SVOA Neurology

ISSN: 2753-9180

ScienceVolks Open Access

Research Article

Surgical Results in Neurotraumatology in a Hospital in Botswana

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DOI: https://doi.org/10.58624/SVOANE.2023.04.0102

***Received:** August 26, 2023* ***Published:** September 07, 2023*

Abstract

Objective: To describe the surgical results in patients operated on for traumatic brain injury in a hospital in Botswana.

Methods: Observational, descriptive, cross-sectional study, in the period from January 2023 to August 2023, at the Nyangabgwe Referal Hospital in Botswana. The sample under study consisted of 50 patients. General and specific variables of the traumatic Brain injury were analyzed.

Results: The average age was 40.8 years, with a predominance of males (86%), the most frequent cause of head trauma was aggression (50%), chronic subdural hematoma predominated (36%), with intrahospital pneumonia being the complication more frequent (10%), mortality was 12%.

Conclusions: Traumatic brain injury is a health problem in Botswana, it behaves with an incidence and prevalence that rises despite the small population of the country. Surgical results of a heterogeneous group of pathologies secondary to TBI were described.

***Keywords:** Neurotraumatology, Traumatic brain injury (TBI), Neurosurgery, Monitoring.*

Introduction

Head injury is the most common cause of death and disability in people under 40 years of age in the UK [(1)]. The prevalence of traumatic brain injuries in Botswana is high [(2)], this associated with the small population that it presents and the predominance of the young population as the main affected, brings with it serious productivity problems. The objective of this investigation was to describe the surgical results in patients operated on for traumatic brain injury in a hospital in Botswana.

Material and Method

An observational, descriptive, cross-sectional study was carried out in the period from January 2023 to August 2023, at the Nyangabgwe Referal Hospital in Botswana. The universe consisted of the total number of patients admitted with a diagnosis of head trauma, after applying inclusion and exclusion criteria, a study sample of 50 patients was obtained.

Inclusion criteria

• Patients operated on secondary to head trauma

• Informed consent to participate in the study.

Exclusion criteria

• Insufficient data in the medical history

The variables under study were divided into: common variables for all operated patients, individual or specific variables for each type of head trauma (Epidural Hematoma/Chronic Subdural Hematoma/Depressed Fracture).

Table 1: Distribution of the investigative variables under study.

General Variables	Specific variables
Age/ Sex/ Cause of head trauma/ Glasgow scale [3] on admission/ Diagnosis/ Tomographic classification according to Marshall scale [4]/ Tomographic classification according to Rotterdam modified by Mass [5]/ Surgical time/ Intraoperative bleeding/ Complications/ Stay hospitalization/ Mortality/ Extended Glasgow Functional Scale [6, 7, 8]	**Epidural hematoma:** Location/ Thickness/ Volume/ Technique used **Acute and Chronic Subdural Hematoma:** Location/ Thickness/ Volume/ Markwalder Scale [9]/ Technique used **Depressed fracture:** Location/ Size of depressed fracture/ Depth of depression/ Dural rupture/ Associated bruises/ Technique used

All the information collected was obtained from the review of the medical records and the review of the tomographic images of each patient. The results were expressed in absolute numbers and relative frequency.

To carry out this research, ethical principles were applied in accordance with the provisions of the Declaration of Helsinki, seventh revision (Brazil, 2013) [10].

Results

The general variables of the operated patients are presented. Of a total of 50 cases, the average age was 40.8 years, with a predominance of males (86%), the most frequent cause of head trauma was aggression (50%), chronic subdural hematoma predominated (36%). Intrahospital pneumonia being the most frequent complication (10%), mortality was 12%. Table 2.

Table 2: General variables of the patients studied.

