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Prognostic Value of the Brain CT-Scan in Head Trauma in Yaounde Central Hospital

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Abstract

Introduction: Cranial trauma is a serious medico-surgical pathology that hinders the vital and functional prognosis. The Rotterdam computed tomography (CT) score refined features of the Marshall score. This score was designed to categorize traumatic brain injury (TBI) type and severity in adults. The aim of our research was to evaluate the association between the Rotterdam CT scores of patients after a cranial traumatism in terms of survival. **Material and methods:** It was a cross-sectional and analytical study from January 2018 to March 2020, using medical records of patients suffering from cranial traumatism, received and taken in charge in the Yaounde central hospital. **Results:** 100 patients were retained out of 115 recruited patients. The average age was 35.20 with a sex ratio of 4.55. The Rotterdam score was between 1 and 5 with a median of 2. The overall mortality at 6 months and 1 year was 32%. With an equal score compared to European studies, we recorded significantly higher mortality. We found the sequelae in 24% of the patients. GOS ranged from 1 to 5, and survival without sequelae (GOS 1) was the most represented. There was a positive correlation between the Rotterdam score and the GOS with a Pearson correlation coefficient of **+0.514**. **Conclusion:** The death rate in Rotterdam score equals is greater in our context compared to European studies.

Keywords

Cranial Traumatism, Cerebral CT-Scan, Prognosis, Rotterdam Score

1. Introduction

Head trauma is defined as any trauma to the skull and/or the brain [1]. According to the NHIF (National Head Injury Foundation) is called head trauma: It is any cerebral attack following an external force which causes a decrease or a deterioration in the state of consciousness, which leads to a deterioration of cognitive or physical capacities, which can also produce Behavioral or emotional disorders [2]. Prognostic information is helpful for caregivers and family members to guide the care of patients with traumatic brain injury (TBI), especially for those with life-threatening injuries. Because patients with severe TBI or hypoxia after TBI are frequently intubated and sedated, and often receive neuromuscular blocking agents prior to arrival in the emergency department, the initial neurologic exam may be limited. Radiographic imaging is one the earliest pieces of objective data available to evaluate the severity of head injury and aid in determining prognosis. Non-contrast computed tomography (CT) scan of the head is the initial imaging study of choice due to its rapid image acquisition and ready availability in most hospitals [3].

It is a frequent condition and remains the most common cause of trauma mortality with particularly high mortality and morbidity in low and middle income countries. The overall incidence of head injuries in high-income countries is approximately 200/100,000/year [3]. In sub-Saharan Africa data on head trauma shows a high incidence with global values of 106/100,000 [3]. In Cameroon, a study carried out in 2016 in five hospitals was able to count 2835 cases of head trauma. Mortality over one month was 77% for severe head injuries [4]. Head trauma is a traumatic neurosurgical condition that impairs the vital and/or functional prognosis of an individual. The medical or surgical management undoubtedly depends on the findings of the CT scan.

The more recently developed Rotterdam scoring system utilizes some elements of the Marshall score, specifically the status of the basilar cisterns and the presence/degree of midline shift, along with presence of subarachnoid hemorrhage (SAH) and intraventricular hemorrhage (IVH). This scale differentiates between types of mass lesions, recognizing the more favorable prognosis associated with epidural hematomas (EDH) [4]. Many studies have shown a prognostic and predictive value of the Rotterdam score in the management of head trauma. This score is an instrument of choice in therapeutic decision-making [3] [5]. In the Cameroonian context, few studies have been carried out to determine the prognostic value of the brain CT-Scan in head trauma. This study aimed to determine whether the Rotterdam CT score was predictive of in-hospital mortality for all age patients with moderate to severe trauma brain injury.

2. Patients and Methods

2.1. Study Type

We conducted a cross-sectional study using the medical records of head trauma patients received and treated at the Yaoundé Central Hospital.

2.2. Study Period

Our study took place over a period of 26 months from 9th January 2018 to March 2020.

2.3. Study Population

Patients were included in our study if they were cared at Yaoundé Central Hospital and presented signs of head trauma during the period of our research. Patients were excluded in case of uncompleted data in medical file.

2.4. Data Collection

To describe the ROTTERDAM score (Figure 1), our results were expressed in numbers and frequencies of the different scores obtained. We sought the association between the ROTTERDAM score with survival at 6 months and 1 year and the correlation using the Pearson correlation tests was sought with the GOS.

