Clinical Presentation and Outcome of Neurosurgical Conditions at Butare Teaching Hospital, Rwanda

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Background: Neurosurgical services have only been introduced in Rwanda recently. Consequently little information about spectrum of neurosurgical conditions in th country is available. This descriptive prospective study was aimed at determining the pattern, causes and outcome of management of neurosurgical conditions seen in Butare University Teaching Hospital (BUTH) in Rwanda.
Methods: The study population consisted of 152 patients admitted at BUTH with neurosurgical conditions between October 1 2007 and May 31 2008. Patients were grouped into different neurosurgical conditions according to their clinical presentations. . Information collected included age, gender, cause and severity of injury, the time interval between injury Glasgow Coma Score, GOS scales were used to assess head injured patients.
Results: The majority (70.4%) of patients came from rural areas. Their ages ranged from 15 days to 78 years with a mean of 31.98+/-18.75 years. The Male to female sex ratio was 2:1. Most (73.0%) of the patients suffered from trauma with 67.6% of them sustaining head injury and 32.4%, spinal trauma. Motor Vehicle crashes were the major cause of traumatic injuries (20% in spinal trauma and 70.7% of head trauma). Only 23% of the patients had CT scan performed. Only 12% of patients with traumatic brain injury (TBI) had CT scan.. A total of 78.7% of all head injuries were admitted in the first 24 hours following trauma. A significant number (44.4%) of spinal cord injury presented late (up to 7 days before referral to a neurosurgeon) and stayed longer in the hospital (52.7% up to 3 months). Laminectomy and fixation was the most common spinal operative procedure (58.7%) followed by discectomy (34.8%). The commonest cranial operation was for posttraumatic intracranial haemorrhage (41.4%) followed by surgery for depressed fracture (37.9%). One child had a shunt procedure for hydrocephalus. Good recovery was associated with GCS >13 on admission (*P*<0.001). The overall mortality rate was 13.2%. The mortality among patients admitted with GCS <8 was 52.4%.
Conclusion: Neurological injuries were the most commonly seen conditions mainly in head injuries. This study confirms that neurosurgical procedures can still be done with fair results using very little equipment. Providing basic equipment to national neurosurgeons, however, and training them to work in an adverse environment remains a big challenge.
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Introduction

Despite the recent WHO report urging increased awareness of the rising global public health importance of various common neurological disorders including neurological injuries[1], most of Africa lacks neurosurgical expertise estimated at 1 neurosurgeon per 6.36 million population and many African patients die everyday from untreated posttraumatic haematomas, unrecognised abscesses. Untreated hydrocephalus results in death or disability among children with this disease[2].

In Rwanda, until recently, major neurosurgical interventions could not be done for lack of neurosurgery specialists. Patients with neurosurgical conditions had to be referred to foreign countries at high cost. At the time of this study, there were only 3 neurosurgeons in Rwanda giving a neurosurgeon to subject ratio of 1: 2.863.333 inhabitants. Two of them were located in Kigali and the third was at Butare. One of the two in Kigali is relatively young national

neurosurgeon with a few years experience. Apart from shortage of human resources, the infrastructure is poor and limited to the capital Kigali. There is only one CT scan and no MRI in the country. Since March 2007 BUTH has become a major centre for neurological services in the country thanks to the presence of an expatriate neurosurgeon. This study was aimed at determining the pattern, causes, clinical presentation and outcome the neurosurgical conditions managed in BUTH

Patients and Methods

This was a prospective study of patients with neurosurgical conditions treated at Butare Teaching Hospital (BUTH) over 8 months period from 1st October 2007 to 31st May 2008. BUTH is the referral regional hospital in the Southern and Western Provinces of Rwanda. Information collected included age, gender, cause and severity of injury, the time interval between injury. Subjects were excluded if they were admitted before the study or treated as outpatients.

The severity of neurological deficit was graded according to GCS. The degree of neurological recovery or regression in head injured patients was determined by comparing the GCS and GOS before discharge. Favourable outcome in TBI was assessed either as moderate disability or good recovery (GOS). The following data was collected for all subjects: gender, age at the time of injury, cause of injury, co-morbidity, investigations done, length of stay in the Hospital (LoS), GCS, GOS (death, vegetative state, severe disability, moderate disability). The treatment was classified as conservative or surgical and the different neurosurgical procedures performed were recorded. The data collected was analyzed using Epi data 3.1 with SPSS software version 11.5 and Microsoft Office Excel 2003. Categorical variables (presented as absolute values and percentages) were compared by $\chi 2$ test. Clinical demographic explanatory variables were assessed through the one-way analysis of variance and the corresponding F-statistic. Statistical significance was defined as $P<0.05$.

