Scientific Research Publishing

Open Journal of Modern Neurosurgery, 2022, 12, 104-115
https://www.scirp.org/journal/ojmn
ISSN Online: 2163-0585
ISSN Print: 2163-0569

Neurological Sequelae in Cranioencephalic Trauma Patients at the National Hospital in Zinder (Niger)

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How to cite this paper: Rabiou, M.S., Moumouni, A.K., Tabe, A.T., Kpelao, E., Hounkpatin, S., Taofik, M., Babana, A.A., Ajavon, D.R.D., Kelani, A. and Sanoussi, S. (2022) Neurological Sequelae in Cranioencephalic Trauma Patients at the National Hospital in Zinder (Niger). *Open Journal of Modern Neurosurgery*, **12**, 104-115.
https://doi.org/10.4236/ojmn.2022.122011

Received: March 18, 2022
Accepted: April 26, 2022
Published: April 29, 2022

Abstract

Introduction: Cranioencephalic trauma is a frequent reason for admission to emergency departments and is a source of mild to severe neuropsychological defects that will persist over time. Their management remains difficult. **Objectives**: To evaluate the sequelae presented by patients suffering from cranioencephalic trauma. **Methods**: This was a retrospective, descriptive, cross-sectional study conducted at the National Hospital of Zinder. It will include all patients admitted and hospitalised in the emergency, intensive care and neurosurgery departments of Zinder National Hospital for head injury over a period of 28 months from 1 January 2016 to 30 April 2018. Brain scan, X-ray were the imaging tests used. **Results**: Out of a total of 974 admissions, 367 were retained, *i.e.* 37.6%, with a male predominance (82.6%). The average age was 26.5 years. MVAs were represented in 89.7% of cases. Moderate CTE accounted for 64% of cases. Altered consciousness was reported in 295 patients (80.38% of cases). Brain scans were used in 76.7% of cases and skull X-rays in 4.2% of cases. Medical management was performed in all patients. Treatment was operative in 78 patients (21.25%). Recovery without immediate sequelae was found in 187 patients (50.9%). Persistent headache represented 47.7% of the late sequelae observed in the patients, epileptic seizures represented 16.8% of the late sequelae, neurological deficit represented 14.7%. **Conclusion**: Cra-

nioencephalic trauma represents a major public health issue. Although their in-hospital management remains a challenge, post-hospital management related to the appearance of sequelae remains another.

Keywords

Cranioencephalic Trauma, CT Scan, X-Ray, Sequelae, Niger

1. Introduction

The National Head Injury Foundation considers TBI to be any brain injury resulting from an external force that causes a decrease or alteration in consciousness, impairment of cognitive or physical abilities, and producing behavioural or emotional problems [1].

In the United States, the number of patients admitted to emergency departments for traumatic brain injury (TBI) is estimated at 1.5 million per year [2]. Of these patients, 50,000 will die and one third will suffer mild to severe neuropsychological consequences that will last for a long time. In 2004, it was estimated that 5.3 million people were living in this country with more or less severe after-effects of TCE [2]. Although it is difficult to give precise figures, the "financial burden" of managing these patients was estimated to be $60 billion per year [2]. The same is true in England where 4% of emergency admissions are related to CTE [3]. Many studies have focused on codifying the therapeutic management of the most serious TCEs (TCG), but it should be borne in mind that "non-severe" TCEs (Glasgow coma score > 8) are the most frequent and are responsible for a morbidity and mortality that is not negligible insofar as it could be avoided [4]. Their consequences in terms of morbidity, mortality, physical and psychological sequelae, and socio-economic impact, especially on the most active segments of the population, represent a major public health problem for all countries. Once the preserve of industrial countries [5] [6] [7], in recent decades it has become an increasing concern also in developing countries [8] [9]. Despite improvements in investigation and treatment techniques, the morbidity and mortality associated with this disease are still very high [5] [10] [11].

In sub-Saharan Africa, CTE is becoming increasingly problematic [9] [12] with the uncontrolled development of cities; according to numerous studies, the incidence varies from 3.5 to 7 per 1000 inhabitants and morbidity is very high even for mild or moderate CTE [9] [13]. In Niger, the situation has become alarming in the last ten years, due to traffic accidents, the leading cause of CTE [14]. Although there are many studies in the field of head trauma, very few have focused on the evaluation of the neurological sequelae of patients with head trauma. In Zinder, a town located in the south-east of the country, no study has yet been carried out in this area. This justifies the present study on the evaluation of the neurological sequelae of cranioencephalic trauma at the university hospital of Zinder in order to improve the care of patients in our context of a country with

limited means.

