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The ICU Outcome of Head Injury in Basrah, Iraq

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Abstract. A prospective study was carried out on 60 acutely head-injured patients admitted to the Intensive Care Unit at Basrah Teaching Hospital, Basrah, Iraq. The study assessed parameters that may affect the outcome of the patients, including age, sex, time & mode of injury, clinical state on admission, and management. Of the 60 patients, 22 died, 7 had some degree of disability, and 31 recovered fully. Significantly good results were obtained in younger age groups of either sex, in those received within the first 4 hours following injury, in those who sustained shell and gunshot wounds, and in those who experienced a fall from height, in those with Glasgow Coma Scale of 11–15, in those with depressed fracture with or without penetrating injury in comparison with basilar fracture, and in those with intracerebral hematoma in contrast with acute subdural hematoma. The most common cause of death was intracranial hematoma.

Introduction

The management of head-injured patients comprises a major part of the work of the Intensive Care Unit (ICU) in Basrah Teaching Hospital, which serves the southern area of Iraq and provides care for a population of nearly 2 million people.

The prediction of the outcome following head injury is an area of intense interest. As the salvage rate from severe injuries had improved, it has become increasingly important to try to identify those factors that will predict either a good recovery or an adverse outcome.

The head-injured patients who were admitted to the ICU included those who were seriously ill on admission to the hospital, those whose condition deteriorated in the neurosurgical unit, and those who needed continued monitoring, especially following neurosurgery [1].

Because the major factors causing death after severe head injury are intracranial hematoma, cerebral hypoxia, and brain edema [2], the goals of treatment were early protection of airway, early diagnosis and treatment of intracerebral hematoma, prevention of hypoxia and hypercapnia, and reduction of cerebral edema [3].

The aims of this clinical study were to define the special groups who are vulnerable to head injury, to assess the number and nature of morbidity and mortality of head-injured cases admitted to the ICU, to estimate the factors that influence and determine the outcome of those patients, and to evaluate our routine management.

Patients and Methods

All head-injured patients who were admitted to the ICU were included in this study. A total of 60 patients were collected between January 1995 and 1995. The patients and their companions were questioned. Personal data, time and mode of injury, clinical state on admission, management, final outcome and cause of death were recorded.

Head-injured patients were received in the ICU from three sources: directly from the outpatient department, from the neurosurgical unit, and from the theater following neurosurgery.

Once the patient arrived at the ICU, a careful history was taken and a thorough clinical examination was done. Those patients who had significant alteration of consciousness or were deeply comatose were managed with urgent care of the oropharyngeal airway, and/or endotracheal tube with or without artificial ventilation. Oxygen–air mixture, Foley's catheter, and nasogastric tube feeding was provided when necessary. All patients had A–P and lateral skull X ray, complete blood count, and prophylactic antibiotics. Monitoring devices were set, but unfortunately there were no facilities for computed tomography (CT) scan and (ICP) monitoring. The progress of the patients' clinical signs and investigations was used to determine if surgery was indicated.

The final results of the patients were death, disability in its different degrees (mild, moderate, vegetative), or

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complete recovery. All surviving patients were sent to the neurosurgical unit.

Data were analyzed statistically to test the significance of each factor affecting the outcome, using standard normal deviate test (SND test).

Results

Of the 60 head-injured patients admitted to the ICU, 22 patients died, 7 had different grades of disability, and 31 patients recovered fully. The ICU stay period ranged from a few hours to 15 days, with a mean of 3.7 ± 3.2 days.

Age range was 3–55 years. Most of the cases were in younger age groups (Fig. 1); only 18.3% of the cases were older than 40 years. Results were better among younger age groups than among those older than 40 years, with a highly significant difference in the death rate. In those older than 40 years, there was 63.6% death rate, while in those younger than 20 years, only 28.6% died.

Regarding sex, 9 patients were females and 51 were males. There were no significant differences between males and females in regard to the outcome as demonstrated in Fig. 2. No females had disability in this sample.

Figure 3 shows that most patients were received in the ICU within the first 4 hours of the injury. A highly significant difference in the outcome was noticed, as 81.8% of those who died were received after 4 hours following the accident, and 79.4% of those with good outcome were received within the first 4 hours.