Results

Demographic profile (Figure 1)
The study population consisted of 100 males (65.8%) and 52 females subjects (34.2%). Male to female ratio was 2:1.The ages ranged from 15 days to 78 years with a mean of 31.98 years (STD deviation 18.75). Many patients were young with 28.3% between 31-45 years typical for a young population (11) but also indicating that trauma occurs frequently among the active group in the population.

The majority of our cases 70.4% (n=100) came from rural areas. It is not a surprising finding as 83% of Rwanda's population live in rural areas (11) and where the majority economically rely on agriculture. Butare Teaching Hospital being located in the southern part of the country, the Southern province represented the largest part of our population 76.32% (n=116), the Northern province 7.89% (n=12), the capital Kigali 6.58% (n=10), the Western province 5.92% (n=9), the Eastern province 0.66% (n=1) and few from foreign countries who sustained injury while travelling in Rwanda (heavy truck drivers from Uganda) or who were transferred from Burundi hospitals 2.63% (n=4). Many of our patients sustained traumatic injury 73% (n=111), followed by degenerative conditions 13.2% (n=20) including 14 cases of lumbar disc disease (9.2%). Tumours were 5.9% (n=9). Congenital malformations represented 3.9% (n=6), neuroinfections 2.6% (n=4) (Table 1). Tuberculosis constituted 1.3% of all cases (n=2). One patient who sustained hyperextension injury of the cervical spine tested positive for HIV. Patients were not routinely tested for HIV and so the seroconversion rate cannot be discussed here. Traumatic brain injury and spinal trauma accounted for 49.3% and 23.7% of all neurosurgical admissions respectively and 67.67% (n=75) and 32.43% (n=36) of all neurological injuries. RTA was the

major cause of traumatic injuries with 54.5% (n=60) with 53 TBI (70.7%) and was the leading cause of mortality 44.4% of all deaths. Falls were more associated with spinal trauma at 58.3% (Table 1). Fifty nine (78.7%) of all traumatic brain injuries were admitted in the first 24 hours following trauma, while a considerable delay of up to 7 days before referral to a neurosurgeon was observed in 16 (44.4%) of spinal cord injury patients (Table 2).

Characteristics of patients	n=152	Deaths	Head injury	Spinal trauma
		20(13.2)	75(49.3)	36(23.7)
Age-yr	31.98+/- 18.75			
Male sex - no.%	100(65.8)			
Degenerative conditions - no. %	20(13.2)	0		
Congenital malformations - no.%	6(3.9)	1(16.7)		
Neurological infections - no. %	4(2.6)	0		
Tumours - no. %	9(5.9)	1(11)		
Neurological injuries - no. %	111(73)	18(16)	75(67.67)	36(32.43)
Road traffic accidents - no. %	60(54.5)	8(44.4)	53(70.7)	7(20)
Falls - no. %	32(28.8)	5(27.8)	11(14.7)	21(58.3)
Assaults - no. %	11(9.9)	2(11.1)	7(9.3)	4(11.1)
Other (landslide, sports...) - no. %	6(5.4)	2(11.1)	2(2.7)	4(11.1)
Unknown causes of injury - no. %	2(1.8)	1(5.5)	2(2.7)	0
X-ray - no. %	132(86.8)		73(97.3)	34(94.4)
CT scans - no. %	35(23)		9(12)	26(72.2)
Conservative treatment – no.%			51 (68)	19(52.7)
Surgical treatment – no.%			24(32)	24 (66.6)

Table 1. Characteristics of patients

Table 2. Correlation between neurological injuries and delay before admission

Neurological injuries	Duration of symptoms before admission								P value
	1-24hours		1-7 days		2-34 weeks		> 2-12 months		
	No.	(%)	No.	(%)	No.	(%)	No.	%	
Head injury (No. = 75)	59	(78.7)	12	(16.0)	4	(5.3)	0	(0)	
Spinal trauma (No. = 36)	6	(16.7)	16	(44.4)	11	(30.6)	3	(8.3)	<0.001
Total (No. = 111)	65	(58.6)	28	(25.2)	15	(13.5)	3	(2.7)	

Table 3 Operative Procedures Done.

