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Mortality in childhood head injury in Ibadan

M.T. SHOKUNBI* and B.A. SOLAGBERU

Neurosurgery Unit, Department of Surgery, University College Hospital, Ibadan, Nigeria.

Summary

The clinical records of patients who were 15 years and younger and who attended our casualty department between July 1989 and June 1990 because of head injury were retrospectively analysed in order to determine the mortality rate and evaluate the management of the patients prior to death.

One hundred and sixty such patients were identified. They comprised 5.7% of the 2,812 children and 2% of all patients seen during this period. There were 20 deaths in this group, giving a mortality of 12.5%. This rate was greater than that for all patients in this age group (1.3%) and all age groups (1.2%) of patients attending the casualty department during this period. Whereas, children with head injury comprised 2% (160/8,192) of all patients, the deaths in this group comprised 19% (10/107) of all deaths in casualty during this period.

Of the 12 patients for whom case records were available, 8 were seen elsewhere before referral. Four patients talked prior to death, suggesting the existence of a treatable mass lesion, while 8 patients were in coma from the onset of head injury to the time of death. Airway management was inadequate in all the patients. The interval to death was less than 2 hours in 7 patients. Only 4 of the patients were evaluated by the neurosurgical service prior to death.

These observations suggest that: (1) head injury is a cause of high mortality among children attending our casualty department; (2) there are preventable factors contributing to death.

Résumé

Les dossiers cliniques des patients agés de 15 ans et moins qui ont fréquenté le département des accidentés entre les mois de Juillet 1989 et de Juin 1990 et présentant de lesions de cerveaux ont été analysés rétrospectivement afin de déterminer le taux de mortalité et d'évaluer les soins des patients avant le déces. Ont été identifiés 160 patients; y compris 5.7% d'un total de 2,812 enfants et 2% de tous les patients qui se sont présentés pendant cette péeiode. Il y avait 20 déces parmi ce groupe, soit une mortalité de 12.5%. Ce taux est plus élevé que celui de tous les patients de ce groupe d'âge (soit 1.3%) et celui de tous les groupes d'âge (1.2%) des patients qui fréquentaient le département des accidentés pendant cette période. Bien que les enfants souffrant des blessures de tête constituent 2% de tous les patients (160/8,192), la mortalité de ce groupe constitue 19% de tous les déces du département (10/107) pendant la période.

Parmi les 12 patients dont nous avons les dossiers médicaux, 8 patients ont visité d'autres hôpitaux auparavant, 4 patients ont parlé avant leur déces, preuve de la présence d'une lésion de masse traitable tandis que 8 patients étaient en coma depuis leur accident jusqu'à la mort. Chez tous les patients le soin de voie d'air était inadéquat. Le passage à la mort était moins de 2 heures chez 7 patients. Pas plus de 4 patients ont été évalués par le service neuro-chirugical avant la mort.

Ces observations suggèrent: 1. La lésion de cerveau est une cause de mortalité elevée chez les enfants qui viennent au département des accidentés. 2. D'autres facteurs évitables contribuent à la mortalité.

Introduction

It is often difficult to ascertain the true mortality rate from head injury in a given population. Minor head injuries may not be reported to the hospital; some of those that do may be overlooked, and patients with severe head injury resulting in death prior to reaching the hospital are easily omitted from the rate equation[1]. Nevertheless, in a community, the mortality rate from head injury is a useful index of the quality of care available to such patients.

In two previous studies[2-3] from our centre over different time frames, a mortality rate of 2% was reported for children younger than 16 years who sustained head injury. The study population were

* Correspondence: Dr. M.T. Shokunbi, Neurosurgery Unit, Department of Surgery, University College Hospital, Ibadan, Nigeria.

derived from patients referred to the neurosurgical service so that these figures may actually under-estimate the true situation.

Certain factors such as intracranial mass lesions, severe systemic injuries and alcoholism predispose to a high mortality rate in head injury. They are less frequently present in children who therefore enjoy a better outlook than adults following head injury, even when such injury is severe[4,5,6]. However, the initial non-surgical management of these children is vital to outcome. In this study we have determined the mortality rate among children with head injury presenting to our casualty department and have analysed the management of the fatal cases up to the time of death.