Injury severity was evaluated using the Glasgow coma scale (GCS), injury severity score (ISS), mechanism of injury, and use of intracranial pressure (ICP) monitoring.

The Glasgow coma scale was assigned by the Emergency Department (ED). Patients were excluded if they died before the initial non-contrast head CT was obtained and if there were no CT images for review.

Our data was recorded on a pre-established data sheet and entered into the database as the research continued. Our sampling technique was non-probability and by reasoned choice.

2.5. Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics Version 21 (IBM

Predictor	Score
Basal cisterns	
Normal	0
Compressed	1
Absent	2
Midline shift	
No shift or shift ≤ 5 mm	0
Shift > 5 mm	1
Epidural mass lesion	
Present	0
Absent	1
Intraventricular blood or subarachnoid hemorrhage	
Absent	0
Present	1
Sum score	+1

Figure 1. Rotterdam computed tomography classification[a]. [a]In the Rotterdam scoring system, 1 point is added as a sum score to make the Rotterdam grade numerically total 6 points, consistent with the motor score of the Glasgow Coma Scale and the Marshall classification.

Corp., Armonk, NY, USA). The t-tests was used to compare means score between two categories, and ANOVA for more than two categories. The chi-square test was used to compare the 6 month and 1 year survival of head trauma patients in our context with that predicted by the Rotterdam score in the baseline study. A p-value < 0.05 was considered statistically significant.

2.6. Ethic

Our study was submitted to the Central Hospital research committee for approval of the research protocol. We obtained permission from the Director of the Central Hospital before starting data collection. The information collected was recorded anonymously on pre-established forms and the confidentiality of the data was guaranteed.

3. Results

115 patients were included in our research, 82% of whom were male. The most represented age group was 6 - 50 years old. 48% of patients were treated within the first 24 hours, while 40% of patients were treated beyond 72 hours.

We found the sequelae in 35.29% of the patients. The most common functional sequelae were paralysis/paresis of the face or limb with a frequency of 13.24%, followed by memory impairment at 7.35%. The most common sensory sequelae were hearing impairment with a frequency of 2.9%. In our study, the mortality obtained with a Rotterdam score 5 was 100% while the mortality was 83.5% for a Rotterdam score equal to 4 (Table 1).

In our research, 21 patients with a Rotterdam score greater than or equal to 3 died. There is a significant association between a Rotterdam score ≥ 3 and mortality with a risk of mortality increased by 10.93 (Table 2).

Table 1. Distribution of mortality frequencies at 6 months and 1 year.

Score	Mortality obtained	Expected mortality	P-value
Rotterdam 1	5.6%	0%	0.0003
Rotterdam 2	20%	7%	0.429
Rotterdam 3	56.5%	16%	0.00006
Rotterdam 4	83.3%	26%	0.004
Rotterdam 5	100%	53%	-

Table 2. Association between mortality and the different ranges of GCS.

Rotterdam score	Number of deceased		OR	P-value
	Yes	No		
≥3	**21**	**11**	**10.93**	**0.000003**
≤2	11	57	0.09	0.000003
Total	32	68	-	-

Table 3. Correlation between the Rotterdam scores of the patients and their respective GOS.

	Glasgow outcome scale (GOS)					Correlation coefficient
Rotterdam score (n)	GOS 1	GOS 2	GOS 3	GOS 4	GOS 5	
Rotterdam1 (17)	10	6	0	0	1	**+0.514**
Rotterdam2 (51)	26	13	1	1	10	
Rotterdam3 (22)	7	3	0	0	12	
Rotterdam4 (7)	0	1	0	0	6	
Rotterdam5 (3)	0	0	0	0	3	

n: number of case.

Concerning the correlation between the Rotterdam score and the Glasgow Outcome Scale (GOS), our result showed that in 17 patients with a Rotterdam score of 1, the GOS was 1 in 10 patients. Out of 22 patients with a Rotterdam score of 3, the GOS was 5 in 12 patients in our sample (Table 3). There was a positive correlation between the Rotterdam score and the GOS with a Pearson correlation coefficient of **+ 0.514** (Table 3).