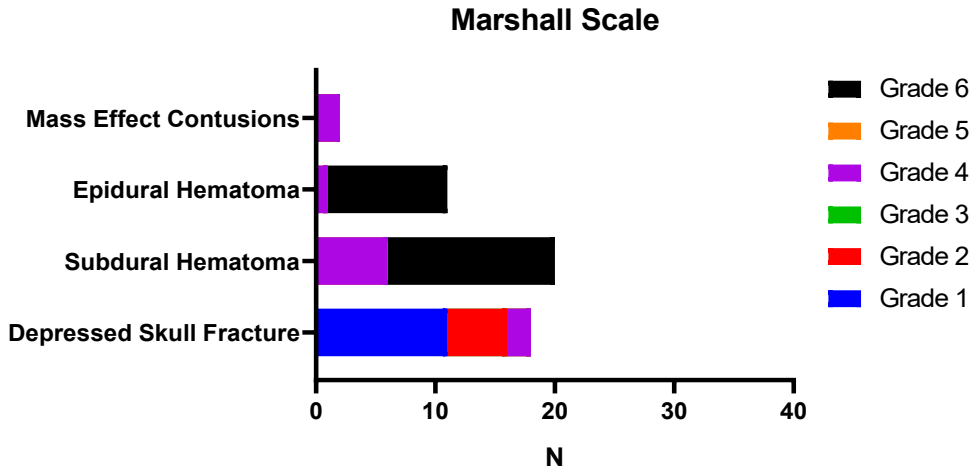
Age	40.8 years	
Gender	**N.**	**%**
Male	43	86
Female	7	14
Cause of TBI	**N.**	**%**
Assault	25	50
Car accident	8	16
Previous fall (more than 2 weeks)	12	24

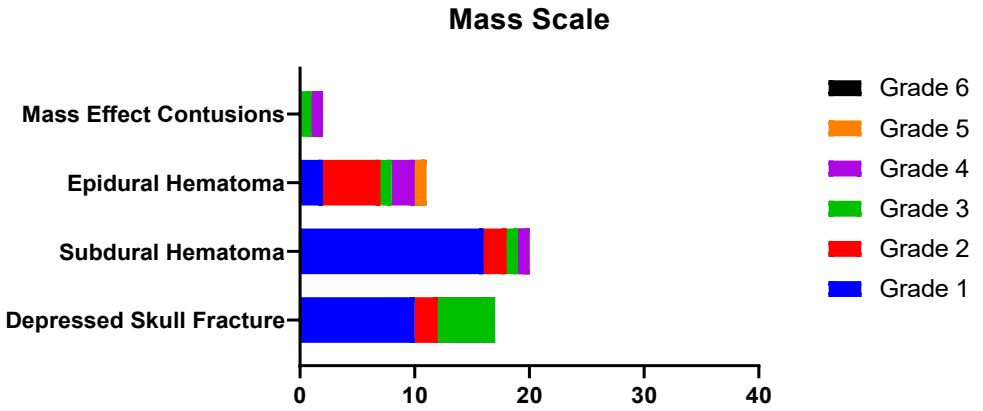
Table to be continued...

Recent fall from height	1	2
Not specified	4	8
Glasgow Coma Scale on Admission	**N.**	**%**
15	22	44
14	17	34
9-13	8	16
≤8	3	6
Diagnosis	**N.**	**%**
Depressed skull fracture	17	34
Epidural hematoma	11	22
Chronic Subdural Hematoma	18	36
Acute Subdural Hematoma	2	4
Mass Effect Concussions	2	4
Surgical Time (min)	121,7	
Intraoperative bleeding (ml)	242,4	
Hospital stay (days)	7	
Complications	**N.**	**%**
Hospital-acquired pneumonia	5	10
Post-surgical seizures	3	6
CSF fistula	1	2
Surgical wound infection	3	6
Postoperative hematoma	1	2
Hydromineral imbalance	1	2
Mortality (%)	6 (12%)	
GOSe	**N.**	**%**
I	6	12
II	-	-
III	1	2
IV	2	4
V	1	2
VI	2	4
VII	2	4
VIII	36	72

The relationship of the diagnosis of the patients according to the Marshall and Mass Scale is shown, with Marshall grade 6 being the most frequent with 24 (48%) patients, as for the Mass scale, grade 1 predominated with 28 (56%).) patients. Graphs 1, 2.

Graphs 1, 2: Distribution according to diagnosis, marshall scale, mass scale.





Regarding the specific variables, in the Epidural Hematoma the right parieto-temporal location predominated (27.3%), the average thickness of the hematoma was 35.7 mm, flap trauma was the most used technique (63.7%), in Chronic Subdural Hematoma the left hemispheric location predominated (50%), the average thickness was 28.6 mm, Marwalder grade II (61.1%) was the most frequent, 1 trephine plus subdural drainage (44 4%) was the most used technique for the evacuation of these, in terms of Depressed Fractures the right Fronto-Parietal location (24.5%) was the most frequent, the average depth of the depression was 25 mm, the Craniectomy (73.5%) was the most used technique.

Table 3. Distribution of operated patients according to specific variables for Epidural Hematoma, Chronic Subdural Hematoma and Depressed Fracture.