Patients and methods

The medical records of the casualty department of our hospital covering the time period between July 1989 and June 1990 were examined in order to obtain information on total attendance, patients with head injury, total deaths and deaths from head injury. The case records of patients 15 years and younger who died following head injury were examined to determine the cause of the head injury, the source of referral to the department, the severity of the head injury, the care received up to the time of death, the interval to neurosurgical consultation, the interval to death, and the occurrence of associated injuries.

Results

During the period under review, 2,812 children under the age of 16 attended the department, and constituted 39% of the total (8,192) attenders. There were 160 children in whom a diagnosis of head injury had been made, approximately 42% of the total number (373) of patients with head injury. Twenty (12.5%) of the head injured children died. The head injury mortality rate in these children was similar to the overall mortality rate (12%) in all head-injured patients but was much in excess of the mortality rate (1.3%) in all attenders and that (1.3%) in all children attending the casualty department (Table 1). Whereas children with head injury comprised approximately 2% (160/8192) of the patients attending casualty. The deaths among them comprised 19% (20/107) of all the deaths during the period of study. The mean age of the 20 children who died was 6.5 years with a range of 2 to 12 years. The mean age of children in this study group was 6.8 years, with a range of 2 months to 15 years. The distribution of the fatal cases according to age group is summarized in table 2. This shows a clustering of deaths in the early and later parts of the age group studied. The male to female ratio among the fatal cases was 3 to 1. The case notes of 12 of the fatal cases were available for review. The rest of the analysis is based on these patients.

Table 1: Mortality rates in patients attending the casualty department

	No. of patients		%	
Group	Total	Deaths	Mortality	*P value
Children with HI	160	20	12.5	
all patients with HI	373	45	12.0	
all children	2812	38	1.3	< 0.001
all patients	8192	107	1.3	< 0.001

HI = head injury

* in comparison with the rate in children with head injury.

Table 2: The distribution of patients and mortality according to age

	No. of patients		
Age (yrs)	Total	Deaths	(% of total)
< 6	65	11	(16.9)
7-11	53	1	(1.9)
12-15	42	8	(19.0)

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Causes of head injury

Nine patients suffered head injury as pedestrians in vehicular accidents while the remaining 3 patients sustained falls from storey buildings.

Clinical course

In all the patients, there was an immediate loss of consciousness following the impact. Four patients recovered and talked prior to deterioration and death. The remaining 8 patients were in coma throughout their clinical course to the time of death. Four patients were brought directly to the department from the site of the accident. The others were evaluated at other health care facilities prior to transfer. A diagnosis of head injury was made in only four of these referred patients. The remaining four were simply transferred as cases of road traffic accidents. Among the referred patients, resuscitation was limited to the establishment of an intravenous line and fluid administration.

On arrival in the casualty department, resuscitation was continued but was judged inadequate in many of the patients. In 2 patients, an intravenous line was not established and fluids were therefore not administered prior to death. In one of these patients, a haemothorax was proven by thoracenthesis. Two additional patients were recognized as being in shock and requiring blood transfusion. The patients were not transfused prior to death.

Endotracheal intubation as a means of airway management was the exception rather than the rule in these patients. The majority of the patients, ten of them, were managed using an oropharyngeal airway. All the patients received supplemental oxygen and were ventilated with an AMBU bag. Six patients were referred to the neurosurgical service. Two of them died without being evaluated by the service. The additional treatment offered by the service were the administration of intravenous mannitol and application of cervical collar. Of the four patients seen by the neurosurgical service, two were suspected of harbouring a surgically treatable lesion, an extradural haematoma, but were not explored. One of these two patients was first evaluated by the service during the process of resuscitation, which was unsuccessful and the other succumbed during preparation for surgical intervention. In table 3, we list the interval from arrival to death and the factors judged to have contributed to death in each patient, where such could be identified. The interval between arrival and death was short (one hour or less) in the majority of the patierts. In ten patients, a treatable and/or avoidable complication of head injury suspected of leading to death was identified. Some of these factors were extracranial.

