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Impact of Computed Tomography in the Diagnosis of Traumatic Cerebrovascular Pathologies in Ndjamena (CHAD)

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Abstract

The morbidity and mortality from neurological conditions is constantly increasing around the world. They are responsible for 6.8 million deaths per year and represent the leading cause of non-traumatic acquired disability in adults. Objective: The aim of this study was to evaluate the interest of CT in the diagnosis of cerebrovascular and traumatic pathologies encountered at the CHU-RN of Ndjamena-Chad. Materials and methods: We conducted a cross-sectional and retrospective study over a period of 06 months from July to December 2024 on cerebrovascular or traumatic pathologies in CT. Our study was based on a questionnaire submitted to patients designed using Word software. The data was collected by Microsoft Excel 2016 software and then analyzed using SphinxV5 and XLStat7.5 software. Results: We recorded 150 patients with a male predominance of 68.7% against 31.3% of women, *i.e.* a sex ratio (M/F) of 2.19. The average age was 38 ± 20.48% with extremes of 12 and 102 years. The profession was largely represented by pupils/students, *i.e.* 50.77%; 48% of patients were married and all lived in urban areas. Coma was the predominant physical sign, 28%, while hypertension was the predominant risk factor, 35.33%. The majority of examinations were performed between 5 and 10 days after the onset of symptoms. The most common indication was TCE, *i.e.* 58.67%. The majority of the results were pathological, *i.e.* 70% with 23.81% of hemorrhagic strokes located in the fronto-parietal area (28.57%). The CT

aspects of DALYs were hypodensity unlike AVCH and brain tumors which were hyperdensity. The CT appearance of the extradural hematoma was that of spontaneous biconvex lens hyperdensity; the chronic subdural hematoma appeared in the form of a lunar crescent hypodensity, on the other hand, the meningeal hematoma and the intracranial hematoma appeared respectively in the form of an iso-density and a well-limited hyperdensity. Conclusion: CT remains the first-line examination in the diagnosis of cerebrovascular and traumatic pathologies. Making it easy to access, the populations will help improve their care.

Subject Areas

Clinical Medicine

Keywords

Computed Tomography, Diagnosis, Cerebrovascular and Traumatic Pathology

1. Introduction

The morbidity and mortality from neurological conditions is constantly increasing around the world. They are responsible for 6.8 million deaths per year and are the leading cause of acquired non-traumatic disability in adults [1]. The World Health Organization (WHO) defines Stroke as the rapid development of localized or global clinical signs of brain dysfunction with symptoms lasting more than 24 hours, which can lead to death with no apparent cause other than a vascular origin [2]. This term refers to very heterogeneous conditions: cerebral infarction (HF), which accounts for 80% to 90% of strokes, intracerebral haemorrhages (IBCs) in 10% to 20% of cases, and meningeal haemorrhages, which account for less than 2% of strokes [3]. Ischemia is the consequence of a vascular occlusion of the brain (thrombosis or embolism) leading to infarction and softening of the brain tissue. Cerebral hemorrhage occurs when a vessel ruptures and causes blood to flow into the cerebral parenchyma [4]. Stroke is a major cause of morbidity and mortality worldwide: 15 million people suffer from strokes each year, 5 million die from it and 5 million have disabling sequelae. In civilized countries, despite a marked improvement in the general health of the population, observed among both men and women, which has reduced the relative mortality rate following a stroke by 35.8% and the total number of deaths by 22.8%. About 795,000 people suffer from an ischemic stroke (obstruction of a cerebral artery) or hemorrhagic stroke each year in the United States, or one stroke every 4 minutes [5]. Worldwide, stroke is a major public health problem and is the third leading cause of death and the leading cause of acquired physical disability in adults [6]. In Chad, according to Sakadi *et al.*, hypercholesterolemia (72.1%), alcohol (51.8%), high blood pressure (47.6%) and diabetes (15.1%) were the most common risk factors, in his study ischemic

strokes were the most common with a prevalence of 66.3% and hemorrhagic stroke with a prevalence of 26.6%. The mean time spent in hospital was 10.3 ± 4 days, and the death rate was 14.7% [7]. A study carried out in Mali in 2013 showed that hemiplegia was the most well-known symptom and the telltale symptom of a stroke in 61.1% of cases. The 40% were divided in descending order between disorders of consciousness (20%), sensory disorders (15%) and others (5%) [8].

Traumatic brain injury (TBI) is commonly described by the WHO as a silent epidemic. In Quebec, 3607 hospitalizations in 2009 were attributable to traumatic brain injury, but many victims did not benefit from hospitalization. According to the WHO, the severity of TBI (mild, moderate or severe) is assessed from different clinical signs. Mild traumatic brain injury (MCI) accounts for 75% to 90% of all traumatic brain injuries [9]. In Cameroon, head trauma is one of the leading causes of death in fasting adults [10]. They are mainly due to falls in the extreme ages of life, and especially to road accidents (AVP). PVAs are responsible for 1.3 million deaths per year, 93% of which occur in low- and middle-income countries. The main victims are generally motorcyclists, who are very young and lack knowledge of the highway code [11]. According to a study conducted by Samaké *et al.*, the prevalence of head injuries due to road accidents was 82.80% with a mortality rate of 11% [12].

