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BRIEF REPORT

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Severe head injury patients in a multidisciplinary ICU: are they a burden?

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Abstract *Objective*: Patients with severe head injury (HI) are often considered to be a burden in a multidisciplinary intensive care unit (ICU). This study was undertaken to compare the severe closed HI patients with all other patients in the ICU in terms of age group involved, stay in the unit, complications and outcome.
Design: Retrospective analysis.
Setting: Multidisciplinary ICU of a tertiary care hospital in Northern India.
Patients and participants: All the patients admitted to the ICU between January 1995 and December 1997. The patients were classified into two groups: group A comprising patients with severe closed HI and group B consisting of all other patients.
Results: The mean age of the patients was around 30 years in both the groups. The average stay of the patients in the unit was 12.71 ± 11.9 days in group A, compared to 9.9 ± 14.4 days for group B ($p < 0.05$). The duration on the ventilator or on an endotracheal airway was not different between the groups ($p > 0.05$). The mortality in group A was 46.8 % and that in group B was 38.5 % ($p > 0.05$). The mortality was directly proportional to the age in group A. Hypotension, renal failure and septicaemia were the commonest complications in both the groups but the difference was not statistically significant.
Conclusions: This study demonstrates that patients with severe HI do not pose an extra burden in a multidisciplinary ICU.

Key words Head injury · Outcome · Prognosis · Age · Intensive care

Introduction

Severe closed head injury (HI) is one of the major causes of morbidity and mortality in patients with trauma [1, 2, 3]. Management in the intensive care unit (ICU) has been shown to improve the ultimate outcome [1, 4]. It is a common belief among medical personnel that HI patients are a burden on hospital resources as they tend to have a greater mortality as well as occupy the ICU beds for a longer time when compared to other patients. This becomes more important in a multidisciplinary ICU, where patients from different specialties have to be accommodated. The scant intensive care resources need to be utilized in an optimal way to benefit the maximum number of patients. This study was undertaken to compare severe closed HI patients with all other ICU patients in terms of age group involved, stay in the ICU, complications and outcome.

Materials and methods

This is a retrospective analysis data of all the patients who were admitted to the ICU of the Postgraduate Institute of Medical Education and Research, Chandigarh between January 1995 and December 1997. The institute is a 1000-bedded tertiary care hospital in

Table 1 Diagnostic categories and number of patients

Diagnosis/Category	Number of patients
Group A	
Extradural haematoma	12
Subdural haematoma	23
Diffuse brain oedema	67
Contusion	45
Intracerebral haemorrhage	14
Others	10
Total	171
Group B	
Guillian Barre syndrome, Other neuro-paralytic disorder	24
Chronic obstructive pulmonary disease, Bronchial asthma	27
Status epilepticus	12
Sepsis and other medical disorders	73
Poisonings other than snake bite	31
Snake bite	31
Bronchopneumonia, Acute respiratory distress syndrome	42
Chest injury/Flail chest, Fat embolism syndrome, Abdominal injury, Polytrauma other than head injury	117
Postoperative neurosurgery other than head injury	59
Postoperative patients – general surgery, urology, orthopaedics, obstetric and gynaecology etc.	129
Total	545

Table 2 Demographic characteristics of the two groups

	Group A	Group B
Number of patients	171	545
% of all ICU admissions	23.9 %	76.1 %
Male : Female	145 (84.8 %) : 26 (15.2 %)	391 (71.7 %) : 154 (28.3 %)
Mean Age ± SD	28.9 ± 15.5	34.2 ± 17.2*

* $p < 0.05$ when compared to Group A

Northern India and caters to the needs of the neighbouring states up to a radius of 500 km. The ICU is a multidisciplinary unit with eight beds and patients from both the medical and surgical specialties are admitted for intensive care. As the hospital also has separate coronary care, cardiothoracic surgical recovery, paediatric intensive care and tetanus care units, patients admitted primarily for treatment for myocardial ischaemia, postoperative cases of cardiothoracic surgery, paediatric medical conditions or tetanus are not admitted here. Although the hospital has general surgical and gynaecological step-down units, the excess patient load leads to some of these patients being admitted to the ICU. A consultant anaesthetist normally controls admissions to the unit. The demand for the ICU beds is almost always much greater than the number available and the average bed occupancy rate is higher than 95 %. The primary admission criteria are the age of the patient, nature of pathology and the availability of bed. Thus, non-availability of bed may mean that a patient who can potentially benefit may be denied intensive care and conversely, availability of bed may lead to admission of a critically ill patient who is less likely to benefit from the care.