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Table 3: The intervals to death and the factors judged to have contributed to mortality

Patient no.	Interval from arrival to death (hrs)	Avoidable factor
1. *	1/2	Not known
2. *	1	Penetrating HI, ICH?
3. *+	16	ICH?
4. *+	35	Seizures
5. *+	35	Compound fracture of femur, sepsis.
6. *+	1/2	ICH?
7.	3/4	Large frontal depressed fracture, fractured femur.
8.	1/2	Hypovolaemia
9.	1/2	Aspiration of blood
10.	3/4	Haemathorax, hypovolaemia.
11.	3	Not known.
12.	48	Septicaemia seizures

* The approximate time of injury was recorded for these patients; the intervals to arrival in our centre were 1/2, 1, 24, 1, 1/2 and 2 hrs respectively.
+ Patients evaluated by the neurosurgical service
HI — Head Injury
ICH — Intracranial Haemorrhage

Discussion

Additional extracranial injuries may be present in up to half of the patients with severe head injury[7] and may contribute to mortality through a compromise of cardiorespiratory and haemodynamic functions. It has been shown that mortality can be reduced substantially if patients are resuscitated early enough (particularly in the field), if surgically treatable lesions are identified promptly and dealt with, and if elevated intracranial pressure is treated aggressively [8,9]. In children, a favourable outcome is often possible following severe head injury, so that reducing mortality becomes even more worthwhile.

The need for prompt treatment of surgical lesions usually compels primary physicians to transfer patients immediately to a neurosurgical unit. In the enthusiasm to accomplish this goal, patients with head injury may not have been sufficiently stabilized haemodynamically. The value of this policy of rapid transfer has recently been challenged. In a prospective study of 400 consecutive patients, 33% of whom suffered severe head injury, a delay in admission to a specialized centre due to initial evaluation and stabilization elsewhere was not found to increase mortality[10]. Furthermore, in a trans-national collaborative study of severe head injury in three countries, the variation in the interval between injury and neurosurgical evaluation inherent in the differing referral patterns did not result in any significant differences between the head injury mortality rates of the participating countries[11].

In our practice setting, an established system of rapid evacuation of patients with head injury from the site of the accident is lacking. It is vital therefore for primary physicians to commence airway and circulatory care prior to transfer. It is evident from our data that resuscitation was frequently overlooked in the process of rapidly transferring the patient to our centre. The care provided on arrival in the department was examined by studying the hospital activity analysis charts. Although the records clearly showed that resuscitation was attempted in every case, it was neither systematized nor sufficiently aggressive.

It was instructive to learn that majority of the patients died without being evaluated by the neurosurgical team when indeed the ostensible reason for referral was to have evaluation for suspected surgically treatable lesions. This observation underscores the need to specify the population being studied when discussing head injury mortality, and illustrates the sort of error to which mortality rates are liable when calculated from cases seen by a neurosurgical service.

Severe diffuse axonal injury and traumatic brainstem transection, lesions from which recovery is unlikely and for which there is at present no treatment can be regarded as injuries leading to unavoidable death. A confirmation of these diagnoses requires a detailed postmortem examination of the brain. Such is also required for detecting missed surgical lesions[12]. Unfortunately the autopsy findings for these patients are not available and as such the diagnosis of intracranial haematoma in patients 2,3 and 6 is merely a clinical suspicion. However, because two of these three patients talked and then deteriorated, the likelihood that they harboured a surgical lesion is high[13].

Our data suggests that the mortality rate in children with head injury can be reduced by improving our resuscitation of these patients and treatment of elevated intracranial pressure. Although the latter is usually the responsibility of the specialist centre, it need not be exclusively so. It is generally accepted that for optimal use of osmotic diuretics in lowering intracranial pressure (ICP), monitoring of the latter is required. However, mannitol can be administered intravenously without an ICP line and may be used during the initial resuscitation prior to transfer. This measure together with airway maintenance and ventilatory assistance when required will buy the patient sufficient time to permit evaluation by the specialist team. Furthermore, a computerized tomographic scanner has become fully operational in our centre since the period covered by this review. This should contribute to the reduction of mortality by early detection of surgical lesions.

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