Intracranial tumors are defined as malignant or benign, primary or secondary intracranial expansive processes that involve the skull, envelopes, or cerebral parenchyma [13]. These tumours can cause significant disability and are the cause of heavy burdens on patients' families and health systems [14]. Primary brain tumors account for only 2% of all tumor diseases. With a total incidence of 7/100,000 in adults, this still represents nearly 500 patients per year in Switzerland. Two-thirds of primary brain tumors are gliomas, classified by WHO [15]. In Madagascar, according to Tongavelona *et al.*, the main telltale signs were intracranial hypertension (18.8%), cerebellar syndrome (13.67%) and motor deficit (11.96%). Exophthalmos accounted for 0.85% and decreased visual acuity 1.70% [13].

Computed tomography (CT) is a radiological imaging technique that allows you to obtain axial sections reconstructed from the coefficient of attenuation of the X-rays in the volume explored. Thanks to the continuous improvement of its technical performance, CT has experienced considerable growth over the last 20 years, justified by its diagnostic interest [16]. CT is one of the most effective modern methods of medical imaging both in terms of diagnosis and interventional radiology [17]. Its medical use in the 1970s revolutionized medical diagnosis, particularly in the field of neurology. Thanks to the continuous improvement of its technical performance, CT has experienced considerable growth over the last 20 years, justified by its diagnostic interest. Today, all over the world, CT and magnetic resonance imaging are the essential imaging examinations in cranioencephalic exploration [18].

It is important to redouble our efforts to contribute not only to the improvement of the diagnosis of neurological diseases but also to the management of these

pathologies, especially since, at the limit of our knowledge, little work has been carried out in Chad, particularly at the National General Reference Hospital in N'Djamena. As a result, we asked ourselves the question of what is the interest of CT in the diagnosis of vascular and traumatic brain pathologies encountered in the radiology and medical imaging unit of the General Hospital of National Reference in N'Djamena (Chad).

2. Equipment and Methods

2.1. Equipment

2.1.1. Type and Period of Study

It was a retrospective cross-sectional study for a period from July to December 2022, *i.e.* a duration of 06 months.

2.1.2. Choice of Study Location

Place of study:

Our study took place in the Radiology and Medical Imaging Unit of the National Reference University Hospital of N'Djamena-Chad.

2.1.3. Study Population and Selection Criteria

1) Study population

Our study involved patients with traumatic brain injuries, strokes and brain tumours.

2) Selection Criteria

a) Inclusion Criteria

All patients suffering from cerebrovascular, traumatic and tumor pathologies who had given their consent were included in our study.

b) Exclusion Criteria

All patients with brain conditions other than cerebrovascular, traumatic and tumor pathologies were excluded from our study.

2.1.4. Sampling

This was a non-probability consecutive type of sampling.

2.1.5. Study Variables

- Socio-epidemiological data: age, sex, marital status, occupation and residence.
- Clinical data: physical signs, risk factors.
- Scanograhic parameters: indications, results, type and location of lesions.
- Data collection was carried out on the basis of a survey sheet (in the appendix to the protocol).
- Data entry was done by Word 2016 software.

2.1.6. Statistical Analysis

Data were entered from Microsoft Excel 2016 and analyzed using XLStat 7.5 and SphinxV5. Quantitative variables are presented in mean and standard deviation,

while qualitative variables are presented in terms of numbers and frequencies. The association between different qualitative variables was achieved using the Chi2 test. The differences were significant for $p < 0.05$.

2.1.7. Ethical Considerations

This research project was submitted to the ethics clearance committee for approval. Authorization from the Director General of the National General Reference Hospital of N'Djamena was obtained before the start of the study. We ensured the confidentiality of the information collected and all files and registers were consulted only at the Radiology and Medical Imaging Unit at the National Reference University Hospital of N'DJAMENA or in the archives of the Radiology and Medical Imaging Unit CHU-RN.

2.1.8. Procedure

After obtaining validation of our research project from the management of the CHU-RN, we examined the registers of the radiology and medical imaging department as well as the files of patients who came to the department to have a brain scan in the emergency department during the period studied. The aim was to collect the information relevant to the study and to transfer it to the information sheets (Appendix).

2.2. Methodology

Protocol for performing a brain scan

- A FUJIFILM SCENARIA View 64-Bar CT scanner.
- The preparation for the examination consisted of welcoming and explaining to the patient.

  The procedure, duration, interest, and contraindications of the examination.
- The placement of a peripheral venous line, preferably 20 G, was necessary for cases of iodinated contrast agent injection.
- The subject was in the supine position, head firmly fixed in the headpiece in a position as close as possible to the orbitomeatal line.
- The full-skull profile radio mode was performed for the use of automatic dose modulation.
- The acquisition parameters (KV, mas, pitch) were set according to the subject's morphotype, with millimetric helical acquisitions covering the skull to the vertex without injection of the contrast agent into the parenchymal and then bony windows.
- Examinations with injection of the contrast medium were carried out with manual or automatic injection, from 50 ml to 80 ml of contrast agent with a minimum of 350 mg/ml of iodine.
- The same previously scan was repeated after a delay of a few minutes.
- We finished with the reconstruction step from a pile of sections of about 1 mm increment 0.7 mm in soft filter for the cerebral parenchyma, then another stack of sections of about 1 mm increment 0.7 mm in hard filter for the

bone structure [4].

