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Original Research Article **Radiology**

Contribution of Computed Tomography in the Management of Cranio-Encephalic Trauma in the Radiology and Medical Imaging Department of CHU-Gabriel Toure

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Abstract

Introduction*:** Head trauma is a major public health problem and a major cause of morbidity and mortality, particularly in young adults. ***Objective*:** To clarify the interest of computed tomography in the management of cranioencephalic trauma in the radiology and medical imaging department of the CHU GT. ***Methods*:** This was a retro and prospective study of 5 months ranging respectively from January to March 2010 on 103 cases, from August to November 2010 on 12 cases and concerned 115 patients who came for a CT scan in a context of traumatic brain injury. ***Results: The average age was 26.6 years with extremes from 4 years to 65 years. The sex ratio was 4.7%. Road accidents accounted for 80.9% of cases. All patients with computed tomography abnormalities, fractures of the vault represented 74.1% of cases, the base with 17.2% and in 8.5% of cases the fracture concerned both the vault and the base. The linear fracture interested the arch in 39.6% of cases. Pericerebral lesions were dominated by meningeal hemorrhage and extradural hematoma with 63.2% and 22.8% of cases. Hemorrhagic edema accounted for 81.7% of intracerebral lesions and in 12% of cases, intracerebral lesions were associated. Based on these data 48.3% of patients were operated on in neurosurgery. The mortality rate was 7.8%. ***Conclusion**:* CT remains the examination of choice in the management of craniocerebral trauma.

Keywords: Head and brain injury, CT, Management.

INTRODUCTION

Cranioencephalic trauma (CTE) is a direct or indirect mechanical attack on the skull [1]. It is a major public health problem and a major cause of morbidity and mortality, particularly in young adults [2, 3]. In contrast to Western countries that have a patient transport system (mobile emergency service) and adapted resuscitation [3], in Mali, the absence of a pre-hospital early management system makes morbidity and mortality high. Medical imaging finds a prominent place among diagnostic methods and computed tomography is the primary examination in the management of a traumatic brain [4]. Our study aims to evaluate the contribution of CT data in the management of head and brain injuries.

METHODOLOGY

It was a retrospective study and a combined prospective study lasting 5 months and 09 days. The first (retrospective) spread over a period of 2 months and 15 days (4 January-20 March 2010), involving 103 patients. The second (prospective) spread over a period of 2 months and 24 days (21 August-14 November 2010), covering 12 patients in the medical imaging department of the CHU-Gabriel Touré. All the files of the 115 patients were exploited.

Were selected for our study, all patients admitted for acute traumatic brain injury having performed at least one CT scan. The parameters of interest were age, sex, the circumstance of the occurrence of TCE, the Glasgow Score (GCS) at admission, the report of the cranial CT scan and the medical-surgical management received.

Excluded from this study were patients admitted for CT scan other than head injury, old TCE and those with insufficient clinical information.

The data was collected; captured and analyzed on SPSS 17.0 with Microsoft Word 2007 software. A Philips Brilliance 6 Multi-barrette CT scanner with a main console, a second image processing console and a networked AGFA DRY STAR 5503 printer was used.

