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Head trauma in China

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ABSTRACT

Objective: The Chinese Head Trauma Data Bank (CHTDB) has been established, which includes 7145 hospitalised cases with acute head trauma patients in 47 hospitals.
Methods: We explored factors that might affect the outcome of acute traumatic brain injury.
Results: There was no statistical difference in the mortality rate between male (7.5%) and female (7.2%) patients ($P > 0.05$). The mortality rate in children (<18 years), adults (18–65 years) and elderly (>65 years) was 7.3%, 7.2% and 9.0%, respectively ($P > 0.05$). The mortality rate of patients with mild (2.7%), moderate (5.0%) and severe (21.8%) head trauma was significantly different ($P < 0.001$). The mortality rate of patients with unilateral tentorial herniation, bilateral tentorial herniation and tonsillar herniation was 24.2%, 60.2% and 78.8% respectively ($P < 0.001$). The mortality rate of patients with intracranial pressure (ICP) < 20 mmHg, 20–40 mmHg and >40 mmHg was 6.3%, 21.4% and 93.1%, respectively ($P < 0.001$). The mortality rate of patients with no cerebral contusion, single cerebral contusion and multiple cerebral contusions was 3.9%, 7.8% and 14.8%, respectively ($P < 0.001$). The mortality rate of patients with and without traumatic subarachnoid haemorrhage (tSAH) was 9.5% and 5.4%, respectively ($P < 0.001$). The mortality rate of patients with no intracranial haematomas, single intracranial haematoma and multiple intracranial haematomas was 5.8%, 8.4% and 20.6%, respectively ($P < 0.001$).
Conclusion: The CHTDB, the first head trauma data bank in China, has one of the largest numbers of cases of any head trauma data bank in the world. Our major findings on mortality may be helpful to neurosurgeons for predicting the outcome of acute head trauma patients.

Introduction

Traumatic brain injury (TBI) is a major cause of disability, death and economic cost in the world. Over 2 million Americans sustain TBI annually, one-quarter of whom require hospitalisation and 15% of them face physical, cognitive, behavioural and/or psychosocial impairments in USA.[3] The mortality rate from non-penetrating severe TBI has steadily and significantly declined over the past 30 years from approximately 40% down to 25% and lower and is likely due to improvements in patient management.[12] TBI leads to 1 000 000 hospital admissions per annum throughout the European Union. It causes the majority of the 50 000 deaths from road traffic accidents and leaves 10 000 patients severely handicapped; three-quarters of these victims are young people.[2,3,13] From 23 European reports, including Denmark, Sweden, Finland, Portugal, Germany and from regions within Norway, Sweden, Italy, Switzerland, Spain, Denmark, Ireland, the U.K. and France, the TBI severity ratio of hospitalised patients is about 22:1.5:1 for mild versus moderate versus severe cases, an average mortality rate is about 15 per 100 000 and the case fatality rate is about 11 per 100, respectively.[21]

A number of factors are believed to influence the outcome of head trauma patients including age, gender, Glasgow Coma Score (GCS), intracranial pressure (ICP), pupillary size and responsiveness, hypoxia and computed tomography (CT) findings.[4,6,10,11,14,15,19] The Japan Neurotrauma Data Bank studied the medical treatment of 1002 cases of severe traumatic brain injuries (GCS of 8 or lower) from 1998 to 2001 at 10 emergency medical centres and found that the patient's age and mechanism of injury were the most important factors in the outcome.[16] In the present study, we have established the Chinese Head Trauma Data Bank (CHTDB) and have found a number of factors affecting the outcome of 7145 hospitalised cases with acute head trauma in 47 hospitals.

Materials and methods

Data collection and management of the patients

From 1 December 2008 through 20 August 2009, 7145 patients with acute head trauma (GCS 3–15) were consecutively admitted to 47 hospitals and enrolled in the CHTDB. All participating

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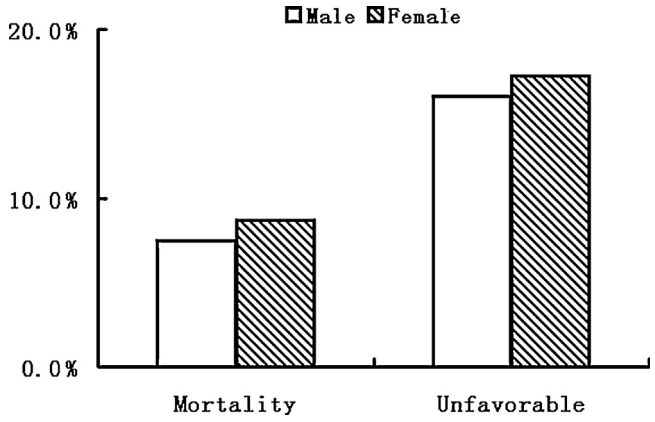

Fig. 1. Effects of gender on the outcome of patients with acute head trauma.