2.3. Ethical Considerations

This research project was submitted to the ethics clearance committee for approval. Authorization from the Director General of the National General Reference Hospital of N'Djamena was obtained before the start of the study. We ensured the confidentiality of the information collected and all the files and registers were consulted only at the Radiology and Medical Imaging Unit at the National Reference University Hospital of N'DJAMENA or in the archives of the Radiology and Medical Imaging Unit CHU-RN.

3. Results

During the 6-month study period from January 2024 to July 2024 for the retrospective and other cross-sectional study of a 5-month period from July 2024 to November 2024, we collected: 150 Patients with suspected cerebral, vascular and traumatic diseases and who had undergone a vascular or traumatic brain CT scan (see Tables 1-5).

Table 1. General characteristic of patients.

Variable	(N = 150)	Frequency (%)
Sex		
Masculine	103	68.7
Feminine	47	31.3
Age range		
[12 - 27[	67	44.67
[27 - 42[	27	18.00
[42 - 57[	31	20.67
[57 - 72[	9	6.00
[72 - 87[	12	8.00
[87 - 102[	4	2.67
Profession		
Driver	4	2.67
Merchant	7	4.67
Retired	24	16.00
Housekeeper	15	10.00
Official	25	16.67
Pupil/student	75	50.00
Marital status		
Mary	65	43.00
Bachelor	72	48.00
Widow	13	9.00

Table 2. Distribution of patients according to clinical signs, indications, these delay between the appearance of symptoms and the implementation of the examination.

Variable	(N = 150)	Frequency (%)
Clinical signs		
Hemiplegia	15	10.00
Aphasia	1	0.67
Aphasia and hemiplegia	16	10.67
None	51	34.00
Coma	42	28.00
Coma and hemiplegia	2	1.33
Visual impairment	8	5.33
Monoplegia	7	4.67
Paraplegia	8	5.33
Directions		
Head Trauma	88	58.64
Headache	8	5.33
Suspected stroke	48	32.00
Search for a tumor mass		64.00
Brain CT scan time		
[5 - 10 [days	62	41.00
>5 days	34	23.00
≥10 days	54	36.00

Table 3. Distribution of patients according to medical history, and cardiovascular risk factors.

Medical and cardiovascular ATCD	Staff	Frequency (%)
Diabetes		
No	128	85.33
Yes	22	14.67
Hypertension		
No	97	64.67
Yes	53	35.33
Heart disease		
No	141	94.00
Yes	9	6.00
Sedentary lifestyle		
No	104	69.33
Yes	46	30.67

Continued

Alcohol		
No	124	82.67
Yes	26	17.33
Tobacco		
No	140	93.33
Yes	10	6.67
Obesity		
No	139	92.67
Yes	11	7.33

The most predominant risk factors were hypertension, *i.e.* 35.33%.

Table 4. Distribution of patients according to the type of lesion and the location seen on the brain CT scan.

Type of Lesions	Workforce (n = 105)	Frequency (%)
Pathology		
Hemorrhagic stroke	**25**	23.81
Ischemic stroke	24	22.85
Oedemato-hemorrhagic contusion	15	14.29
Fracture	8	7.62
Fracture with swerves	10	9.52
Intracranial hematoma	2	1.90
Extradural hematoma	8	7.62
Chronic subdural hematoma	7	6.67
Meningeal hemorrhage	1	0.95
Brain tumor	5	4.76
Lesion location		
Frontal	16	15.24
Front-parietal	**30**	28.57
Parietal	19	18.10
Temporo-parietal	5	4.76
Temporal	13	12.38
Temporo-occipital	2	1.90
Temporo-parietal-occipital	13	12.38
fronto-parietal-occipital	6	5.71
parieto-occipital	1	0.95

Of the 105 pathological CT scans, a majority were hemorrhagic strokes (23.81%);

the location of the lesions was mostly Fronto-parietal (28.57%).

Table 5. Distribution of general patient characteristics according to non-traumatic vascular brain pathologies.

	Non-traumatic cerebral pathologies			P-value
	Hemorrhagic stroke (N = 25)	Ischemic stroke (n = 24)	Brain tumour (N = 5)	
Age range				
[12 - 27[	2	0	4	
[27 - 42[	1	0	1	
[42 - 57[	13	14	0	0.761
[57 - 72[	3	3	0	
[72 - 87[	2	7	0	
[87 - 102[	4	0	0	
Sex				
Feminine	9	7	1	0.740
Masculine	16	17	4	
Marital status				
Bachelor	2	0	**4**	
Married	**16**	**20**	1	**<0.0001**
Widow	7	4	0	
Profession				
Driver	1	1	0	
Retired	**7**	**11**	0	
Merchant	3	2	0	**0.002**
Housekeeper	6	1	1	
Official	6	8	0	
Pupil/student	2	1	**4**	
Place of residence				
Rural	5	5	2	0.709
Urban	20	19	3	
Diabetes				
No	17	14	5	0.304
Yes	8	10	0	
Hypertension				
No	4	1	**4**	**0.000**
Yes	**21**	**23**	1	
Heart disease				
No	20	22	5	0.317
Yes	5	2	0	