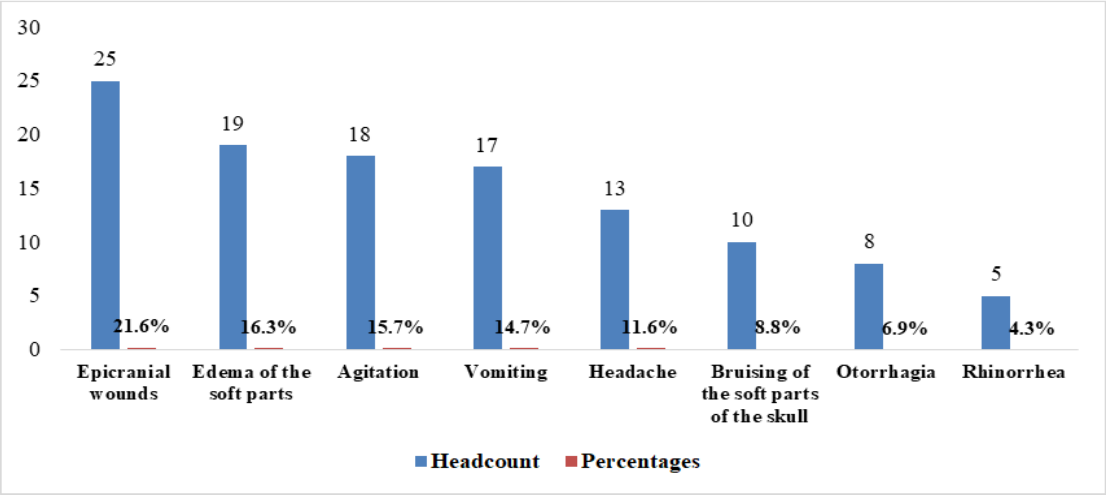
RESULTS

During the study period, 115 patients were retained out of 566 CT scans performed, or 23.4% of cases. The average age was 26.6 years with extremes from 4 years to 65 years. The sex ratio was 4.7%. Young adults (pupils and students) were the most affected in 34.5% of cases, followed by traders and workers with 13% and 9.6%. The majority of patients came from urban environments in 67.8% of cases. Road accidents were 80.9% followed by aggravated assault and domestic injuries with 7% and 6.8% (Table I).

Table I: Distribution of patients by type of trauma

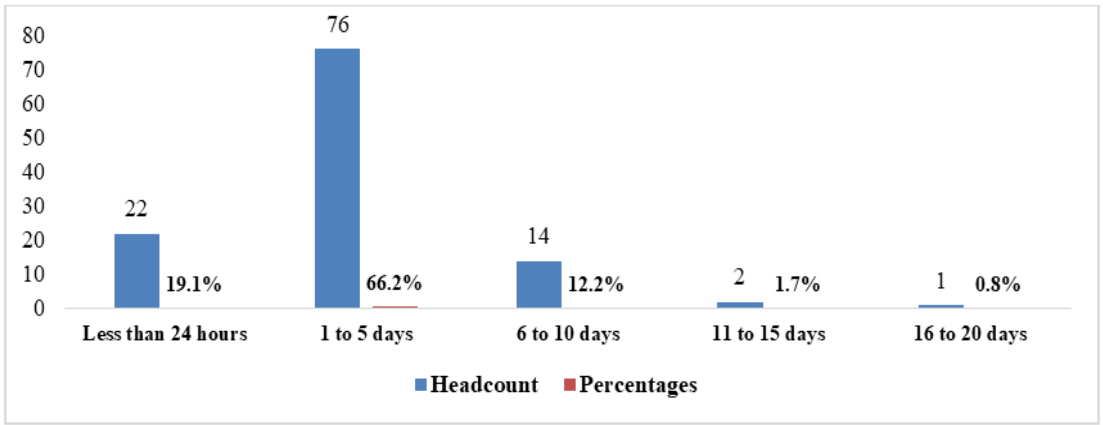
Indication	Headcount	Percentage
Motor Vehicle Accidents	93	80,9%
Domestic accidents	8	6,8%
Willful blow and injury	8	7%
Employment injuries	6	5.2%

At admission, the notion of initial or secondary loss of consciousness and the severity of the head injury conditioned the severity of cranio-cerebral injuries. Thus, clinical signs were dominated by epicranial wounds in 21.63% of cases followed by edema of the soft parts 16.3%, agitation 15.7%, vomiting 14.7% and headache 11.6% (Chart I).



Graph I: Distribution of patients by clinical signs at admission

In our series, only 19.1% of cases received CT within the first 24 hours (Chart II).



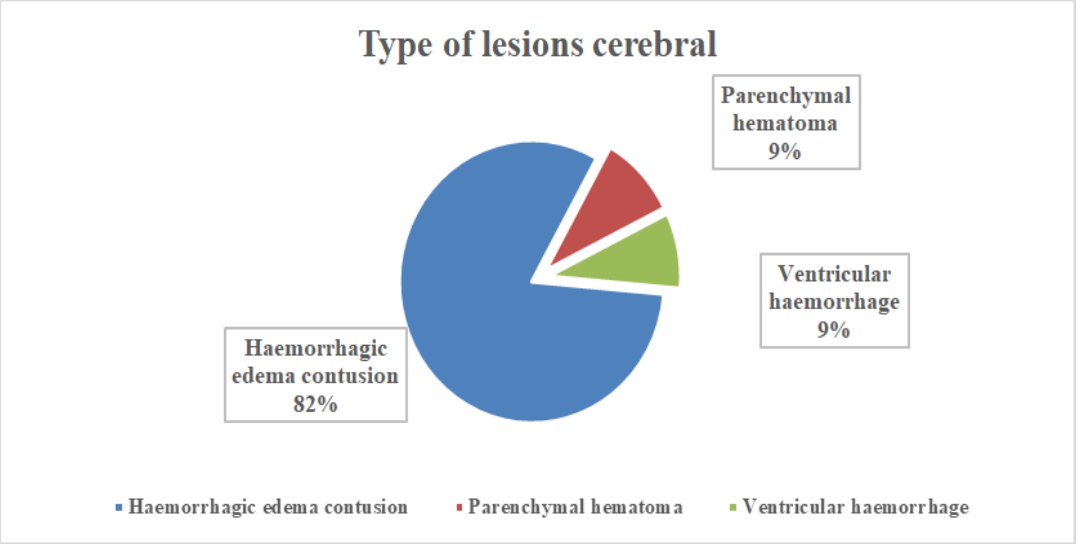
Graph II: Distribution of patients according to the delay of the CT scan

