalus was present in 31.2% of patients. Hydrocephalus was secondary to ventricular invasion in 6 patients and by compression of the fourth ventricle (V4) by a cerebellar hematoma in 4 patients.

For cerebellar hematomas, suboccipital craniectomy plus or minus C1 laminectomy with evacuation of the hematoma after a CSF shunt were the most commonly used surgical techniques (60%).

For sustentorial hematoma, craniotomy with evacuation of the hematoma was the most performed type of surgery in 66.6%. Decompressive craniectomy alone was performed in 14.8% of cases.

Neurological status improved in 43.8% of patients after surgery.

The average length of stay in the intensive care unit was 14 ± 21 days.

Four patients had pneumopathy and one patient had postoperative meningitis. The mortality rate was 40.6% (n = 13). The average length of hospital stay was 23.7 ± 39.7 days.

The mean age was 53.15 years for the deceased and 50.63 years for the living, but this difference was not statistically significant.

There was a significant relation between preoperative GCS and the occurrence of death. A GCS up to 8 was associated with low mortality. We did not find a significant relation between the decrease in GCS score.

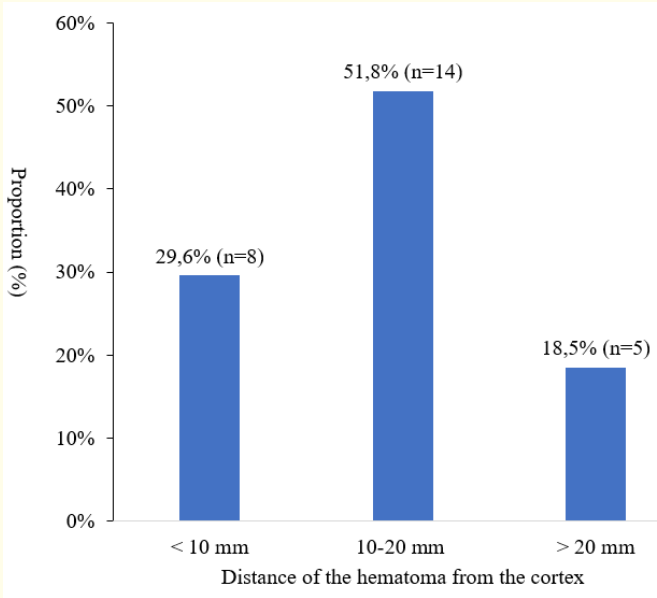

Figure 2: Distribution according to the distance of the hematoma from the cortex.

between admission and at the time of the surgical indication and the occurrence of death (Table 2).

There was no significant relation between the volume of the hematoma, its location, its distance from the cortex, and the occurrence of death.

Seventeen of the 19 living patients were reviewed at follow-up. The mean follow-up time was 8.5 months.

The mRS at 3 months was 0-2 in 29.4% of cases.

		Décès			
		Yes n = 13(%)	**No n = 19(%)**	**Total n = 32(%)**	**P**
Glasgow before surgery					
15		0	1 (5,3)	1 (3,1)	**0,001**
14 - 8		3 (23,1)	16 (84,2)	19 (59,4)	
<8		10 (76,9)	2 (10,5)	12 (37,5)	
Decrease of Glasgow*					
Yes		8 (61,5)	15 (78,9)	23 (71,9)	0,248
No		5 (38,5)	4 (21,1)	9 (28,1)	

Table 2: Distribution of patients according to preoperative GCS score and occurrence of death.

* Decrease in GCS score between admission and time of surgical indication.

Discussion

According to the literature, the incidence of spontaneous ICH increases with age and is more important in the male population with a maximum peak between 60 and 80 years of age [1,5]. The mean age of the patients in our series was 51.6 ± 9 years. The population is younger because this study was performed in front of a case of primary ICH, the younger subjects are the most operated.

In this series, all patients were hypertensive, half of the patients were not under treatment, and 74.9% had grade 2 and 3 hypertension. According to the literature, hypertension is the main risk factor for the occurrence of spontaneous ICH; the risk is proportional to the severity of the hypertension [1]. Half of the hypertensive patients were not under treatment because most Malagasy people believe in natural remedies to be effective. In addition, patients cancel treatment when their blood pressure is stable.

In this series, all patients had a cerebral CT scan. MRI was performed in 6.2% (n = 2) and no cerebral arteriography was performed. Angioscanner and/or cerebral MRI were requested in the presence of a lobar hematoma in young subjects to rule out an arteriovenous malformation.

Access to MRI is still difficult in Madagascar because of the very high cost. In addition, this examination is not available in emergency. Cerebral arteriography is not yet available in Madagascar, although the 11 patients who had a lobar hematoma should have it.

Whatever imaging test is available, it should be repeated as a matter of emergency in case of deterioration of the neurological condition.

Routine use of mannitol to prevent edema and control ICP is not recommended. However, medical treatment with mannitol or hypertonic saline can be used as an emergency measure in case of worsening cerebral edema, elevation of intracranial pressure (ICP), or in case of temporal and/or tonsillar involvement pending surgery [6,7]. In this study, 93.7% of the patients had a good outcome. In this study, 93.7% had received mannitol osmotherapy before surgery. Patients who did not receive mannitol were those who presented with small-volume spontaneous ICH.