Continued

Sedentary lifestyle				
No	8	5	**4**	**0.035**
Yes	**17**	**19**	1	
Alcohol				
No	17	13	5	0.238
Yes	8	11	0	
Tobacco				
No	18	21	5	0.202
Yes	7	3	0	
Obesity				
No	19	21	5	0.322
Yes	6	3	0	
Time between symptom onset and CT				
<5 Days	8	5	2	
[5 - 10[Days	9	10	3	0.509
≥10 days	8	9	0	
Physical Signs				
Hemiplegia	6	**9**	0	
Aphasia	1	0	0	
Aphasia and hemiplegia	**8**	7	0	
Coma	2	0	0	**<0.0001**
Coma and hemiplegia	0	2	0	
Visual impairment	0	0	**5**	
Monoplegia	4	3	0	
Paraplegia	4	3	0	
Directions				
Search for a tumor mass	0	0	**5**	
TEC	2	0	0	**<0.0001**
Suspected stroke	**23**	**24**	0	

N: Staff; stroke: stroke; CT: Computed tomography; ECT: Cranioencephalic Trauma; P-value < 0.05 in Chi^2 test and Fisher's Exact test.

Of the sociodemographic parameters, only marital status and occupation had a significant link with non-traumatic brain pathologies, with a predominance among married and retired people for hemorrhagic stroke respectively 64% and 28%; ischemic stroke by 80% and 44%. Patients suffering from brain tumors were mainly represented by singles and pupils/students, *i.e.* 80%.

Among cardiovascular risk factors, high blood pressure (p = 0.000) and physical

inactivity (p = 0.035) were the risk factors related to non-traumatic brain pathologies.

Aphasia and hemiplegia were the predominant physical signs in hemorrhagic strokes (33%); hemiplegia in ischemic strokes (37%) and visual disorders in brain tumours in 100% of cases.

Table 6 presents the distribution of CT and cardiovascular lesion localization presented by patients according to cerebrovascular and traumatic pathologies.

Table 6. Distribution of CT and cardiovascular lesion localization presented by patients by non-traumatic vascular cerebral pathologies.

	Non-traumatic cerebral pathologies			P-value
	Hemorrhagic stroke	Ischemic stroke	Brain tumor	
CT Appearance				
Hyperdensity	1	0	**5**	<0.0001
Intraventricular hyperdensity	9	0	0	
Spontaneous hyperdensity	**15**	0	0	
Hypodensity	0	**24**	0	
Location of the lesion				
Frontal	1	0	2	0.108
Parietal	4	3	2	
Temporal	5	6	0	
Temporo-Parietal	6	6	0	
Temporo-parietal-occipital	1	2	0	
Frontoparietal	4	7	1	
Fronto-parietal-occipital	3	0	0	
Parieto-occipital	1	0	0	

N: Staff; stroke: stroke; CT: Computed tomography; P-value < 0.05 in Chi^2 test and Fisher's Exact test.

The CT appearance of hemorrhagic stroke was mainly spontaneous hyperdensity with a predominant temporoparietal site 60%; for ischemic stroke, all images presented in hypodensity with a co-predominance of the lesion at the temporal and temporoparietal site; for brain tumors the appearance was that of hyperdensity predominating at the frontal and parietal site.

Table 7 presents the distribution of patients according to CT aspects, physical sign and location of cardiovascular lesions presented by patients according to cranial hematomas.

The CT appearance of the extradural hematoma was that of spontaneous hyperdensity in a biconvex lens with a predominant fronto-parietal location; for chronic subdural hematoma, a crescent-shaped hypodensity with a predominance

of the lesion at the parieto-occipito-temporal site; The meningeal hematoma and the intracranial hematoma presented a CT appearance, respectively, isodense and well-limited hyperdense. Coma was the predominant physical sign in extradural and subdural hematomas.

Table 7. Distribution of CT appearances, physical signs and location of cardiovascular lesions presented by patients according to cranial hematomas.

	Brain hematomas				
	Extradural hematoma (N = 8)	**Intracranial hematoma (N = 2)**	**Chronic subdural hematoma (N = 7)**	**Meningeal hemorrhage (N = 1)**	**P-value**
Physical signs					
None	0	1	1	1	0.042
Coma	**8**	1	**6**	0	
Scanographic appearance					
Well-limited hyperdensity	0	**2**	0	0	<0.0001
Spontaneous hyperdensity in biconvex lens	**8**	0	0	0	
Hypodensity in crossing moon	0	0	**7**	0	
Iso density	0	0	0	1	
Location of lesions					
Frontal	0	1	1	0	0.725
Pariétal	1	0	0	0	
Temporo-pariétal	1	0	1	0	
Temporo-pariétal-occipital	2	0	**3**	0	
Fronto-pariétal	**3**	0	1	1	
Fronto-pariétal-occipital	1	1	1	0	

CT: Computed tomography; P-value < 0.05 using the Chi^2 test and Fisher's exact test.