The notion of initial loss of consciousness was found respectively 41.7%, 24.3%, 20.8% of cases of brain, pericerebral and bone damage. The combination of initial and secondary loss of consciousness represented both 50% for peri-cerebral and cerebral lesions. However, it was absent in 50% and 25% of cases. At admission, TCE was severe in 7.5% of cases, moderate in 72.5% of cases and mild in 20% of cases. (Table II).

Table II: Distribution of patients by Glasgow score and computed tomography cranioencephalic lesions

Glasgow scale	Headcount	Percentage
Less than 8	7	7,5%
Between 8 and 13	63	72,5%
Greater than 13	45	20,0%

Of all patients with computed tomography abnormalities, hemorrhagic contusion was the most frequent intracerebral lesion in 81.7% followed by intraparenchymal hematoma with 9.6% of cases (Chart III).



Graph III: Distribution of patients by type of brain cerebral

Pericerebral lesions were dominated by meningeal hemorrhage in 63.2% of cases followed by extra dural hematoma with 22.8% (Table III).

Table III: Distribution of patients by peri-cerebral lesions

Pericerebral injuries	Headcount	Percentages
Meningeal hemorrhage	36	63,2%
Extradural hematoma	13	22,8%
Acute subdural hemorrhage	8	14%
Total	**57**	**100%**

Bone lesions were found in 50.4% of cases and distributed as follows: fracture of the vault in 74.1% of cases, the base with17.2% and in 8.5% of cases, the fracture concerned both the vault and the base. Vault fractures were dominated by linear fractures in 39.6% of cases followed by embarrure and comminutive fractures with 31.3% and 12.5% (Table IV).

Table IV: Distribution of patients by arch fracture type

Type of arch fractures	Headcount	Percentages
Linear fracture	19	39,6%
Rib fracture	15	31,3%
Comminutive fracture	6	12,5%
Complex fracture	5	10,4%
Suturing diastasis	1	2,1%
Ping-pong fracture	2	4,1%
Total	**48**	**100%**

Table V: Showing the distribution of patients by location

Location of fractures of the vault	Headcount	Percentages
Parietal	16	33,3%
Temporale	14	29,2%
Frontale	9	18,8%
Occipitale	4	8,3¨%
Parietotemporal	4	8,3%
Frontotemporal	1	2,1%
Total	**48**	**100%**

These fractures were localized in the parietal region 33.3% of cases (Table V).

COMMENTS

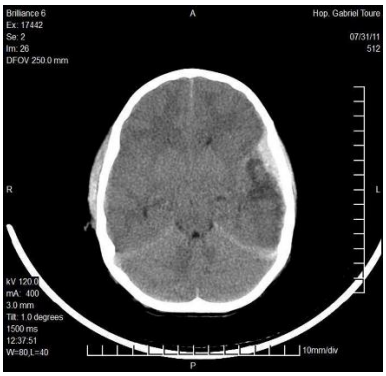
Comment N°1 :

L.S: sexe masculin, 55ans, commerçant, adressé pour scanner crânio- encéphalique suite à un AVP avec notion de perte de connaissance initiale. L'examen TDM montrant un hématome intra-parenchymateux compressif disséquant frontal gauche avec œdème péri-lésionnel et effet de masse sur le ventricule latéral gauche

Comment N°2 :

C.K: Elève, 17 ans, sexe Masculin, adressé pour scanner crânio-encéphalique, suite une chute d'une hauteur avec notion de perte de connaissance initiale. L'examen TDM montrant un hématome extradural droit.