The most common causes of head injury were road traffic accident (RTA), fall from height, and assault (Fig. 4). RTA showed significant death rate (62.5%) compared with other causes. The highest normal outcome was found in shell injury (66.6%), fall from height (64.3%), and gun shot wounds (60%).

Regarding Glasgow Coma Scale (GCS), most of the head-injured patients admitted to the ICU had a scale of 11–15 (31 out of 60); 17 out of 60 patients had a scale of 3–5 (Fig. 5). Those with a scale of 3–5 had a significant rate of death (82.3%), while those with a scale of 11–15 had a significant rate of normal outcome (87.1%).

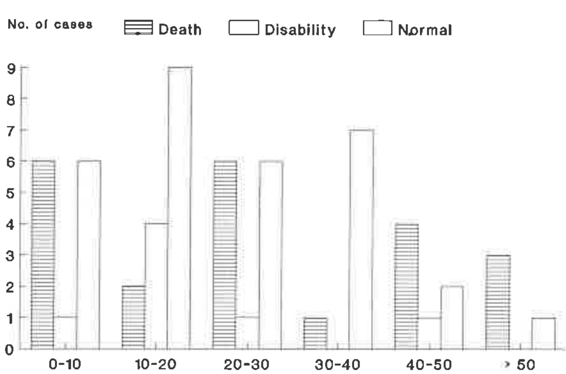

Fig. 1. Relation of age to outcome.

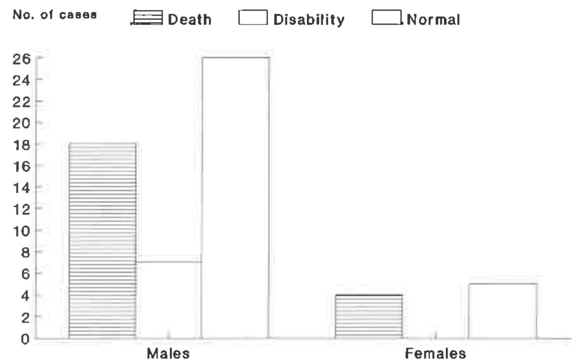

Fig. 2. Relation of sex to outcome.

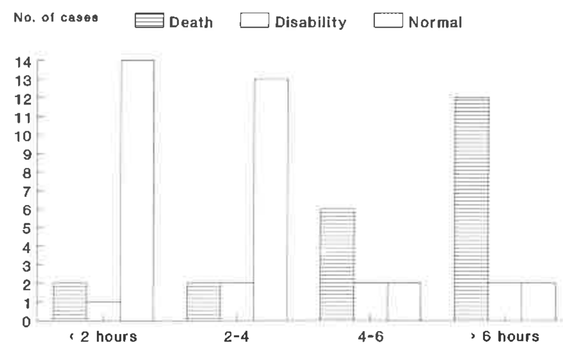

Fig. 3. Relation of time elapsed between injury and admission to outcome.

The X ray findings were positive in 80% of the cases (Fig. 6), with a highly significant death rate in the basilar fracture of the skull (75%), and a high normal outcome in the depressed fracture (66.7%) and depressed with penetrating injury (54.5%).

Figure 7 shows that the most fatal type of hematoma confirmed by surgery was the subdural hematoma (highly

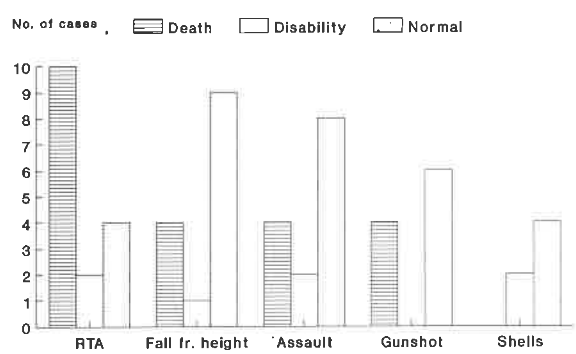

Fig. 4. Relation of mechanism of injury to outcome.