2. Patients and Methods

Type and period of study

This was a cross-sectional, retrospective and descriptive study carried out in the Emergency Department, Neurosurgery Department and Anaesthesia and Resuscitation Department (SAR) of the National Hospital of Zinder from January 1, 2016 to April 30, 2018, *i.e.* a period of 38 months.

The diagnostic criteria were based on anamnestic, clinical and imaging data.

Brain scan was the most commonly used imaging test.

Study population

The study population consisted of patients admitted to the Emergency Department, the Neurosurgery Department and the Intensive Care Unit.

2.1. Patient Selection Criteria

To establish the patient selection criteria, all medical records of patients admitted to the Emergency Department, Neurosurgery Department and Intensive Care Unit during the study period were reviewed. All records of patients with head injury were selected.

2.2. Inclusion Criteria

Diagnostic criteria were based on clinical and imaging data.

The brain scan was the most commonly used imaging test. The following CT lesions were considered: extra dural haematoma, acute sub dural haematoma, chronic sub dural haematoma, intra parenchymal haematoma, cerebral contusion, pneumencephaly.

2.3. Criteria of Non Inclusion

All patient of which given them of the coloured print were not revealing none anomaly and who were not presenting none clinical manifestation have not been held back.

The variables studied

Socio-demographic variables: age and sex of patients.

Admission variables: mode of admission, admission time, mode of transport.

Diagnostic variables: represented by

- Clinical examination data (altered state of consciousness, mydriasis, miosis, somnolence, agitation, Broca's aphasia, Wernicke's aphasia, convulsion, vomiting, headache, visual disturbances, haemodynamic state, associated lesions).
- And above all the imaging data (embarrure, extra dural haematoma, sub dural haematoma, intra parenchymal haemorrhage, cerebral oedema, cerebral contusion, concussion, pneumencephalus, midline deviation, commitment).

Treatment variables

- Time to treatment variables: less than 1 hour, more than 24 hours, 24 to 72 hours, and more than 72 hours.
- Medical treatment variables: conditioning, osmotherapy, diuretic, filling solution, barbiturate, level 1 analgesic, level 2 analgesic, level 3 analgesic, neuroleptic, corticosteroid, anti-platelet aggregator, vitamin therapy.

2.4. The Collect of Given

Given them of the study have been caught from case-histories hospitalized patients, of the patients interrogatory and/or of their near by telephones calls.

Stick them of skinning were constituting the principal tool of collect.

The distraint, the treatment and datas analyses of the study have been developed by the aid of the Spica software Info version 3.

The respect and the preserving of the physical integrity and personal datas have been de rigueur for each patient of which clinical datas have been used in our study.

3. Results

During the study period, 878 cranioencephalic trauma cases were identified, of which 357 (40.7% of cases) were retained. They represented 2.3% of admissions (15378) to the National Hospital of Zinder, all categories combined, and 7.1% of emergencies (5023) admitted during the same period.

The patients were 90.2% male and 9.8% female. The sex ratio was 9.2.

The average age of the patients was 28.8 ± 15.8 years with extremes ranging from 6 months to 97 years.

Time of admission and mode of onset of CTE Patients admitted between the second and twenty-fourth hour accounted for 94.2% of cases.

Of the circumstances of occurrence, 322 cases (90.1%) were caused by road traffic accidents, 83% of which were caused by motorbike accidents.

On admission, the haemodynamic status of the patients was stable in 89.3% of cases (319 patients) and unstable in 30 cases (8.4%). The hemodynamic status was not specified in 7 patients (2%).

Complementary investigations were carried out in 253 patients (71.2%), including 233 cranioencephalic scans (65.3%) (Table 1) which revealed several lesions (Table 2). Cerebral contusion was the most representative lesion found on these scans.

Table 1. Imaging exams.

	Reviews coplomed	Workforce	frequency (%)
Patients scanned	Cerebral scan	233	65.3%
	Cranial radiography	21	5.9%
Unexplored patients	No X-ray examination	103	28.8%
Total		357	100%

Neurosurgical management was performed in 70 patients (19.6%).

The average hospital stay was 12.8 days with extremes of 2 days and 50 days.

Recovery without immediate sequelae was found in 230 patients (64.7%).

Late sequelae were dominated by chronic headaches (47.6%) followed by epileptic seizures (7.2%) (Table 3).

Table 2. Lesions observed on brain CT.

Type of lesions	Workforce	Frequency (%)
Pneumencephaly	2	0.6%
Extra dural hematoma	37	10.4%
Subdural hematoma	23	6.4%
Intraparenchymal hematoma	33	9.2%
Hygroma	5	1.4%
Meningeal hemorrhage	14	3.9%
Cerebral contusion	128	35.9%
Craniocerebral wound	5	1.4%
Embarrassment	67	18.8%
Cerebral edema	12	3.4%
Undocumented CTE	128	35.8%
Total	454	100%

Table 3. The observed after-effects.