Comment N°3 :



M.T: Etudiant de 21ans, sexe Masculin, adressé pour scanner crânio- encéphalique suite à un AVP avec notion de perte de connaissance initiale.
L'examen TDM montrant une contusion œdémato-hémorragique, plus hématome extradural temporal gauche et une discrète hémorragie méningée temporo-occipitale gauche

DISCUSSION

Head trauma is a major public health problem and causes significant morbidity and mortality, particularly in young adults [1, 2]. In contrast to Western countries that have a patient transport system (mobile emergency service) and adapted resuscitation [3], in Mali, the absence of a pre-hospital early management system makes morbidity and mortality high. In Europe the annual incidence of all TCE is estimated at 235 per 100,000 inhabitants and 98 per 100,000 inhabitants in the United States. This makes them a major public health problem in these countries [5].

During the study period, TCE represented 22.4% of all patients referred for computed tomography because of its availability.

The predominance of a young working population (average age 26 with extremes from 4 to 65 years), the male sex (ratio to 4.7%) and that of road traffic accidents (80.9%) found in our study are consistent with international literature data and are no longer to be demonstrated [4, 6].

These predominances would be justified by the fact that the juvenile population is the most economically active. The involvement of men in high-risk occupations such as taxi drivers, motorcycle drivers and activities requiring many movements would expose them to road traffic accidents. The absence of a true road safety policy with the non-observance of the wearing of the seat belt in vehicles or helmets for motorcyclists, speed limit signs, signal lights not functional in places, the poor condition of roads, would explain the predominance of road traffic accidents in these developing countries in general.

According to the World Health Organization, head injuries are the leading cause of death for motorcyclists, wearing safe helmets, quality reduce the risk of death by more than six times and TCE-related brain injuries by up to 74% in developing countries [9].

The transport of patients from the accident site to the hospital is essential for the reduction of secondary brain attacks of systemic origin (ACSOS) which are often the factor of severity both in pre-hospital and intra-hospital [10, 11].

In our study, the collection and transportation of TCE was done by witnesses, family, private vehicles, public transit, relatives, thus exposing patients to the risk of secondary injuries. This way of transporting the traumatized in general and the TCE in particular is not a specificity in the republic of Mali, but rather most developing countries. The same observation was reported by ETIENNE ODIMBA [12] and KANNAN N [13] in their respective study. Several African studies have reported low medicalization of TCE transport around 50% [9-14]. This is justified by the insufficient means of medical transport in the health facilities of developing countries in general. In the Republic of Mali there is no pre-hospital medicine for patients. The creation of a pre-hospital TCE transport unit like the UAS, as well as the introduction and expansion of the health insurance system to the entire population could help improve the immediate prognosis of these patients.

Clinical signs were dominated by cranial wounds 21.6% of which 16.3% of edema of the soft parts followed respectively by agitation, vomiting and headache with 15.7% 14.7% 11.6% of cases. The same observation was reported by other authors in varying proportions [15].

In our study the Glasgow score was between 8 and 13 with 72.5% of cases and less than 8 with 7.5% of cases. For MARTIN A *et al*., [16], the mean GCS is 6.4+ or – 3.1 and is a prognostic factor. For GR BOTO *et al*., [17], a GSC below 5 is a factor of poor prognosis.

Computed tomography is the standard examination in the detection of brain damage. Its negative predictive value is close to 100% to eliminate brain damage neurosurgical indication [18].

In our context the realization of the CT and other examinations or assessments are the responsibility of the families of the patients, the lack of financial means can delay the realization of these as well as the adequate management.

It was done in 66.2% of cases. This result is close to that found by Ageumom and AR [19], in their study on TCE in intensive care in Benin. This is justified by the socio-economic standard of living of different countries.

In our series computed tomography lesions were dominated by meningeal hemorrhage, embarrure fracture and extradural hematoma with 63.2%, 31.3% and 22.8% of cases. Sissoko A [20] in his study of computed tomography aspects of traumatic brain injuries found the same trends. Sanou Joahim *et al*., [21], reported brain injuries, linear single fractures of the vault and diffuse cerebral edema as the main CT brain lesions encountered in children admitted to intensive care in Burkina.

Some patients who benefited from neurosurgical management with complications (meningitis, suppuration), late sequelae (headaches, convulsions) and an estimated percentage of death 7.8% recorded.

CONCLUSION

Head and brain injuries maintain a serious reputation, only early diagnosis, good CT, medical-neurosurgical management improve the prognosis.

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