Neurosurgical interventions	No.%	Spinal surgery group %	Cranial procedures group %	Deaths (no. %)
Elevation of depressed fractures	11(7.2)		37.9	2 (18.2)
Craniotomy for intracranial hemorrhage	12(7.9)		41.4	4 (33.3)
Shunting procedures for hydrocephalus	1(0.7)		3.4	0
Cerebral empyemas and abscesses	1(0.7)		3.4	0
Surgery for brain tumours	1(0.7)		3.4	0
Other cranial surgery	3(2.0)		10.4	0
All cranial surgeries	29(19.1)			6 (20.7)
Laminectomy and fixation	27(17.8)	58.69		5 (18.5)
Surgery for disc disease	16(10.5)	34.78		0
Other spinal surgery	3(2.0)	1.97		1(33.3)
All spinal surgeries	46(30.3)			6 (13.0)

Table 4. Outcome in traumatic brain injuries

GCS on admission (n)	GOS					
	Deaths	Vegetative state	Severe disability	Moderate disability	Good recovery	pValue
GCS>13 (36)	**0**	**0**	**0**	**2(5,6)**	**34(94.4)**	
GCS=9-13 (7)	**1(14.3)**	**0**	**1(14.3)**	**2(28.6)**	**3(42.9)**	**<0.001**
GCS<8 (21)	**11(52.4)**	**0**	**2(9.5)**	**6(28.6)**	**2(9.5)**	
Other(12)	**1(8.3)**	**0**	**0**	**0**	**11(91.7)**	

Table 5. Correlation between Traumatic injuries and Duration of Hospital Stay

Neurological injuries (n)	Length of hospital stay			
	1-7 days	**2-4 weeks**	**2-3 months**	**> 3 months**
Head injury (75)	38 (50.7)	32 (42.7)	5 (6.7)	0
Spinal trauma (36)	6 (16.7)	10 (27.7)	19 (52.7)	1(2.8)
Total (111)	44 (40)	42 (38.2)	24(20.9)	1(0.9)

The commonest investigation done in 132 (86.8%) was plain X-rays. It was performed in 107 (94.6%) of cases of neurological injuries; done in 73 (97.3%) for head injuries. CT scan, which is unavailable at BUTH, was performed in only 35 (23%) of the patients with 12% (n=9) for TBI (Table 1). Surgical interventions were performed for 77 patients (50.7%) and 49.3% of cases were managed conservatively. (Figure 2).Spinal surgery was the most commonly performed operation with 30.26% (n=46) followed by cranial and intracranial procedures with 19.07%

(n=29). Laminectomy and spondylodesis was the commonest type of surgery at 58.69% (n=27), followed by discectomy 34.78% (n=16). The most common cranial operation was craniotomy for intracranial haemorrhage 41.38% (n=12) followed by elevation of depressed fractures 37.93% (n=11). One child with hydrocephalus (3.44%) underwent shunt revision. Seventy five (49.3%) of the cases had non-operative (conservative) treatment. There were 11 (14.3%) and 9 (12%) deaths among the surgical and conservative cases respectively. Good recovery (GOS) observed in 34 patients (94.4%) was associated with GCS>13 (minor head injury) on admission and mortality was 52.4% (n=11) among severely head injured patients (P<0.001) (Table 3).
Patients with spinal trauma stayed longer at the hospital than TBI patients (P<0.001) 52.7% staying up to 3 months (Table 5).

Discussion

Trauma is the major cause of neurosurgical admissions in Butare. The major obstacles encountered in managing traumatic brain injury at Butare Teaching Hospital is the unavailability of CT scan, ICP monitoring devices and intermittent shortage of mannitol which is an essential drug along with other fluids during resuscitation[4,5]. Steroids were never used as they have shown no effect for reducing the intracranial pressure in traumatic brain injury and appear to be associated with increase mortality[6]. Outcome of management of brain injury significantly depends on the severity of injury (initial GCS) and the delay before treatment[7].

Operative decompression and stabilization improve the outcome in spinal trauma. Close follow up is crucial so as to prevent complications such as pressure sores, urinary tract infections[7]. Recent studies have shown that not all patients with herniated discs benefit from back surgery[8] but early discectomy has proven to be effective for patients with sciatica owing to herniated disks[9]. Although relatively uncommon at Butare Teaching Hospital, VPS for hydrocephalic children is a familiar practice in East, Central and Southern Africa and both imported and locally produced shunts are utilized[10].