Table 8. Distribution of CT appearance, location of the lesion and physical sign of patients according to other traumatic cerebrovascular pathologies.

	Traumatic brain pathologies			P-value
	Contusion oedemato-hémorragique (N = 15)	**Fracture (N = 8)**	**Fracture with imprint (N = 10)**	
Physical signs				
None	4	3	2	0.576
Coma	11	5	8	
CT appearance				
Hyperdensity	0	**8**	**10**	<0.0001
Isodensity	**15**	0	0	

Continued

Location of the lesion				
Frontal	**7**	2	2	
Pariétal	2	**3**	1	
Temporal	1	0	1	
Temporo-Pariétal	0	2	1	0.340
Temporo-pariétal-occipital	0	0	1	
Fronto-pariétal	3	1	**4**	
Fronto-pariéto-occipital	2	0	0	

CT: Computed tomography; P-value < 0.05 using the Chi^2 test and Fisher's exact test.

The CT appearance of edema-hemoragic contusion was that of isodensity with a predominant frontal location; for the bills a hyperdensity with a predominance of the lesion at the parietal and Fronto-parietal site (see Table 8).

4. CT Images Presenting the Different Traumatic and Non-Traumatic Cerebrovascular Pathologies (See Figures 1-6)

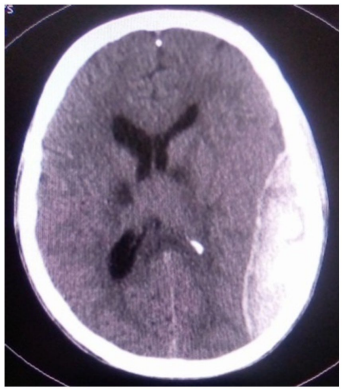

Figure 1. An axial section of the brain CT, showing spontaneous hyperdensity in a left Temporo-Parietal biconvex lens, indicating an extra-dural hematoma.

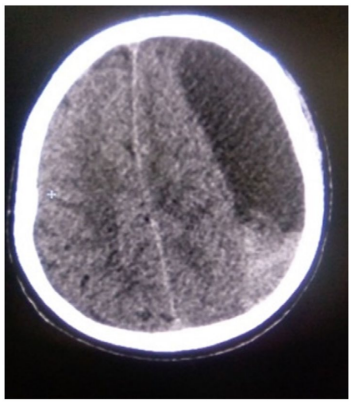

Figure 2. An axial section of the brain CT showing a left Fronto-temporo-parietal Hypodensity in the shape of a crescent moon, indicating a chronic subdural hematoma.

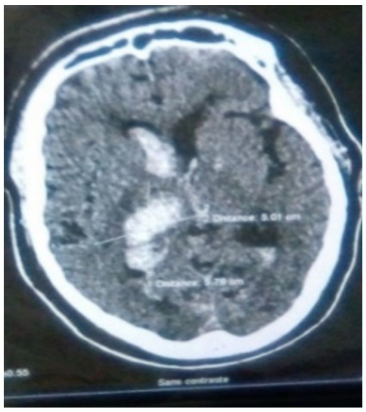

Figure 3. An axial section of the brain CT showing spontaneous right intraventricular hyperdensity indicating a hemorrhagic stroke with triventricular flooding (lateral ventricles and third ventricle).

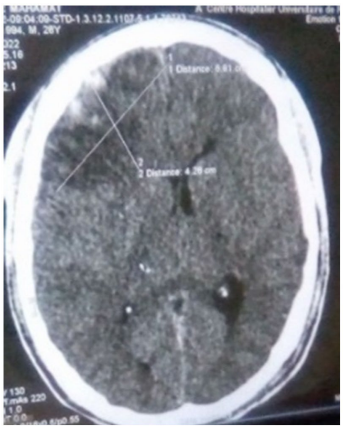

Figure 4. An axial section of the brain CT showing right frontal isodensity, indicating contusion-edematous-hemorrhagic.

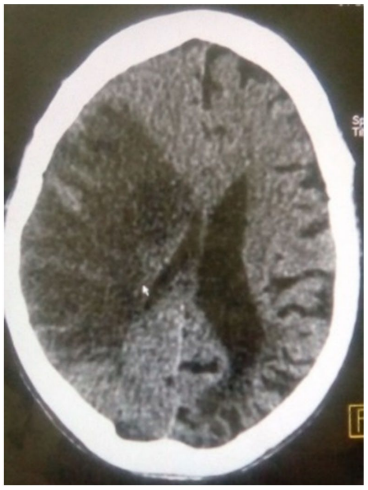

Figure 5. An axial section of the brain CT showing right temporoparietal hypodensity which exerted a mass effect on the ventricles indicating an ischemic stroke.

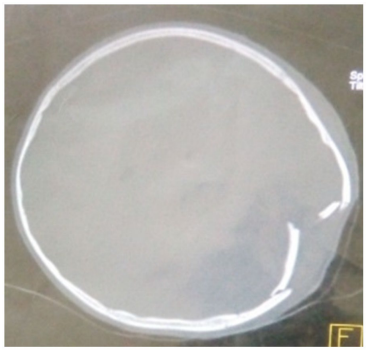

Figure 6. An axial section of the Brain CT showing a fracture with impingement of the Temporo-parietal bone.

