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AGE RELATED PATTERN AND OUTCOME OF HEAD INJURY IN INDIGENOUS AFRICA

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ABSTRACT

Background: Most studies of patients with head injury managed outside of indigenous Africa have shown poorer outcome with increasing age, but data on this subject is scanty in this part of the world.

Aim: To determine age related pattern and outcome of head injury in an indigenous African setting.

Methods: A retrospective analysis of clinical characteristics, mechanism of head injury, associated injury, trauma scores and outcome in patients admitted for head injury at the University Teaching Hospital, Ilorin, Nigeria, between 1989 and 1999.

Results: The 648 patients comprised of 39 older subjects (= 60 yrs), 357 adults (17-59 yrs) and 252 children (= 16 yrs). They were aged 1 to 105 years (mean = 37years). Road traffic injury was the commonest cause of trauma to the head. Children were most often injured as pedestrians while adults and older patients were more often victims of passenger vehicular accidents. Older patients had the poorest outcome with a mortality rate of 48.7%. They were more prone to severe head injury (41.0%) and multi-system trauma (51.3%), with higher mean injury severity scores and lower probability of survival than younger patients. Outcome was predictable by age and GCS (p=0.0206 & 0.0000) in all age groups put together and in children while GCS was a predictor in adults (p =0.0000), and none of the variables could predict outcome in the older patients.

Conclusion: The study reaffirms that outcome of head injury worsens with advancing age and indicates that severity of head injury and higher frequency of multi-system trauma may contribute to worse outcome in older patients.

Key Words: Head Injury, Pattern, Outcome, Age *(Accepted 7 August 2007)*

INTRODUCTION

In spite of the formidable role played by North Africa in the development of neurosurgery world wide, during the Pharaoh era, many African countries still lag behind in the growth of neurosurgical services[1]. All over sub-Saharan African there is a dearth of neurosurgical services with some countries not having a single Neurosurgeon[1]. There are today, 500 neurosurgeons in Africa to a population of about half a billion, a ratio of one neurosurgeon to 1,350,000 inhabitants[2]. Of these, only 12 are serving a population of 126 million Nigerians, (one neurosurgeon to over 10 million inhabitants) in major Teaching hospitals including the first center which was established at the University College Hospital, Ibadan, on the 25th of October 1962, by the Africa's first black Neurosurgeon. Because of lack of neurosurgical facilities and manpower, most head injured patients admitted during the period (1989-1999), before the birth of a neurosurgical unit in October 2000, were managed non-operatively by non-neurosurgeons.

Several previous reports of outcome in head injured patients managed both operatively and non-operatively, in well equipped neurosurgical centers outside indigenous Africa, have consistently shown an increase in mortality rate with advancing age[4, 5]. The study was focused at determining age related variation in the pattern and outcome of non-penetrating head injury, in an African setting.

PATIENTS AND METHODS

In a retrospective analysis, 648 consecutive patients satisfying the study criteria, who required admission for mild to severe head injury, were studied. These were drawn out of 756 patients managed during the period, the remainder lacked sufficient data and were excluded from analysis. They were categorized into children aged 16 years or less, adults between 17 and

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59 years and older patients aged 60 years and above. Data extracted from patients' case notes and analyzed include patient demographics, mechanism of head injury, associated injuries, clinical and neurological findings, and outcome at 6 months post injury, discharge or death whichever occurred first. Head injury was classified as mild (GCS=13 -15), moderate (GCS=9 -12) or severe (GCS=3 -8), using Glasgow coma scale (GCS).[6] The scale was modified for illiterate children less than three years old[7]. Outcome of head injury was categorized into good recovery, moderate disability, severe disability, persistent vegetative state, and dead according to the Glasgow outcome scale (GOS).[8] Patients with insufficient data, penetrating gun shot injuries, brain death, and mild head injury requiring only outpatient care, were excluded from analysis. The patients were managed with intravenous fluid therapy, maintenance of airway patency, oxygen delivery by face mask, suture of scalp lacerations, mannitol (10-20%), analgesics and antibiotics as indicated. Plain skull radiographs were mandatory for all patients, though the result did not alter the mode of management.

RESULTS

The 648 patients comprised of 252 (39%) children, 357 (55.0%) adults, and 39 (6%) older patients (Table 1), aged 1 to 105 years (mean=37 years). In all age groups, males were more frequently head injured than females (Fig.1); the children were 163 males and 89 females (ratio 2:1), adults were 267 males and 90 females (ratio 3.2:1) while older patients comprised of 30 males and 9 females (ratio 3:1).

The most common cause of head injury in the entire population was road traffic accident occurring in 481(74.2%) victims (Table 1). Miscellaneous mechanisms were falls from height (18%), non-penetrating assaults (5.1%), and domestic injury

FIGURE LEGEND

Fig. 1: Age and sex distribution in 648 patients with closed head injury

Fig.2: Mortality rate versus advancing age (in decades) in 648 patients with closed head injury.