4. Discussion

We obtained in our study a minimum age of 1 year and a maximum of 84 years with an average of 35.20 years +/− 19 years. The average age is greater than the result found by King [6] who had found an average age of 32.6 years. The population concerned was mainly male. These results are similar to those found by Ousmane [7] in Mali, 2009 and Konate [8] in Bamako, 2013. They found a male predominance at 88% and 92% respectively.

More than half of the patients (52%) were treated 24 hours after their head trauma, contrary to the results obtained by Ousmane *et al.* [7] where the majority of patients were cared for (51.4%) between 30 min and 6 h. Mehdi *et al.* [9] in Morocco 2018, had obtained a care delay at 6 h after head trauma in 60% of cases. This difference could be explained by the fact that in our context, patients come late to hospital structures due to economic problems.

Neurological sequelae were noted in 24% of our patients while, Zimmerman *et al.* [10] in the USA and Fatima *et al.* [11] in Morocco, 2006, found neurological sequelae in 14% and 18% of their patients. This can be explained by the limited and delayed practices of physiotherapy sessions in our context.

In our study, we obtained 32% of deaths at 6 months and 1 year. These results are similar to those obtained by Solagberu *et al.* [12] in Nigeria 2002, which obtained a mortality of 31%. However, the mortality at 6 months according to the different scores of Rotterdam was statistically significantly higher in our study compared to those predicted by Maas *et al.* [13]. We can explain this by the gravity of head traumatized patients and the late arrival of the patients in the hospital structures.

Concerning the prognosis on the basis of GOS, we obtained as score the most represented GOS 1 (43%) followed by GOS 5 (32%), GOS 3 and 4 at 1%. These results are comparable to those obtained by Taleb and al [14] in Algeria 2014, which found a similar distribution for the GOS 1, 3 and 4, however with regard to the GOS 5 our results are different to those found in the USA by King *et al.* [6] Where, the latter came last with a frequency of 2%. This difference can be explained by the fact that GOS 5 is the equivalent of mortality, so we recorded a higher mortality rate.

We found a statistically significant association between the GCS inferior or equal to 9, the ROTTERDAM score superior or equal to 3 and the mortality and with the risks increased by 11.41 and 24.66 respectively. These results are comparable to those found by Marine *et al.* [15] in 2018 in France where the GCS and the Rotterdam score were associated with mortality with the respective OR of 1.1 and 14.6. We also found a positive correlation between the Rotterdam score and the GOS with a coefficient of +0.514. This can be explained by the fact that the Rotterdam score being strongly associated with the severity of the CT the risk of sequelae and death increases with the score.

The main limitation of our study was the small sample size which would have given more strength to our results. However, no study in low and middle income countries has provided these preliminary results.

5. Conclusion

Of the 115 head trauma patients included in our study, most were made up mainly of young adult males. We obtained an overall mortality of 32%. The mortality rate associated with each score is significantly higher in our context compared to studies published in Europe. The Rotterdam score greater than or equal to 3 was associated with 65.6% of the mortality with a positive correlation between the Rotterdam score and the GOS. From the point of view of the multivariate analysis, we found that increased mortality was associated with a Rotterdam score greater than or equal to 3, a GCS less than or equal to 9 and medical treatment of the resuscitation type. We can therefore say that the Rotterdam score must be used to assess the prognosis of head trauma patients in Yaoundé.

Conflicts of Interest

There are no conflicts of interest.

Authors' Contribution

Bombah Freddy Mertens: He participated in writing the research protocol. He also participated in the collection of data, the writing of the discussion and the bibliography. He participated in the writing of the final paper.

Messina Ebogo: He participated in writing the research protocol. He also participated in the collection of data, the writing of the discussion and the bibliography. He participated in the writing of the final paper.

Bello Figuim: As a neurosurgeon, he wrote the methodology for this research. He defined the interests of this research in the improvement of head trauma management. He also participated in the critical reading of this research.

Doulanni Bouba: The author chose the subject. He participated in writing the research protocol. He also participated in the collection of data, the examination of the results and the drafting of the discussion.

Ongolo Zogo: Radiologist, he was the general supervisor of this work. He also participated in the critical reading of our present study.