Epidural hematoma		
Location	**N. (11)**	**%**
Left Temporary	2	18,2
Right Parieto-Temporal	3	27,3
Left Front	2	18,2
Right Front	2	18,2
Right Fronto-Temporal	2	18,2
Epidural Hematoma Thickness (mm)	35,7	
Epidural Hematoma Volume (cm^3)	42,3	
Surgial technique used	**N.**	**%**
Trauma Flap	7	63,7
Craniectomy	4	33,3
Chronic Subdural Hematoma		
Location	**N. (18)**	**%**
Left fronto-parieto-temporal	9	50
Right fronto-parieto-temporal	5	27,7
Bilateral fronto-parieto-temporal	4	22,3
Chronic Subdural Hematoma Thickness (mm)	28,6	
Chronic Subdural Hematoma Volume (cm^3)	37,9	
Marwalder scale	**N.**	**%**
0	-	-
I	3	16,6
II	11	61,1
III	2	11,1
IV	2	11,1
Surgical technique used	**N.**	**%**
1 Trephine + Drainage	8	44,4
2 Trephines + Subdural lavage + Drainage	2	11,1
2 Trephines + subdural lavage	6	33,4
1 Trephine + subdural lavage	2	11,1

Depressed skull fracture		
Location	**N. (17)**	**%**
Fronto-Parietal Right	4	23,5
Front Right	2	11,8
Front Left	3	17,6
Left Fronto-Parietal	1	5,9
Right Parietal	3	17,6
Left Parietal	2	11,8
Right Temporary	2	11,8
Depth of Depression (mm)	25	
Duramadre rupture (%)	6 (35,3)	
Other associated injuries	**N.**	**%**
Hemorrhagic cerebral contusions	3	17,6
Epidural Hematomas	3	17,6
Subarachnoid hemorrhage	4	23,5
Surgical technique used	**N.**	**%**
Craniectomy	13	76,5
Elevation of the fracture site	4	23,5

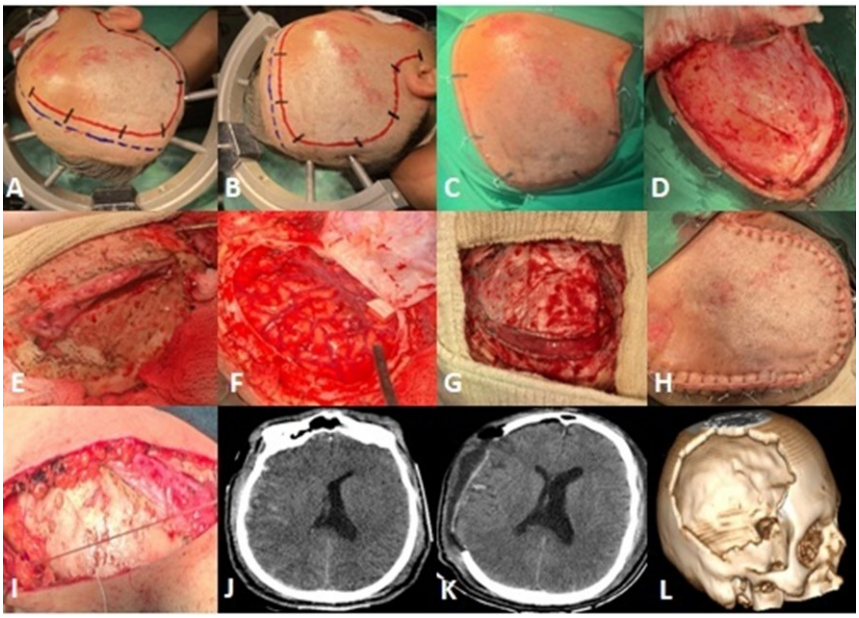


Figure 1. *Patient with Marshall IV scale. Decompressive Craniectomy.*

Example of Operated Case. A, B, C: Surgical position of the patient with the placement of the Sugita surgical head and planning of the surgical incision with the placement of the field drapes. D: Exposure of the superficial temporalis fascia and right frontoparietal aponeurotic galea, subfascial dissection of the frontal branch of the fascial nerve. E: Dissection of the temporal muscle with exposure of the right fronto-parieto-temporal bone area. F: Fronto-parieto-temporal craniectomy with C-shaped durotomy, note subarachnoid hemorrhage and right fronto-temporal contusions. G: duroplasty. H: Closure of the myocutaneous flap. I: Placement of the extracted bone fragment in the abdominal subcutaneous cell space. J: Pre-surgical head CT scan showing subarachnoid hemorrhage and significant cerebral edema in the right frontotemporal region displacing the interhemispheric fissure and collapsing the right ventricular system, Grade IV of the Marshall Classification. K: Post-surgical cranial CT 72 hours after surgery, the bone defect of the performed craniectomy (greater than 12 cm) is observed, the right ventricular system can be observed as it re-expanded and increased in size compared to the pre-surgical tomography. L: Three-dimensional reconstruction of the post-surgical CT showing the bone defect of the fronto-temporo-parietal craniectomy performed. **Figure 1**