The beneficial effect of surgery has been demonstrated in some cases, such as ventricular drainage of acute hydrocephalus secondary to ventricular effusion or cerebellar hematoma compressing V4, young patients with lobar hematoma and signs of cerebral involvement, and cerebellar hemorrhages with signs of brainstem compression [2,4].

The indication for surgery does not depend only on the imaging characteristics of the hematoma but must take into account the patient's neurologic status.

In this series, the time to surgery from stroke was less than 24 hours in 50% of cases (n = 16) and 9 of the 16 patients survived. In his meta-analysis of supratentorial spontaneous ICH, Sondag reported that earlier surgery within 24 hours of stroke may have a beneficial effect on vital and functional prognosis. 8 The literature suggests that patients with supratentorial spontaneous ICH should be treated as soon as possible.

According to the literature, patients with acute hydrocephalus due to ventricular invasion associated with impaired consciousness may require urgent placement of an external ventricular shunt, which allows drainage of cerebrospinal fluid and monitoring of intracranial pressure [9].

In our series, suboccipital craniectomy with or without C1 laminectomy with evacuation of the hematoma after a CSF shunt was the surgical technique used in 3 patients (60% of cases) with cerebellar hematoma with hydrocephalus. Kirollos., *et al.* developed a grading system based on the size, configuration, and location of the fourth ventricle (V4) on brain CT. Patients with a GCS ≥ 13 and a grade I (normal) and II (compressed or deformed) fourth ventricle could be managed conservatively. In case of neurological deterioration, i.e., GCS < 13, in the presence of hydrocephalus, the authors suggested inserting an external ventricular shunt, followed by evacuation of the hematoma in the absence of clinical improvement. For patients with a grade III (completely effaced) fourth ventricle, irrespective of the GCS, the authors suggest evacuation of the hematoma with an external ventricular shunt [11]. According to the American Heart Association/American Stroke Association recommendations for management and the European Stroke Organization (ESO) guidelines, patients with cerebellar hematoma (regardless of volume) with acute hydrocephalus, brainstem compression, or worsening neurologic status should be operated on as soon as possible. Evacuation of the hematoma with external ventricular shunting is recommended over ventriculo-external shunting alone [10,12].

According to the literature, craniotomy with hematoma evacuation is the most commonly used surgical technique for primary supratentorial spontaneous ICH [2,13,14]. We also used this technique in the majority of cases (66.6%).

In South Korea, Lee., *et al.* compared the outcome of hematoma evacuation by craniotomy and trepanation. They found a higher mortality in the trepanation group [15].

In his meta-analysis of the surgical management of primary supratentorial spontaneous ICH, Gregson., *et al*. suggest that better outcomes can be achieved with surgery within 8 hours in patients with a Glasgow score of 9 with a hematoma of 20-50 ml and an age range of 50-69 years [13].

According to an international, multicenter, prospective, randomized, double-blind study of early surgery in patients with spontaneous lobar ICH between 10 and 100 ml without intraventricular hemorrhage (STICH II Study) with distance of the hematoma from the cortex less than 1 cm. Surgery may increase survival but has no functional effect. Therefore, surgery is indicated in patients with a Glasgow score between [9,12] and in case of worsening neurological status after initial conservative treatment [16].

In this series decompressive craniectomy alone was performed in 14.8% of cases. According to the American Heart Association/American Stroke Association recommendations for management and the European Stroke Organization (ESO) guidelines, decompressive craniectomy with or without hematoma evacuation can reduce mortality in patients with deep spontaneous ICH, especially in those who are comatose and have large hematomas resulting in significant mass effect, or also in patients with refractory intracranial hypertension [9].

Minimally invasive surgery such as stereotactic or endoscopic hematoma aspiration with or without thrombolytics could revolutionize the management of primary supratentorial spontaneous ICH. Compared to conventional craniotomy, morbidity appears to be lower. Numerous studies are underway to validate or not these techniques in the management of patients with spontaneous ICH [17]. In Madagascar these techniques are not yet feasible due to the lack of technical facilities.

In this series we found a significant association between preoperative GCS and the occurrence of death. A Glasgow score higher than 8 is associated with a low mortality. Operated patients who are not in coma have a better prognosis of survival.

Shabaan., *et al.* reported that factors associated with low 30-day mortality for supratentorial spontaneous ICH were preoperative GCS score higher than 9, hematoma volume less than 80 ml, and time from stroke to surgery, whereas factors predictive of better functional outcome were age, IVH, and time from stroke to surgery [18].

Conclusion

Spontaneous ICH associated with high morbidity and mortality in this study. Hypertension is the main risk factor. The preoperative Glasgow score may influence survival. The specificity of this study is the occurrence of hematoma in young patients and the delay in management. There is not yet a consensus for the surgical indication. The decision for surgical intervention must be studied on a case-by-case basis. The challenge of surgical treatment is to im-

prove the short-term vital prognosis and preserve as much autonomy as possible. Early detection of hypertension in young patients and their correct treatment is a primary prevention of spontaneous ICH.

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