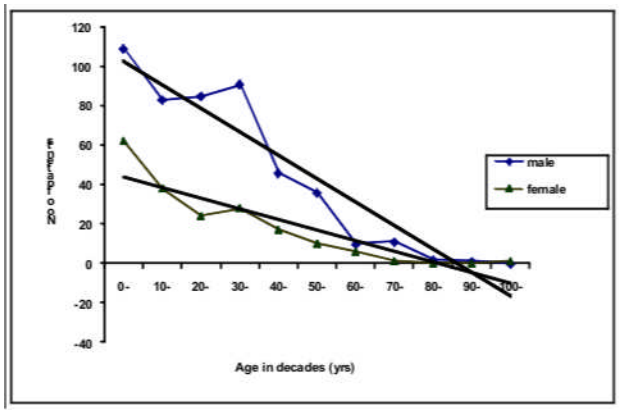

Fig. 1: **Age and Sex Distribution in 648 Patients with Closed Head Injury**

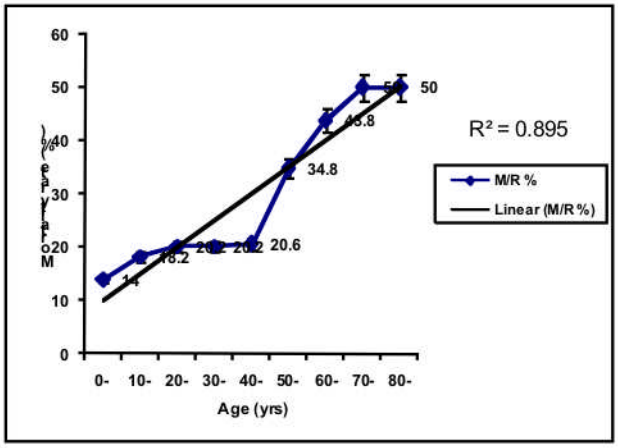

Fig. 2: Mortality Rate versus Advancing Age (in Decades) in 648 Patients with Closed Head Injury.

Table 1: Mechanism of Injury According To Age Group in 648 Patients with Closed Head Trauma

Mechanism		Age Group (yrs) =16		17 - 59		≥ 60		Total
		No	%	No	%	No	%	
Road Traffic	Occupant	32	12.7	215	60.2	16	41.0	263
Injury	Pedestrian	105	41.7	57	16.0	13	33.3	175
	Cyclist	17	6.8	23	6.4	3	7.6	43
Fall From Height		85	33.7	25	7.0	6	15.4	116
Domestic Injury		10	3.9	5	1.4	0	0	15
Non-Penetrating Assaults		1	0.4	31	8.6	1	2.6	33
Sporting		2	0.8	1	0.3	0	0	3
Total		**252**	**100**	**357**	**100**	**39**	**100**	**648**

Table 2: **Mean Trauma Scores According To Age Group in Head Injured Patients with Multiple Injuries**

Type of Trauma Score	Mean Trauma Scores According To Age Group		
	0- 16 yrs	17-59 yrs	≥ 60 yrs
Injury Severity Score (ISS)	9±4	15±6	20±9
Revised Trauma Score (RTS)	7.3±3.1	6.9±2.2	4.1±1.8
Trauma and Injury Severity Score (TRISS)	95%	88%	65%

Table 3: **Age Related Outcome of Closed Head Injury According To Glasgow Outcome Scale**[8]

	Age (yrs)							
	0- 16		17-59		≥ 60		Overall	
Outcome	No	Percent	No	Percent	No	Percent	No	Percent
Good Recovery	188	74.6	253	70.9	12	30.8	453	70
Moderate Disability	10	4.0	10	2.8	2	5.1	22	3.4
Severe Disability	7	2.8	9	2.5	4	10.3	20	3.1
Vegetative Survival	3	1.2	5	1.4	2	5.1	10	1.5
Death	44	17.5	80	22.4	19	48.7	143	22
Total	**252**	**100**	**357**	**100**	**39**	**100**	**648**	**100**

Table 4: **Trauma Scores and Outcome Determinants with Respective P-Values in Patients with Closed Head Injury**

Outcome Determinants	Children	Adults	Older Patients	All Age Groups Combined
	p-Values	*p-Values*	*p-Values*	*p-Values*
Age	0.0206*	0. 289	0.353	0.0000*
GOS	0.0000*	0.0000*	0.305	0.0000*
Sex	0.338	0.242	0.695	0.0760

Indicates significant *p-values

(2.3%). The traffic related injuries involved 263 (55%) passengers, 175 (17.5%) pedestrians and 43 (3.5%) cyclists (Table 1). The commonest mechanism of injury in children was pedestrian traffic accident (41%), followed by fall from height (33.7%), while passenger vehicular injury constituted the most frequent cause in adults (60.2%) and older subjects. (41%) (Table 1)

In 215 (33.1%) patients, associated injuries involved bones of the extremities (21.7%), facio-maxillary region (7%), spine (2.6%), abdomen (1.1%) and the chest (0.7%). Multi-system trauma was more frequent in older patients (51.3%) than in adults (43.4%) and children (40%) and the respective median injury severity scores for each age group was highest (20±9) while the mean revised trauma score and the mean probability of survival (TRISS) were lowest in older patients (Table 2).