Late sequelae	Workforce	Frequency (%)
Persistent headaches	170	47.6%
Epileptic seizures	26	7.2%
Amnesia	7	1.9%
Language disorders	2	0.6%
Reduction of libido	5	1.4%
Tinnitus	14	3.9%
Loss of taste. smell or hearing	2	0.6%
Dizziness	7	1.9%
Insomnia	7	1.9%
Other physical sequelae	5	1.4%
Irritability	5	1.4%
Anxiety	2	0.6%
Depression	2	0.6%
Emotional instability and mood swings	2	0.6%
Impaired judgment	7	1.9%

4. Discussion

The unequal distribution of neurosurgeons and especially the lack of technical facilities pose a problem of adequate management. Our inclusion criteria were a function of our diagnostic means. However, they allowed us to have a panoramic view of all cranioencephalic trauma patients and to reach our objectives set at the beginning.

During the study period, 357 cases of cranioencephalic trauma were retained. They represented 7.1% of the 5023 emergencies admitted during the same period. This finding is in line with the work of Fatigba *et al.* [15] in Parakou, Benin, in 2011, who reported 149 cases of cranioencephalic trauma in one year. In Niger, in Niamey, Guidah *et al.* [16] reported 311 patients in 2 years who were admitted for cranioencephalic trauma.

The 90.2% male predominance that we found is similar to the 93.1% observed in 2009 by Fatigba *et al.* [17] and higher than the 79.45% found by Moumouni *et al.* in Cotonou [18], in Benin. This male predominance has also been reported by several authors in different countries [19] [20] [21]. These results could be explained by the fact that most men carry out activities that expose them more to cranioencephalic trauma than women. In Zinder, the socio-cultural context requires women to stay at home and look after the household. The men are the ones who are most involved in professional activities in order to ensure a financial balance in the home.

The cranioencephalic injuries concerned all ages, ranging from 6 months to 97 years, with an average age of 28.8 years. This average is identical to that reported by Fatigba *et al.* in 2009 and Adje in 2011 in Benin [15] [22]. Other studies are identical to our observations: Gouello [23] in Nantes who reported an average age of 33 years, Aguemonetal [24] in Benin, an average of 32 years, Vayre *et al.* [25] in France reported an average of 32.8 years. The 20 to 30 age group was the most affected (33.7%). Traumatic encephalic disorders therefore occur in young adults who constitute the most active population. In Niger, the demographic pyramid is predominantly made up of young adults, which confirms the results observed.

After the trauma, 94.2% of patients among direct admissions and 83.6% among referred patients were received between the second and twenty-fourth hour. Adje [22] in Benin reported that 34.8% of patients were admitted in less than one hour. Djeutcheu [26] in Mali reported in his study that 78.7% of patients were admitted less than one hour after the head injury. This discrepancy can be explained by the fact that many patients lived in towns and villages that were not very close to the city of Zinder and therefore took a relatively long time to find a vehicle to take the victim to the national hospital. Some patients were not directly admitted to the hospital. They were taken to regional hospitals, district health centres and medical practices where they sometimes stayed for several days before being referred.

The most used means of transport was the non-medical car and accounted for

85.2% of the cases. Ambulances were used in 5.3% of cases to transport patients. Pre-hospital care is a real problem as in most countries south of the Sahara [18]. The lack of ambulances, the absence of an emergency number and the fact that the accident site was far from the hospital were factors that justified the use of non-medicalised cars to transfer our patients to hospital.

Road traffic accidents were the main cause of cranioencephalic trauma as found by several authors [6] [18] [27]-[32]. This high rate of occurrence is due to the fact that road traffic accidents are the most common mechanism for the occurrence of traumatic brain injuries. The anarchic development of cities and the increasingly frequent use of two-wheeled vehicles without protective measures (helmets) are favourable factors.

4.1. Distribution of the Evolution of the Patients Admitted According to Whether or Not a Brain Scan Was Performed

Recovery with sequelae was observed in 23 patients (18.54%) among those who did not undergo a brain scan, while it was observed in 19 patients (8.1%) among those who did undergo a brain scan. This high frequency of sequelae observed in patients who did not undergo a CT scan can be explained by the fact that therapeutic decisions are slowed down and the hesitant nature of the doctor who is navigating at a loss of sight, since no lesion diagnosis could be made.

4.2. Distribution of Patients According to Age Group and Appearance of Late Sequelae

In our study, an increasing percentage of late sequelae is observed with increasing age. Older age has a negative influence on the prognosis of the patient both in terms of survival and functional recovery. This can be explained by the fact that the brain mass decreases and atrophies with age due to the massive loss of neurons; this leads to poor adaptation and poor self-regulation of these nerve cells, which are already in apoptosis and release toxic substances into the extracellular environment (**Table 4**).

