Epilepsy Research (2013) **107**, 272—278

journal homepage: www.elsevier.com/locate/epilepsyres

Post-traumatic seizures—A prospective, multicenter, large case study after head injury in China

Huaqing Wang[a,1], **Tao Xin**[a,1], **Xiubin Sun**[b], **Shuzhen Wang**[c], **Hua Guo**[a], **Conor Holton-Burke**[d], **Qi Pang**[a,*]

[a] *Department of Neurosurgery, Provincial Hospital Affiliated to Shandong University, Jinan, Shandong Province, PR China*
[b] *Department of Epidemiology and Health Statistics, School of Public Health, Shandong University, Jinan 250012, Shandong, China*
[c] *Department of Paediatrics, Qianfoshan Hospital Affiliated to Shandong University, Jinan 250014, Shandong Province, PR China*
[d] *Department of Biochemistry, Biophysics, and Molecular Biology, Whitman College, WA 99362, United States*

Received 12 April 2013 ; received in revised form 7 September 2013; accepted 13 October 2013
Available online 23 October 2013

KEYWORDS
Post-traumatic seizures;
Prospective;
Multicenter;
Risk factors

Summary
Background: Post-traumatic seizures (PTS) is a well-known sequela of traumatic brain injury (TBI). The risk factors for PTS are still controversial. Studies on PTS in China are rare and no large prospective, multicenter-based studies are available.
Methods: Data were collected from 15 hospitals prospectively using standardized structured questionnaires in Shandong, a province in China with a follow-up of 2 years.
Results: A total of 3093 traumatic brain injury patients were validated and entered in this analysis. After 6 months of follow-up, 181 (59.9%) patients were identified as having PTS. The number were 236 (78.1%) and 302 after 1 year and 2 years' follow-up, respectively. The cumulative 24-month-rate of PTS is 9.8%. Among these 302 patients, 242 were male (80.1%) and 60 female (19.9%). A marked peak was seen in the young people group aged 15—24 (27.8%). Three factors were identified as significant in the multivariate model of PTS: Frontal—temporal lobar contusion, Linear fracture and Severity of TBI measured by initial Glasgow Coma Scale (GCS).

* Corresponding author at: Department of Neurosurgery, 324 Jin Wu Wei Qi Road, Huaiyin, Provincial Hospital Affiliated to Shandong University, Jinan, Shandong Province 250021, PR China. Tel.: +86 531 68776393.
E-mail address: pangqisdu@yahoo.com (Q. Pang).
[1] These authors contributed equally to this article.

0920-1211/$ — see front matter
http://dx.doi.org/10.1016/j.eplepsyres.2013.10.006

Conclusion: This prospective cohort study shows the epidemiologic features and risk factors of PTS in China. Frontal—temporal lobar contusion, linear fracture and severity of TBI measured by initial Glasgow Coma Scale (GCS) are risk factors for PTS. It is essential to establish a standard surveillance system for PTS.

Introduction

Seizure is one of the most familiar sequela for traumatic brain injury (TBI) patients and has been known since the time of Hippocrates. With the continued economic growth in China, traumatic brain injury due to automotive transportation and other reasons resulted in an increase in disability and mortality, as are post-traumatic seizures (PTS).

Treatment of PTS is expensive and seizures are usually looked as stigma for the patients' families. Hence to understand the characteristics and risk factors of PTS is essential to control the disease and the cost to these families. As different societies and populations are being studied, the risks of PTS vary at the same time (Frey, 2003). Until now, there were few studies on PTS in China, and they were based on just one hospital individually (Zhao et al., 2012; Wang et al., 2008; Jiang et al., 2004). All of them were retrospective studies which may be uninformative and problematic in some extent. No large prospective multicenter studies on PTS are available in China currently. As data from one hospital has its limitations, we are the first to carry out a large, prospective study involving many hospitals in China.

These post-traumatic seizures data were collected during a one-year period (from January 1 to December 21, 2009) with the follow-up extended to the end of 2011. The aim of this study is to investigate the epidemiology and risk factors of PTS in China, hopefully setting up an early warning system which can predict the risk of PTS in Chinese Han population.

Materials and methods

This study collected the data from 15 hospitals in Shandong province. Shandong is one of the most developed provinces in China with nearly 96million people in 2011. The 15 public hospitals cover most districts of Shandong province, and most of them are the major hospitals in their located districts. These data make this study important in offering an important opportunity to view the epidemiology of PTS in China for researchers.

Not all the patients with a diagnosis of head injury were recruited in this study. The following patients were excluded: (1) Patients who were known to have epilepsy before TBI. (2) Patients who had TBI before, or have second or subsequent episodes of TBI. (3) Patients who had fatal TBI (defined as injuries). (4) Patients who took prophylactic antiepilepsy drugs before the PTS came out.

TBI severity

The severity of TBI was classified based on the Glasgow Coma Scale (GCS) rating. The TBI severity was classified as follows: GCS score 13—15 mild, 9—12 moderate, 3—8 severe. The GCS score was measured upon admission to the hospital.

PTS data collection

The general conditions of TBI data were obtained when the patients were in hospital. Trained neurosurgeons collected the data according to the hospital records of the patients. These data included the general conditions, such as sex, age, education level, cause of the TBI, blood pressure. The data also included the treatment of TBI patients, the severity of trauma, GCS score when they entered the hospital. The seizure onset information was recorded if TBI patients suffered one while they were in hospital, and all those patients who suffered the episodes undertook electroencephalogram (EEG) examination. Patients who had seizures before TBI were excluded. Those with conditions such as stroke, intracranial infections or cerebral vascular disease before TBI which may cause PTS were also excluded.

Follow-up investigation

Follow-up investigation was conducted via telephone. The Follow-up Investigation Survey was done after the patient was recovered from the hospital. For the patients who still have to seek care for the combined injures, the date to begin the follow-up were set from the day the patient stopped the neurological service. The follow-up survey contains the general condition of the patient, the occurrence and frequency of the seizures, EEG results and so on.

PTS diagnosis

All the PTS cases were confirmed by the doctors in these hospitals using detailed medical records, follow-up data and EEG results. A team composed of a neurologist and an epilepsy specialist reviewed all the follow-up data which got by telephone. In our study, the discharged patients were informed to seek help from hospital when they encountered episodes which suspect seizure and all the PTS patients undertook electroencephalogram (EEG) examination.

Statistical analysis

The data were recorded in Excel and Access 2003, and statistical analysis was done using SPSS 17.0. A Chi-square test was used for univariate analysis to distinguish the variables that may affect the PTS. Significant factors were entered into a model in a separate analysis. Forward stepwise logistic regression analysis was used to indentify the risk factors