The Glasgow outcome data according to age (Table 3) revealed an overall mortality rate of 22% while 1.5% of the patients survived in a vegetative condition. The mortality rate by age groups increased significantly with age from 17.5% in children to 22.4% in adults and 48.7% in older patients. Fig. 2 further illustrates the rise in mortality rate across age groups in decades with a high coefficient of determination (R2=0.89). In these fatal cases the mean GCS at admission for each age group was higher in older patients (6.3) than in adults (5.5) and children (4). Vegetative survival, but not severe disability also increased with advancing age.

In all age groups combined and in children, age ($p = 0.0000$ & 0.0206 respectively) and GCS ($p = 0.0000$ & 0.0000 respectively) influenced outcome significantly. In adults only GCS could determine outcome ($p=0.0000$), while considering older subjects in isolation, none of these variables influenced outcome ($p>0.05$) (Table 4).

DISCUSSION

The results of this study like most studies of head injury in adults have clearly shown poorer outcome

in patients with increasing age. 4,5,12 The causes of adverse effect of old age on outcome remain obscure and speculative, and it is not certain whether a more aggressive approach to head injury management could mask or eliminate this relationship, since patients managed by non-neurosurgeons in a developing country like ours had the same age-outcome relationship as those managed in better equipped neurosurgical centers outside indigenous Africa. The overall mortality rate of 22 % from head injury in this study, compares favorably with rates elsewhere12, and the higher mortality rate (48.7%) in older patients (constituting 6% of the sample) which was thrice that of children (17.5%) and twice that of adults (22.4%) corroborates with previous findings from outside this domain.12

To eliminate the deleterious effect of age on outcome, factors responsible for this must be identified. The quest for these factors has lead to speculations about the reasons for worse outcome in older patients. Theoretically, morbidity and mortality rates associated with head injury may be higher in older-age groups because the older patient, as a manifestation of aging process, is less able to survive less and recover from the effects of equally severe trauma or more predisposed to developing systemic complications of head injury.[4] On the other hand, the more frequent pre-existing systemic diseases associated with old age and age-related biological differences in the response to injury may produce worse responses to trauma. It is also possible that the older patient experiences injuries of greater severity or lethality than younger age groups.[4] Moreover, this study has identified severity of head injury and multi-system trauma as factors that may contribute to poorer outcome in older patients in our center. In our setting, head injury was more frequently severe in the elderly, probably because of undetected intra-cranial haematomas which are known to be more common in older patients and are associated with poorer prognosis.[13] Patients who are middle aged or older are at a particular risk for traumatic intracranial haematomas even if their GCS score is high,[14] thus explaining why the mean admission coma score, (6.7) in elderly non-survivors, was higher than those in younger patients; suggesting that the older patients tolerated head injury less well.

That multiple injuries were more frequent in older than younger patients in this study contradicts the view of Black et al[7], who opined that multiple system trauma may be more common in children because they are small. In Nigeria, most small children are tied to the backs of their mothers while in passenger vehicles and this offers additional protection against multiple injuries. However, the frail older patients are more prone to suffer multiple traumas because of bony degenerative changes accompanying advancing age.

That children fared better than the older victims of head injury in this study corroborates previous findings.[12, 13, 14] More favorable outcome in children reflects not only the peculiar response of the child's brain to trauma but also the difference in causal factors and type of predominant pathologic changes typical of this age group.[15] In children, head injury becomes fatal only if cranio-cerebral trauma is very serious and coarse with diffuse lesions occurring in the whole brain.[16] In older patients, a fatal outcome may occur not only in a severe but also in a relatively mild trauma probably because of pathological reactions on the part of the cardiovascular and other systems of the patient.[16]

More recently, a study of trauma in the elderly revealed that age alone accounts for little of the variance in outcome in patients in the intensive care units; and that it is the underlying patho-physiology that is the main determinant.17 It is therefore of great importance to detect and correct physiological and metabolic complications of head injury early enough in order to maximize survival.17

CONCLUSION

The study reaffirms that outcome of head injury worsens with advancing age and indicates that severity of head injury and higher frequency of multi-system trauma may contribute to worse outcome in older patients.

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