5. Discussion

A total of 150 patients were included in the study. Their average age was 38 ± 20.48 ans, the most represented age group was 12 to 27 years.

In the literature, data on the age of patients suffering from cerebrovascular and traumatic pathologies differ according to the authors. According to Tembiné *et al.* [19], it would be 55.69 years for strokes in Mali and at the same time Ouedraogo *et al.*, [20] report an average age of 61.01 years in Burkina Faso. Regarding traumatic brain injuries Ratovondrainy *et al.*, [21] report an average age of 30 years in Madagascar while Sanoussi *et al.*, [22] report an average age of 28.21 years in Niger.

In our study, we noted a male predominance of 68.7%. This result is close to the 69.4% rate reported by Ratovondrainy *et al.*, [21] in Madagascar in 2015.

In this work, 77% of the participants lived in urban areas. This result can be explained by the fact that access to the medical imaging centre, which is mainly present in cities, is difficult for people living in rural areas [4].

The study showed that 50% of the participants were students and students. This result could be explained on the one hand by the exponential growth in stroke risk factors in the African context [23] and on the other hand by the disorder on urban roads caused in particular by motorists and drivers of two-wheeled vehicles in a context where traffic is poorly regulated [12].

Hypertension was the most observed risk factor with 35.33% of cases. Mapoure *et al.*, [1] report a 41% hypertension rate in Cameroon, higher than that of our study. At the same time, Sakadi *et al.*, [7] report a rate of 47.6% in Chad. High blood pressure (hypertension) is a disease that can be complicated by stroke, with contributing factors such as a sedentary lifestyle, alcoholism and smoking found in our study [7].

The time taken to perform a brain CT examination for the diagnosis of cerebrovascular and traumatic pathologies is decisive for rapid diagnosis and better patient care. During this study, we observed a predominance of patients who performed their examinations between 5 and 10 days after the onset of symptoms. Indeed, the long delay between the onset of the disease and the performance of

the CT scan in the study could have several sources: financial, when we know that the brain CT scan without injection of contrast agent, the least expensive examination, is still billed at 70,000 FCFA and the one with injection costs 105,000 FCFA, this is certainly not easy for the members of the patient's family, given the low purchasing power of the population, because a stroke and a head trauma will require hospitalization in a specialized structure for good care [4].

In our study, coma was the dominant physical sign with 28% of cases. Our result is lower than that of Mapoure *et al.*, [24] who report a 49.99% rate of comatose patients in Cameroon. This result could be explained by the fact that serious head trauma, due to the insufficient training of drivers on the highway rules and non-compliance with road regulations, leads to extremely serious accidents and leads to the loss of consciousness of the victims.

Cranioencephalic trauma and suspicion of stroke were the most observed indications with 58.67% and 32.00% of cases respectively. These results are higher than those of N'goran *et al.*, [18] who report rates of 17.50% for head injuries and 16.00% for suspected stroke in Côte d'Ivoire

In our study, 70% of the CT scans performed were pathological, *i.e.* had cerebrovascular and traumatic lesions and 30% were normal. These results are lower than those of Sanago *et al.*, who report rates of 77.2% pathological examinations and 22.8% normal examinations [25].

In our work, we observed 105 pathological CT scans with 23.81% hemorrhagic strokes and 21.90% ischemic strokes. The results of this study are different from those of Mbo *et al.*, [4] in Cameroon who report rates of 23.3% of hemorrhagic strokes and 64.3% of hemorrhagic strokes. Damourou *et al.*, [26] in Mali report rates of 88% higher rates of ischemic stroke than in our study and 12% lower rates of hemorrhagic stroke than in our study. This result could be explained by the fact that stroke is the leading cause of cardiovascular mortality, particularly hemorrhagic stroke, and poses a public health problem with contributing factors such as hypertension, tobacco, alcohol, diabetes and a sedentary lifestyle [4].

Regarding head trauma, we observed 14.29% of oedemato-haemorrhagic contusions, 7.62% of fractures9, 52% of fractures with embankment, 1.90% of intracranial haematomas, 7.62% of extradural haematomas, 6.67% of chronic subdural haematomas and 0.95% of meningeal haemorrhages. Our result is lower than that of Motah *et al.*, [10] who reported rates of 11.40% of fractures with embankment, 13.15% of extradural hematomas and 15.78% of chronic subdural hematomas in a study conducted in Cameroon on the management of isolated head injuries. In the same vein, Fatiba *et al.*, [27] report a rate of 30.6% of brain contusions in Benin. This result could be explained by speeding on urban roads, which is largely responsible for accidents on public roads. Public road accidents account for 82.80% of the causes of cranio-encephalic trauma [12].

The location of the lesions was mostly fronto-parietal, *i.e.* 28.57% of cases. Our result is different from those of several authors in the literature. Mbo *et al.*, who report a rate of 40.74% of lesions in the temporal lobe [4] in Cameroon and Legriel

et al., report a rate of 86% of lesions in the occipital lobe in France [28].