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References

[1] Rouxel, J., Tararourte, K., Moigno, S., Ract, C. and Vigué, B. (2004) Prise en charge pré hospitaliere des traumatisés craniens. Elsevier, Amsterdasm, 6-14. https://doi.org/10.1016/j.annfar.2003.09.021

[2] Algerienne, R. (2014) Prise en charge et devenir des traumatisés craniens hospitalisés au chu de tlemcen en 2009 et 2010. These de doctorat de medicine, Université Aboubekr Belkaid-tlemcen Faculté de Médecine, Benzerdjeb.

[3] Odero, W., Garner, P. and Zwi, A. (1997) Traffic Injuries in Developing Countries: A Health Comprehensive Review of Epidemiological Studies. *Tropical Medicine & International Health*, **2**, 445-460. https://doi.org/10.1111/j.1365-3156.1997.tb00167.x

[4] Djientcheu, V., Fongang, E., Etoundi, P. and Esiene, A. (2018) Mortality of Head Injuries in Sub-Saharan African Countries: The Case of the University Teaching Hospitals of Cameroon. *Journal of the Neurological Sciences*, **371**, 100-104.

[5] Liesemer, K., Riva-Cambrin, J. and Bennett, K.S. (2014) Use of Rotterdam CT Scores for Mortality Risk Stratification in Children with Traumatic Brain Injury. *Pediatric Critical Care Medicine*, **15**, 554-562. https://doi.org/10.1097/PCC.0000000000000150

[6] King, J.T., Carlier, P.M. and Marion, D.W. (2005) Early Glasgow Outcome Scale Scores Predict Long-Term Traumatic Brain Injury. *Journal of Neurotrauma*, **22**, 947-954. https://doi.org/10.1089/neu.2005.22.947

[7] Toure, G., Ousmane, M. and Berte, O. (2009) Devenir des traumatises craniens graves en milieu de reanimation au chu gabriel toure de bamako de fevrier 2006 a fevrier 2007. These de doctorat de médecine, Faculté de médecine pharmacie et d'odonto-stomatologie, Bamako.

[8] Amara, K. (2013) Pronostic des Traumatismes Craniens Dans Le Service D'anesthesie Et De Reanimation Du C.H.U.Gabriel Toure. These de doctorat de médecine, Faculté de Médecine de Pharmacie et d'Odontostomatologie de l'USTT de Bamako, Mali, 1-111.

[9] Belkaich, M. (2018) Les facteurs pronostiques du traumatisme crânien grave en réanimation. These de doctorat de médecine, Faculté de Médecine de Pharmacie-

Marrakech, Maroc.

[10] Zimmerman, R., Bilaniuk, L., Gennarelli, T., Bruce, D., Dolinskas, C., Uzzell, B., *et al.* (1978) Cranial Computed Tomography in Diagnosis and Management of Acute Head Trauma. *American Journal of Roentgenology*, **131**, 27-34. https://doi.org/10.2214/ajr.131.1.27

[11] Fatima, E. (2016) Prise en charge des traumatismes crâniens au CHU Mohamed VI de Marrakech expérience de 13 années de 2002 à 2014: Profil épidémiologique. These de doctorat de médecine, Faculté de Médecine de Pharmacie-Marrakech, Maroc.

[12] Solagberu, B.A. (2002) Spinal Cord Injuries in Ilorin, Nigeria. *West African Journal of Medicine*, **21**, 230-232. https://doi.org/10.4314/wajm.v21i3.28037

[13] Maas, A.I., Marshall, L.F., *et al.* (2005) Prediction of Outcome in Traumatic Brain Injury with Computed Tomographic Characteristics: A Comparison between the Computed Tomographic Classification and Combinations of Computed Tomographic Predictors. *Neurosurgery*, **57**, 1173-1182. https://doi.org/10.1227/01.NEU.0000186013.63046.6B

[14] Khajavikhan, J., Jaafarpour, M. and Kokhazade, T. (2016) Outcome and Predicting Factor Following Severe Traumatic Brain Injury: A Retrospective Cross-Sectional Study. *Journal of Clinical and Diagnostic Research*, **10**, PC16-PC19. https://doi.org/10.7860/JCDR/2016/16390.7294

[15] Marine, T. (2018) Évaluation du pronostic neurologique à long terme des patients traumatisés crâniens au sein du TRENAU en fonction de l'âge, étude retrospective multicentrique: Médecine humaine et pathologie. UFR Medicine, Grenoble, dumas-01787524.