4.3. Distribution of Patients According to the Time of Admission and the Appearance of Late Sequelae

In our series, 90.6% of patients were admitted between the second and twenty-fourth hour following the trauma, whether admitted directly or referred. This situation favours the appearance of secondary strokes of systemic origin (SSSA), which cause long-term neurological sequelae. This also explains the high frequency of neurological sequelae in these types of patients (**Table 5**).

4.4. Distribution of Patients According to the GLASGOW Score at Admission and the Appearance of Late Sequelae

We note that the higher the severity, the higher the frequency of sequelae. Late sequelae were recorded in 91.7% of the patients with moderate TCE. This high observed frequency can be easily explained by the simple fact that the majority

of patients (71%) in our study were represented by this class, also among the severe TCE a considerable number of patients without sequelae died, which explains this low observed frequency compared to that of moderate TCE. The degree of severity of the comas presented by the patients is proportional to the severity of the cerebral lesions that occurred, which explains the increased risk of sequelae for the more severe comas (Table 6).

Table 4. Age and late sequelae.

age range (an)	late sequelae		Total
	yes	No	
Moins 5	8 (30.7%)	18 (69.3%)	26
6 - 15	33 (80.5%)	8 (19.5%)	41
16 - 25	71 (92.2%)	6 (7.8%)	77
26 - 35	68 (91.9%)	6 (8.1%)	74
36 - 45	24 (82.7%)	5 (17.3%)	29
46 - 55	25 (52.1%)	23 (47.9%)	48
56 - 65	38 (100%)	-	38
66 - 70	10 (66.7%)	5 (33.3%)	15
Plus 70	15 (100%)	-	15
unspecified	2 (50%)	2 (50%)	4
Total	294	73	367

Table 5. Time of admission and late sequelae.

admission deadline	late sequelae		Total
	yes	No	
less than 1 h	2 (50%)	2 (50%)	4
2 - 24 h	227 (88.7%)	29 (11.3%)	256
24 - 72 h	37 (53.6%)	32 (46.4%)	69
more than 72 h	38 (100%)	-	38
Total	304	63	367

Table 6. Glasgow and late sequelae.

GLASGOW	late sequelae		Total
	Yes	No	
normal 15	-	6 (100%)	6
light 12 - 14	19 (59.4%)	13 (40.6%)	32
moderate 8 - 11	204 (84%)	39 (16%)	243
strict 3 - 7	51 (64.5%)	28 (35.5%)	79
umspecified	-	7 (100%)	7
Total	274	93	367

4.5. Distribution of Patients According to Diagnosis and Occurrence of Late Sequelae

Among the patients who did not undergo a CT scan, sequelae accounted for 76.4% of cases. This high frequency is due to the fact that the diagnosis of the lesion could not be established in order to allow the clinician to better refine his management. Also, due to the lack of financial means to pay for first aid, most patients have worsened their lesions because they did not have a CT scan because they come from a poor background.

Cerebral oedema (65.5%), subdural haematomas (70%), extra dural haematomas (81.3%) and cerebral contusions (96.4%) were the scan lesions most likely to cause late sequelae. The seriousness of these lesions from a pathophysiological point of view and the lack of adequate care are due to various factors including the lack of financial means and insufficient technical facilities.

4.6. Distribution of Patients According to the Length of Hospitalisation and the Appearance of Late Sequelae

In our study, the frequency of appearance of late neurological sequelae was higher (157.1% from the 19th day) with a longer hospital stay. A longer stay reflects the severity of the clinical picture and therefore the occurrence of neurological sequelae related to all these phenomena of cerebral suffering.

4.7. Distribution of Patients According to the Length of Time to Surgery and the Appearance of Late Sequelae

The appearance of after-effects increases as the time taken for the operation increases. This can be explained by the fact that the aim of these operations is to remove the increasing intracranial hyperpressure linked to the installation of a new blood volume. The sooner this hyperpressure is lifted, the extension of ACSOS is limited and fewer neurological sequelae are observed.

5. Conclusion

Cranioencephalic trauma is a real public health problem in our region with a high frequency of admission to intensive care. The morbidity and mortality rate remains high and affects all age groups of the population, but mainly young males. Pre-hospital care is non-existent. The technical facilities are still very inadequate for optimal care of these injuries. Late sequelae occurred mainly in patients admitted for moderate cranioencephalic trauma. These late sequelae are dominated by persistent headaches followed by epileptic seizures and neurological deficits. Advanced age has a negative influence on the prognosis of the patient both in terms of survival and functional recovery.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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