The CT appearance of the extradural hematoma was that of a spontaneous hyperdensity in the biconvex lens with a predominant fronto-parietal site, for the chronic subdural hematoma a crescent moon hypodensity with a predominance of the lesion at the temporo-parieto-occipital site, for the meningeal hematoma and the intracranial hematoma there was respectively a well-limited isodensity and hyperdensity, with as a physical sign the predominant coma in the extradural and subdural hematomas Durals. Since CT is a medical imaging modality that makes it possible to locate and measure the density of cerebrovascular and traumatic vascular organs, it can confirm the diagnosis [29].

Among the general characteristics of the patients, marital status (P = 0.0001) and occupation (P = 0.002) were related to non-traumatic brain pathologies. High blood pressure (P = 0.000) and sedentary lifestyle (P = 0.035) were the risk factors for non-traumatic brain diseases.

Study Limitation

Our work has limitations:

- The non-compliance of the examination reports which led us to restart the interrogation in order to have clinical information and information related to the examination.
- The poor management of the patient's pathway, which made it difficult for us to find some reports after the examination.
- The problem of storing the CT images in the computer because of the lack of an external hard drive.

6. Conclusion

In Chad, strokes, head and brain tumours in general, as in many African countries, are a public health concern. These pathologies are the main causes of high morbidity and mortality. The management of high blood pressure, the main risk factor for stroke, and compliance with the highway code are effective means of prevention. Their Diagnostics uses Medical Imaging for effective treatment. The brain CT scan is an undeniable contribution to confirm the diagnosis and to specify the topography of the lesion.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Mapoure, N.Y., Doumbe, J.I., Gams Massi, D., Nynyikua, N.T., Kuate, T.C. and Luma, N.H. (2018) Epidémiologie clinique des affections neurologiques dans la ville de douala. *Revue de Médecine et de Pharmacie*, **8**, 738-750.

[2] Annick, M.N., Jacqueline, Z.M., Andreas, C., Eliane, N.B. and Gerard, B. (2012) Les accidents vasculaires cérébraux à l'Hôpital Gynéco-Obstétrique et Pédiatrique de Yaoundé. *Schweizer Archiv für Neurologie und Psychiatrie*, **163**, 54-57.

[3] Béjot, Y., Touzé, E., Jacquin, A., Giroud, M. and Mas, J. (2009) Épidémiologie des

accidents vasculaires cérébraux. *Médecine/ Sciences*, **25**, 727-732. https://doi.org/10.1051/medsci/2009258-9727

[4] Mbo, A.J., Yaya, AH., Neossi, N.M., Ngaroua, Hamadou, B.A. and N'ko'o, A.S. (2020) Contribution of CT Scan in the Diagnosis of Vascular Accidents in the Brain at the Garoua Regional Hospital, Cameroon. *Global Scientific Journals*, **8**, 1697-1708.

[5] Bouleti, C., Mathivet, T., Lapergue, B., Monnot, C. and Germain, S. (2014) Accident vasculaire cérébral. *Médecine/ Sciences*, **30**, 608-610.

[6] Raveloson, N.E., Zodaly, N., Rakotoarivony, S.T., Mbolamena, R.L. and Randriammiarana, J.M. (2011) Epidemioclinical, Evolutive and Scannographic Aspects of Hemorrhagic Vascular Cerebral Accident (about 34 Cases). *Revue d Anesthésie-Réanimation et de Médecine d' Urgence*, **3**, 15-19.

[7] Foksouna, S., Allawaye, L., Lintel, A.F., Capel, H., Hinda, C.H., Kamis, D., *et al.* (2021) Prise en charge des accidents vasculaires cérébraux en Afrique subsaharienne, cas du Tchad. *Revue Neurologique*, **177**, S96. https://doi.org/10.1016/j.neurol.2021.02.303

[8] Youssoufa, M., Mohamed, A., Djido, D., Drissa, K., Hassane, S., Issiaka, M., *et al.* (2013) Modalities of Stroke Management in Mali (West Africa): A Survey of Practices. *Mali Medical*, **28**, 30-35.

[9] Mélanie, P., Helene, L., Marie, J.L. and Denise, M. (2013) Perceived Needs and Social Participation of People with Mild Traumatic Brain Injury. *Santé Publique*, **25**, 719-728.

[10] Motha, M., SendeNgonde, C., Beyiha, G., Belley Priso, E., Molongte Nguemgne, C, Gonsu Fotsin, J., *et al.* (2011) Prise en charge des traumatismes crâniens isolés à l'hôpital général de Douala. *Health Sciences and Disease*, **12**, 1-6.

[11] Onana, Y., Mbozo'o, S., Tambe, J., Aminou, M., Guemekane, B., MboAmvene, J., *et al.* (2021) Head Injury and Findings on Computed Tomography at the Douala Gyneco-Obstetric and Head Pediatric Hospital. *Health Sciences and Disease*, **22**, 106-111.

[12] Samanké, B.M., Coulibaly, Y., Diallo, A., Tchamko, F.R.D., Sidibé, S. and Touré, A. (2010) Brain Trauma at the Teaching Hospital Gabriel Touré. *Mali Medical*, **25**, 1-3.