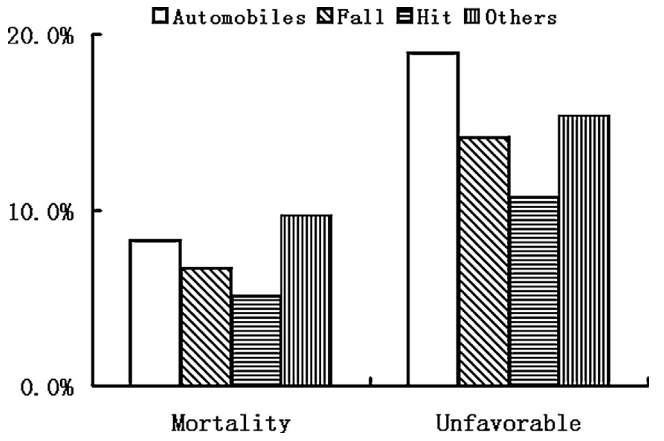

Fig. 3. Effects of causes of trauma on the outcome of patients with acute head trauma.

hospitals were trained before collecting data and all patients' data were sent to the CHTDB website from each hospital. Data were statistically analysed by a professional statistical expert at the Department of Medical Statistics, Shanghai Jiaotong University/ School of Medicine. The GCS was assessed in all 7145 patients within 48 h after trauma. CT scanning was routinely performed in all 7145 patients with acute head trauma. A catheter for monitoring ICP was inserted to provide continuous measurement of ICP in only those patients with severe traumatic brain injury (ICP express™, Codman, Johnson & Johnson Company, USA). All patients were treated according to the principles described in 'Guidelines for the management of severe head injury'.[3]

Assessment of neurological outcome

The patients' neurological outcome was determined at discharge from hospital (mean 31.0, SD 5.1 days). The neurological outcome was scored according to the Glasgow Outcome Scale (GOS) as follows: 1, death; 2, vegetative state – unable to interact with the environment; 3, severe disability – unable to live independently but able to follow commands; 4, moderate disability – capable of living independently but unable to return to work or school; and 5, mild or no disability – able to return to work or school. Good recovery and moderate disability were designated as favourable outcomes; severe disability, vegetative state and death were designated as unfavourable outcomes.[22]

The clinical criteria for scoring tentorial herniation and tonsillar herniation were the following: patients with one-side tentorial herniation included coma and one side pupillary dilation with lack of response to light; patients with bilateral tentorial herniation included coma and bilateral pupillary dilation with lack of response to light; and patients with tonsillar herniation included coma, low blood pressure, irregular respiration or loss of breathing, bilateral pupillary dilation with lack of response to light.

Statistical analysis

The data were analysed by Statistical Package for Social Sciences (SPSS) 11.0. Chi-squared analysis was used to evaluate the relationship between mortality and the various factors (gender, age, causes of trauma, GCS, brain herniations, ICP, traumatic subarachnoid haemorrhage (tSAH), cerebral contusion and intracranial haematomas). *P* values of less than 0.05 were considered significant.

Results

Of the 7145 cases, the breakdown by gender was 5427 cases male (76.0%) and 1718 cases female (24.0%). The causes of head trauma included motor vehicle crash ($n = 3836$, 53.7%), fall ($n = 2381$, 29.1%), violence ($n = 804$, 11.2%) and others ($n = 124$, 9.7%). The age of cases with acute head injury ranged from 1 to 92 years and the most common age category was adults (5381, 75.3%). The GCS was assessed in all patients within 48 h after trauma, including GCS 3–8 in 1626 cases (22.8%), GCS 9–12 in 1222 cases (17.1%) and GCS 13–15 in 4297 cases (60.1%), respectively. CT

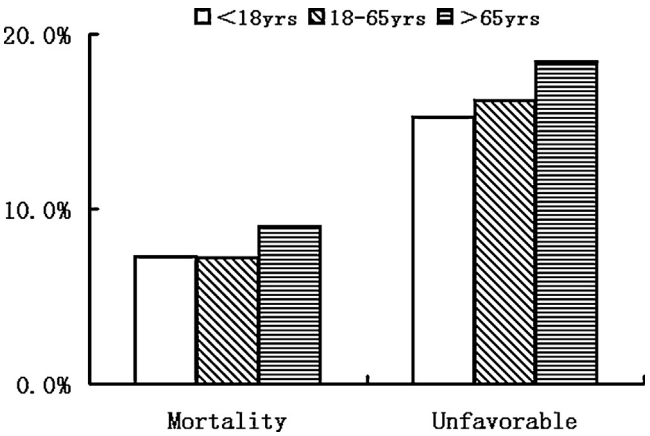

Fig. 2. Effects of age on the outcome of patients with acute head trauma.

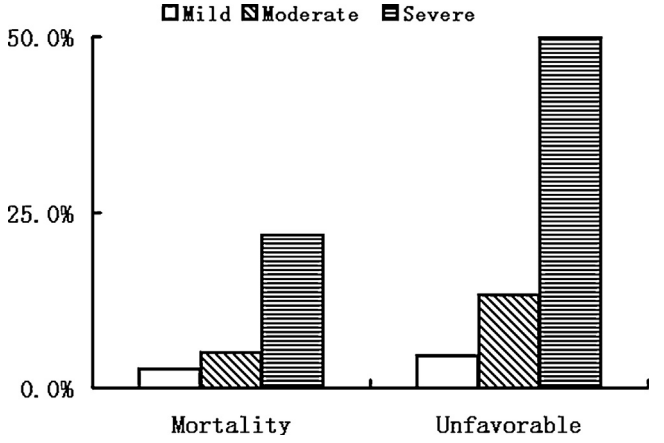

Fig. 4. Effects of GCS on the outcome of patients with acute head trauma.