Discussion

Numerous studies agree with a higher incidence of head trauma in males with an age range between 20 and 50 years. [11, 12, 13] Regarding the cause of head trauma, traffic accidents are the main reason for these patients [14, 15, 16], however in this study aggression (robbery, fights) predominated.

The Glasgow Coma Scale at the time of admission constitutes an important element in the evaluation of the patient with traumatic brain injury, not only to determine the severity of the trauma but also to be significantly associated with mortality and subsequent disability, other variables have also been defined. related to survival such as photomotor reflex, degrees III and IV of the Marshall Scale, hypoxia and systemic hypotension. [11, 17, 18]

Regarding the use of different scales to determine the prognosis of patients with cranioencephalic trauma, the Marshall scale has remained the most used for pathoanatomical screening of patients with ECT. It must be taken into account that it was not designed to prognostic use and does not represent an ordinal scale or grading system from a statistical point of view, it also does not take into account the presence of subarachnoid or intraventricular hemorrhage, it does not categorize the degree of compression of the basal cisterns, nor does it establish differences in terms of the types of intracranial lesions with mass effect, on the other hand, the Rotterdam score was designed with the aim of creating an ordinal scale, including the presence or absence of subarachnoid or intraventricular hemorrhage, differentiating extradural hematoma from the rest of intracranial lesions with mass effect and offering different categories according to the degree of involvement of the perimesencephalic cisterns. Several studies have demonstrated the usefulness and even the superiority of this scale, for the prediction of mortality and poor results in the short and medium term of patients with ECT, after performing decompressive craniectomy and even in pediatric patients. [19, 20, 21]

One of the most controversial issues is the most effective form of treatment for chronic Subdural Hematoma, the Twist Drill Craniostomy is one of the most attractive options for the treatment of these injuries.

Tabadoor and Shulman first reported TDC with a closed drainage system in 1977 in their cohort of 21 patients [22], it is a minimally invasive procedure that involves the creation of a small opening in the skull with a diameter of approximately 2 to 5 mm (usually less than 10 mm), usually using portable drills, [23, 24] has the advantage that it can be performed at bedside under local anesthesia and can therefore be a very attractive treatment option. for patients who are poor surgical candidates. [25, 26]

Intraparenchymal hemorrhage or seizures after rapid decompression of cHSD may occur in 60% of patients older than 75 years, possibly due to excessive hyperemia in the healthy cortex below the hematoma [27]. it is most effective when the hematoma is completely liquefied with minimal membrane formation. [28]

The use of craniotomy has decreased significantly and today it is reserved mainly for recurrent cases of cSDH or hematomas with extensive web formation or calcifications. [26, 27, 28]

Despite its benefit of extensive evacuation of the hematoma and maximum access for excision of membranes, it is the most invasive of the techniques and is associated with longer operative time, greater amount of blood loss, more postoperative complications and hospitalization times. longer, especially in frail patients. [27, 28]

Regarding the management of severe head trauma, many studies have shown that decompressive craniectomy is an advantageous option for intracranial hypertension refractory to conservative therapy. [29, 30, 31]

In recent years, cisternostomy has become popular under the theory of the glymphatic system, which raises the communication of the basal cisterns with the cerebral parenchyma through the Virchow-Robin spaces, therefore by evacuating the cisternal cerebrospinal fluid it is reduced. cerebral edema and intracranial pressure, [32] the superiority of this procedure with respect to decompressive craniectomy in intracranial pressure control has also been demonstrated. [33]

Conclusion

Traumatic Brain Injury is a health problem in Botswana, it behaves with an incidence and prevalence that rises despite the small population of the country. Surgical results of a heterogeneous group of pathologies secondary to TBI were described.

Conflict of Interest

The authors declare no conflict of interest.

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Citation: Benítez EMS, Pérez MQL, Mogae M, Sithole MYS, Molina IR, Nordet IB. Surgical Results in Neurotraumatology in a Hospital in Botswana. *SVOA Neurology* 2023, 4:5, 115-124.