[13] Tongaveleona, A., Randrianjafisamindrakotroka, O., Ramiandrasoa, A.L., Raobela, L., Ratovondrainy, W. and Randrianjafisamindrakotroka, N.S. (2018) The Central Nervous System Tumours at Antananarivo Madagascar. *African Journal of Neurological Sciences*, **38**, 28-37.

[14] Rakotondrairebe, W.F., Refeno, V., Bemora, S.J., Ramarokoto, M., Ratovondrainy, W., Rabarijaona, R.M., *et al.* (2018) Cerebral Tumors Operated in the Neurosurgery Department at Hospital Joseph Ravoahangy Andrianavalona. *Revue Malgache de Cancérologie*, **3**, 48-59.

[15] Moura, B., Migliorini, D., Bourhis, J., Daniel, R., Levivier, M. and Hottinger, A.F. (2016) Prise en charge des tumeurs cérébrales primaires: Une approche multidisciplinaire. *Revue Médicale Suisse*, **12**, 821-825. https://doi.org/10.53738/revmed.2016.12.516.0821

[16] Jankowski, A. and Ferretti, G. (2010) Volumetric Computed Tomography: Principles, Parameters. *Revue des Maladies Respiratoires*, **27**, 964-969. https://doi.org/10.1016/j.rmr.2010.09.004

[17] Am n'goan, D., Kouamé, N., ZodTra, B., *et al.* (2013) Tomography Scan in the Management of Infantile Pathologies at Yopougon Teaching Hôspital (Abidjan-Cote d'ivoire). *Revue Internationale des Sciences Médicales*, **15**, 20-24.

[18] N'goran, K., Sorel, F.M., Anne, M. and Roger, D.N. (2017) The Pratique of Cerebral

CT at Abidjan: Advocacy for the Implementation of Guideline. *OALib Journal*, **4**, 2-11.

[19] Tembiné, K., Mac, C., Diani, N., Sidibé, A., Dramé, A. and Coulibaly, T.H.M. (2021) Hemorrhagic Stroke in Intensive Care at the Hospital in Mal: Epidemiological Clinical Therapeutic and Evolutionary Aspects. *Jaccr Africa*, **5**, 230-237.

[20] Ouedraogo, P.V., Savadogo, A.A., Ouattara, M. and Millogo, A. (2021) Prognosis among Patients Admitted for Stroke in Sourosanou University Teaching Hospital of Bo-Bo-Dioulasso; Burkina Faso. *African Journal of Neurological Sciences*, **40**, 21-28. http://ajns.paans.org

[21] Ratovondrainy, M., Raobela, L. and Rasolonjatovo, E., Rabarijaona, M. and Andriamamonjy, C. (2015) Head Trauma: Reality of Its Management at the Hospital Soavinandriana, Antananarivo. *Rev.anesth-Réanim.med*, **7**, 1-7.

[22] Sanoussi, S., Ali, A., Laouali, H., Assoumane, I., Chaibou, S.M. and Baoua, M. (2013) Traumatic Brain Injury and Anterior Pituitary Dysfunction. Regarding 33 Cases: Evolution Profile over a Six-Month Period. *Neurochirurgie*, **59**, 178-182.

[23] Bademain, J.F.I., Wind-Lassida, F.R.B., Alfred, A. and Bawindsongre, J.K. (2022) Facteurs de risque et etiologies des AVC de l'adulte jeune au chu de Bogodogo à Ouagadougou. *Mali Medical*, **3**, 50-53.

[24] Mapoure, Y.N., Séne, F.D., Ndiaye, M., Mbatchou, H.B.N., Doumbé, J. and Touré, K. (2009) A Prospective Study on Coma in Neurology in the African Setting: Case of Dakar, Senegal. *Revue Médicale de Bruxelles*, **30**, 163-169.

[25] Sanago, S., Kouma, A., Cissé, I., Coulibaly, C., Guindo, I., Diarra, I., *et al.* (2021) Clinical-Epidemiological Presentation and CT Scan Findings of Patient with Head Trauma at Sominé Dolo Hospital (Mopti). *Health Sciences and Disease*, **22**, 57-61.

[26] Damorou, F., Togbossi, E., Pessinaba, S., Klouvi, Y., Balogou, A. and Belo, M. (2008) Accidents Vasculaires Cerebraux (AVC) et affections Cardio-Vasculaires emboligines. *Mali Medical*, **1**, 31-33.

[27] Fatiba, O.H. and Padonou, J. (2010) Epidemiology of Traumatic Brain Injuries in Parakou (Benin). *African Journal of Neurological Sciences*, **29**, 25-33.

[28] Legriel, S., Schraub, O., Azouley, E., Hantson, P., Magalhaes, E. and Coquet, I. (2011) Pronostic fonctionnel du syndrome d'encephalopathie postérieures reversible (PRES) en reanimation. *SRLF et Springer- Verlag France*, **20**, S232-S235.

[29] Imagerie Médicale Pratique (2015) Sémiologies canographiques et technique de la réalisation. Éditions ESTEM, 18-19.