The patients were classified into two groups: group A comprising patients with severe closed HI and group B consisting of all other patients. Severe HI was defined as a Glasgow coma scale of 8 or less on admission to the ICU [5]. Group B comprised patients with neuroparalytic disorders, obstructive lung diseases, status epilepticus, septicaemia due to any cause, other medical emergencies, poisonings and snake bites, chest and polytrauma other than HI, postoperative neurosurgery excluding HI and post major surgical procedures excluding cardiothoracic surgery (Table 1). In both the groups patients who died within 6 h of admission were excluded. The length of stay, number of days on the ventilator and duration of tracheal intubation was compared between the groups. The incidence of complications such as hypotension, renal failure, hypoxia and septicaemia was calculated. Hypotension was defined as the need for inotropes to maintain the mean blood pressure above 60 mmHg. Septicaemia was deemed to be present when the blood culture was positive in the presence of fever and leucocytosis. Renal failure was defined as a creatinine value of more than 1.6 mg/dl. Hypoxia was defined as PaO_2 of 60 mmHg or less at a FIO_2 of 0.6 or more.

The mortality in each group was assessed as a whole and in relation to the age of the patients. The results were analysed using Student's t test for comparison of means and chi-square test with Yates correction for proportions.

Results

A total of 716 patients were admitted to the ICU during this period. One hundred seventy-one patients belonged to group A and 545 to group B. There were no cases of penetrating HI during this period. The distribution of patients in groups A and B is shown in Table 1. The demographic characteristics of the two groups are compared in Table 2. The average age of the patients in group A was 28.9 ± 15.5 years as compared to 34.2 ± 17.2 years in group B ($p < 0.05$). Of the patients in group A, 82.5 % were below 40 years of age as opposed to 69.7 % in group B. There were a majority of male patients in both the groups. The average ICU stay was 12.71 ± 11.9 days in group A, compared to 9.9 ± 14.4 days for group B ($p < 0.05$). The percentage of patients with a duration of ICU stay of 3 days or less was 21.6 % ($n = 37$) and 34.1 % ($n = 186$) in group A and group B, respectively ($p > 0.05$). Among the non-survivors in both groups, 30 % in group A and 42.4 % in group B had a length of stay 3 days or less ($p > 0.05$).

All the patients in group A were ventilated mechanically and the mean duration of mechanical ventilation was 8.16 ± 0.69 days. In Group B 474 patients (87 %) needed mechanical ventilation and the mean length of ventilation was 8.0 ± 9.3 days ($p > 0.05$). The mean du-

Table 3 Distribution of patients in various age groups and the relation to mortality

Age Group (years)	Group A – Head injury		Group B – All other patients	
	Total patients	Dead (%)	Total patients	Dead (%)
≤ 10	22	9 (40.9)	35	12 (34.3)
11–20	27	8 (29.6)	77	29 (37.7)
21–30	47	23 (48.9)	146	60 (41.1)
31–40	45	23 (51.1)	122	40 (32.8)
41–50	19	8 (42.1)	80	33 (41.3)
51–60	5	3 (60.0)	48	21 (43.8)
61–70	3	3 (100)	17	8 (47.1)
> 70	3	3 (100)	20	7 (35.0)

Table 4 Incidence of complications in both the groups

Complication	Number of Patients (percent of total)	
	Group A	Group B
Hypotension	75 (43.9 %)	197 (36.1 %)*
Renal failure	23 (13.5 %)	79 (14.5 %)*
Septicaemia	24 (14.0 %)	106 (19.4 %)*
Hypoxia	25 (14.6 %)	116 (21.3 %)**

* $p > 0.05$
** $p = 0.055$

ration on the endotracheal tube for patients in group A was 4.8 ± 3.8 days with the maximum length being 30 days. In Group B 474 patients needed endotracheal intubation (87 %) and the mean duration on the endotracheal tube was 5.3 ± 5.0 days ($p > 0.05$) with a maximum duration of 43 days. Ninety-one of the 171 patients in group A were tracheostomized (53.2 %) and the mean duration of tracheostomy in ICU was 14.6 ± 10.3 days with a maximum of 55 days. In comparison, 158 of the 474 patients in group B were tracheostomized (33.3 %) and the mean duration of tracheostomy in ICU was 15.6 ± 15.7 days ($p > 0.05$) with a maximum of 115 days.