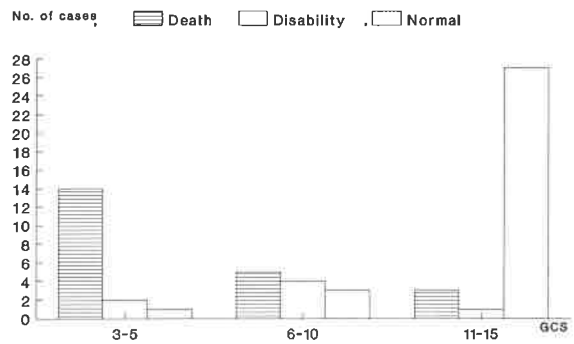

Fig. 5. Relation of Glasgow Coma Scale on admission to outcome.

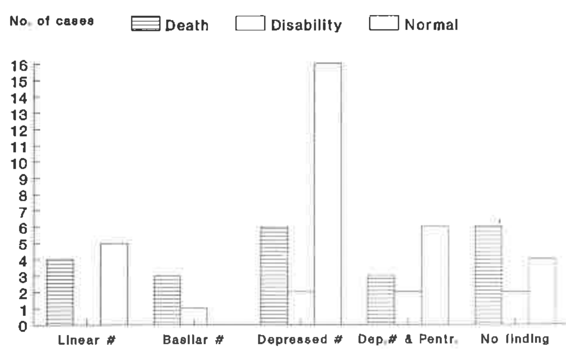

Fig. 6. Relation of X ray findings to outcome.

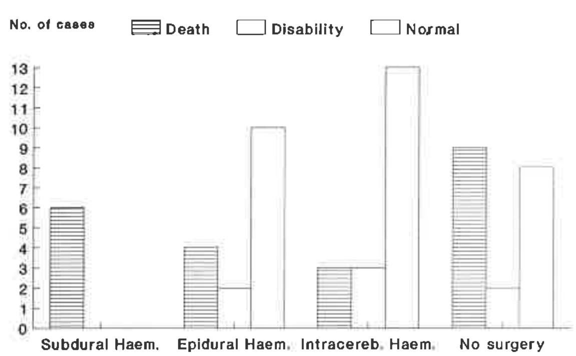

Fig. 7. Relation of operative finding to outcome.

significant; 100% death), and the type of hematoma that carried a high normal outcome was the intracerebral hematoma (68.4%).

The frequency and percentage of the clinical signs on admission to the ICU are demonstrated in Table 1. All the patients who had associated injuries died. Table 2 shows the type of treatment received in the ICU; it also shows that 68.3% of the patients underwent surgery in the form of Burr holes or craniectomy.

The most common cause of death of head-injured patients in the ICU was the intracranial hematoma (63.6%), followed by brain edema (18.1% of those who died) as shown in Table 3.

Table 1. Clinical picture of the patients on admission to the ICU

Clinical picture on admission	No. of patients	Percentage
Fits	5	8.3
Hypotension	1	1.6
Tachycardia	4	6.6
Tachypnea	9	15.0
Abnormal pupil reaction	16	26.6
Abnormal corneal reflex	13	21.6
Constricted pupil <3 mm	7	11.6
Dilated pupil >3 mm	10	16.6
Battle's sign	1	1.6
Raccoon eye	5	8.3
Otorrhea	2	3.3
Rhinorrhea	2	3.3
Otorrhagia	1	1.6
Combined leak	4	6.6
Optic nerve injury	1	1.6
Abducent nerve injury	2	3.3
Facial nerve injury	2	3.3
Combined 3, 4, and 6 nerve injuries	1	1.6
Hemiparesis	4	6.6
Associated injuries:		
Fracture femur	1	1.6
Eye laceration	1	1.6
Colon injury	1	1.6

Table 2. Types of treatment

Treatment	No. of patients	Percentage
Nonoperative treatment		
IV fluid	60	100
Antibiotics	60	100
Corticosteroids	15	25
Barbiturates	25	41.6
Mannitol	15	25
Fursemide	4	6.6
Intubation	9	15
Artificial ventilation	6	10
NG tube feeding	18	30
Surgical treatment		
Burr hole	4	6.6
Craniectomy	37	61.6
No surgery	19	31.6

Discussion

One of the major tasks of the intensive care unit is to receive head-injured patients. Although the ICU is misused by the admission of trivial cases, patients with head injury admitted to the ICU are more severe than those admitted to the neurosurgical ward, and most of them require an urgent and skilled management.