Recent studies have dispelled the notion that brain neoplasms are rare in Black Africa[10]. The lack of centres with adequate manpower and equipment are main obstacles to diagnosis proper management of brain malignancies.

The majority of our patients came from rural area 70.4% (n=100). This is explained by the current geographic distribution of the population as shown by the latest health epidemiological survey in Rwanda where 83% of the population leave in rural areas[11] and where the majority rely on agriculture. These patients need affordable medical care at a price as cheap as possible

The relative frequency of RTC as a major cause of TBI is variable in East and Central Africa where assaults constitute the leading cause of traumatic brain injury in most regional countries such as Uganda with more than 50% of head injuries resulting from assaults[12]. By contrast in Zimbabwe, 72% of all RTC casualties have TBI[14]. In West Africa assaults account for less than 10% of TBI and occur mostly in males as opposed to females in East Africa[10]. We did not find a statistically significant difference in traumatic brain injury or spinal trauma following assaults between males and females (P=0.410), (P=0.067).

Traumatic brain injury accounted for 49.3% of all neurosurgical admissions. The incidence is close to 40% observed in other developing countries. Head Injury incidence ranges from 20% in Kenya[15] through 25% in Uganda[12] and 30% in Zambia[16]. The high incidence among our population is probably due to the absence of protecting measures (helmets) among bicycles riders who constituted a significant part of our patients. Whereas all patients admitted at emergency for TBI in all hospitals of Yaoundé between 1999 and 2004 benefited from a CT scan[17] only 9 (12%) of patients in our study with TBI afforded the CT scan. A study of the

radiological evaluation of minor head injury done at CHUK indicates that CT scans were only done in 10% of TBI[12]. The management figures obtained showing that conservative treatment in TBI was carried out in 51 (68%) patients, surgery required in 24 (32%), are identical to those found by Raja[18] et al. in Pakistan; though elevation of depressed skull fractures were less commonly performed in our study with 37.93% of cranial and intracranial procedures compared to 50% of depressed fractures in Pakistan series and craniotomy done in 76.7% [18].

Infantile hydrocephalus

Whereas in East and Central African countries this surgery has made landmark and significantly contributed to neurological surgery[10], many things need to be done in our hospital where only 1 revision of VPS has been performed because of unavailability of shunts and diagnosed hydrocephalus are sent to a missionary health centre or to King Faisal Hospital a teaching hospital in Kigali.

Spinal disorders

Spinal trauma was the commonest spinal disorder constituting 23.7% of all neurosurgical cases and 32.43% of all neurological injuries. On the other hand spondylosis was the commonest ailment found in a prospective study of patients who underwent spine radiography at Nyeri Provincial Hospital in Kenya[10]. Spinal surgery was found to be the most frequently performed operation at the frequency of 30.26% (n=46). This data is similar to that published by Deyo in the New England Journal of Medicine[8].

Although recent studies have shown a limited intracranial haematomas predicting value of standard X-rays[12], the common method of investigation at Butare was X-ray in 86.8% of all patients. CT scan, which is available only in at King Faisal Hospital in Kigali, was performed in only 9 (12%) of our patients with traumatic brain injury.

Prcticing neurosurgery in a setting with limited facilities is challrnging.. In developing countries it is a widespread phenomenon that university hospitals are neglected at the expense of privately run institutions. This can discourage surgeons who tend to leave for more equipped centres abandoning the poor population to the mercy of their own fate.

Conclusion

Although the study period was short, this descriptive study has given us an idea about the current spectrum of neurosurgical conditions in Rwanda. The study has shown that neurosurgical conditions are common disorders requiring neurosurgical interventions. Traumatic brain injury was the commonest neurosurgical condition. Most cases had minor head injury. Good outcome in head injury is inversely related to the severity of injury at admission. Standard X-ray was the only method of investigation available at Butare University Teaching hospital. The duration of hospital stay was long among patients with spinal trauma compared to those patients with traumatic brain injury. This study also shows that neurosurgery is not a privilege of five star hospitals that can afford costly gadgets; instead good neurosurgery for our disenfranchised people can be done even with very limited conditions and with acceptable results. Policy makers ought to provide basic facities necessary for neurosurgery and have to train nationals to become neurosurgeons.

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