In group A 46.8 % ($n = 80$) of the patients died, while the mortality rate in group B was 38.5 % ($n = 210$; $p = 0.055$). In terms of the mortality in relation to all the ICU deaths, the figure for group A is 27.6 % as opposed to 72.4 % for group B. The outcome in the various age groups is shown in Table 3. In group A, the mortality was directly proportional to the age of the patient. Hypotension, renal failure, septicaemia and hypoxia were the commonest complications in both the groups but there was no significant difference in their incidence (Table 4; $p > 0.05$).

Discussion

Ideally, patients with severe HI should be managed in specialized ICU dedicated to this group of patients, but lack of resources often leads to them being managed in a multidisciplinary ICU. The constant demand for beds means that there needs to be an optimum triage so as to benefit the maximum number of patients in a given time. The fact that HI patients are likely to remain unconscious for a longer period makes prolonged recovery imperative. It is a common view that patients with severe HI are more likely to 'get stuck' in the ICU. At the same time, there are many other medical and surgical disorders, such as Guillain-Barré syndrome and patients with abdominal sepsis, where recovery can take a much longer time. This study was undertaken to assess whether patients with severe HI are really a burden to a multidisciplinary ICU. Severe closed HI patients represented approximately 23.9 % of all ICU admissions, which shows that they did not form the majority of the patients admitted for treatment in this particular unit. The patients admitted to the ICU do not necessarily reflect the hospital admission figures. Only about 20–30 % of the patients with severe head injury who actually require intensive therapy get admitted to the ICU. The fact that the majority of the patients in group A were young should probably justify their admission, although it is difficult to imagine how many survivors with severe head injury are actually able to lead a socially productive life.

Although the duration of ICU stay was longer for patients in group A, the length of time these patients spent on ventilator or with an endotracheal airway was not significantly different from that for group B patients. This might reflect a tendency to keep patients in group A much longer in the ICU due to impaired consciousness. Presently, we do not have any step-down or a high dependency unit, and this leads to the patients being kept longer than optimum. The ICU stay of HI and other patients could be shortened by the creation of such units. The number of patients with an ICU stay of 3 days or less was greater in group B, which might reflect the patients admitted for elective ventilation postoperatively. Although patients with severe HI are more likely to die early, we found that a larger number of patients in Group B died earlier.

The mortality rates in the various recent HI studies have varied from 13.7 % to 41 % [4, 6, 7, 8, 9, 10]. The

relatively higher mortality rate in patients with severe HI in this study means that any further reduction in the mortality rate will go in favour of treating larger numbers of patients in this group. Currently, the outcome is adversely affected by delay in reaching the ICU and the lack of monitoring of intracranial pressure. Severe shortage of beds means that a patient is unable to get the appropriate treatment at the right time. Nevertheless, this study emphasizes the need for the creation of more ICU beds and, if possible, a separate neurosurgical ICU in the hospital.

The difference in mortality was not statistically significant between the two groups. The mortality was directly proportional to the age in the patients of group A, which has been shown in a number of studies before. Thus, it is more likely for an older patient in group B to survive than one in group A. One of the limitations of this study is that it does not provide the outcome at 6 months after head injury, which is considered to be a better indicator of survival.

The incidence of complications is important as it gives an idea of the amount of support required in terms of treatment modalities and level of nursing care. Thus, if a particular group of patients had an increased incidence of complications, they would have required a greater proportion of additional care and interventions. The incidence of common complications was not statistically different between the two groups. This study shows that patients with severe HI do not pose any extra burden on ICU resources when compared to other patients.

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