In this study, a careful analysis of the factors that may influence the outcome were stressed upon, including age, sex, time, mechanism of injury, clinical presentation, investigations, and management.

In patients suffering head injury, age and severity of

Table 3. Causes of death

Cause of death	No. of patients	Percentage
Intracranial hematoma	14	64
Brain edema	4	18
Brain stem injury	2	9
Meningitis	1	4.5
Respiratory complications	1	4.5
Total death	22	100

injury are predominant factors in determining the outcome [4]. The present study indicates the impression that younger patients generally have a good recovery, and with increasing age, significant recovery from injury was extremely poor: 63.6% of those who were older than 40 years died. However, this study showed that patient's sex had no influence on the outcome.

It has been shown that a delay in the evacuation of a hematoma leads to an increase in the morbidity and mortality of head-injured patients, and a delay of more than two hours may be unacceptable [5]. Our results showed that 81.8% of those who died were received within the first 4 hours, in contrast to the 79.4% survival rate of those who were admitted within 4 hours following the accident.

The magnitude of the problem of road traffic accident (RTA) as a cause of head injury is clear in this study. The high death rate in RTA (62.5%) is mainly attributed to severe injuries following acceleration and deceleration, which are usually associated with a low Glasgow Coma Scale score [6]. It is also known that acceleration injuries are commonly associated with contusions, concussion syndromes, and subdural hematoma [7]. In missile injuries, factors significantly related to brain damage include missile nature, velocity, site of intracranial injury, and the interval between injury and surgical intervention. Hammon reported an operative mortality of 7.6% from fragment wounds, 22.7% from gunshot wounds, and a 10% mortality from wounds of hand guns fired from a distant range [8]. Our results in the ICU showed a higher mortality rate, which can be explained by the fact that patients admitted to the ICU are more critically injured than those who are admitted to the neurosurgical ward.

The Glasgow Coma Scale (GCS) was used as a useful clinical tool for rapid assessment of the patient's eye opening, and verbal and motor responses, and it also permits an early, simple, and accurate prediction of the outcome [9]. This study proves that GCS is a sensitive indicator of the outcome, as 82.3% of those who died had a GCS of 3–5.

All patients admitted to the ICU had A–P and lateral skull X ray routinely, which was the sole neuroradiological investigation in our unit. The occurrence of a high percentage of positive findings in the plain films in this series (80%) reflects the high percentage of severe injuries, as well as the presence of missile injuries.

The highly significant death rate found in patients with basilar skull fracture (75%) was probably due to brain stem injury, or to complications of the fracture such as central spinal fluid rhinorrhea or otorrhea resulting in meningitis.

Depressed fractures of the skull are usually not associated with diffuse brain damage, as they result from a local impact effect, and they were treated surgically by craniectomy and elevation. The associated brain injury was local in form of meninges laceration; brain contusion and laceration; and intracerebral hematoma. This explains the high survival rate (66.7%) of depressed fracture compared with other types of fracture.

The outcome of acute subdural hematoma has been generally unsatisfactory, as the majority of series in the literature reported a mortality of over 50% [10] (all our patients with subdural hematoma died). Factors that influence the mortality in acute subdural hematoma include the age and the initial GCS of the patient [11]. However, Seeling et al. have shown that prompt operation had an important bearing on outcome; patients with functional survival had an operation within 3 hours of their injury, and those who died had an operation on the average 6 hours after the trauma [12].

A mortality of 25–72% had been reported in cases of intracerebral hematoma, which depend on the patient's neurological status at the time of operation.

In spite of our close monitoring with the available tools (Table 1) and the various types of management (Table 2), the death rate in this series was obviously high and the largest number of the patients died because of intracranial hematoma (Table 3). The main reason for this high death rate was the absence of CT scan and ICP monitoring. The absolute dependence on the clinical assessment, including waiting for clear lateralizing signs upon which the surgeon is going to decide about the operation, obviously led to a delay in management, which was reflected in patient outcome.

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