



Characteristics of the ischemic stroke patients whose seizures occur at stroke presentation at a single institution in Eastern China



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ABSTRACT

Purpose: We compared clinical characteristics and outcomes of the early-onset seizure post-stroke patients who had seizures occurring at stroke presentation (SSP) with other patients without SSP at a single institution in Eastern China.

Methods: We reviewed 20,947 ischemic stroke patients in our hospital electronic medical records system from January 2007 to December 2016. Among them, there were 91 (0.43%) patients with early-onset seizure post-stroke. Among these 91 patients, there were 35 (0.16%) SSP patients and another 56 (0.27%) were designated as non SSP patients because they also had early-onset seizure post-stroke, but without SSP. We compared the clinical presentations of the SSP patients with those of the non SSP patients including baseline stroke risk factors, and 10-year Kaplan-Meier death risk after their first stroke.

Results: In the SSP patients, 25.7% of them presented with posterior circulation infarction, whereas only 12.5% of the non SSP patients had this condition ($P < 0.05$). In contrast, 17.1% of the SSP patients were being treated with antiepileptic drugs at discharge whereas 37.5% of the non SSP patients received such treatment ($P < 0.05$). The percentage of SSP patients with temporal lobe lesions was less than in non SSP patients ($P < 0.05$). However, brain stem and thalamus lesions were more frequently seen in SSP patients than non in SSP patients ($P < 0.05$). The risk factors for ischemic stroke including a history of hypertension, diabetes mellitus, hyperlipidemia and atrial fibrillation were the same in these two groups ($P > 0.05$). In the SSP patients group, the 10-year risk of death was 36.9% after the initial seizure incident, and in the non SSP patients group, the 10-year death risk was 40.1%, but this difference between the two groups was not significant ($P > 0.05$).

Conclusions: Ischemic stroke patients with SSP had some unique signs that included a higher incidence of posterior circulation infarction than non SSP patients.

1. Introduction

Seizure is a characteristic neurological symptom in stroke afflicted patients. Post-stroke seizures are classically subdivided into two categories: early-onset seizure post-stroke, which occurs within 14 days after stroke, and late-onset seizure post-stroke, which occurs after 14 days. If a seizure occurs within 24 h after onset of stroke, it is defined as an ‘onset seizure’ [1,2]. Seizure as an initially presenting symptom of ischemic stroke in the acute stage is a special type designated as ‘onset seizure’ of stroke. In this study, seizures occurring at stroke presentation (SSP) were defined as any clinically evident seizure observed by a parent/guardian or medical provider occurring as the heralding sign of the stroke [3].

Patients with SSP are a special type designated as onset seizure of stroke, but there are only a few case reports describing this condition in

adult patients [4,5,6,7,8]. There is only one full length article comparing the clinical characteristics of seizures at adult ischemic stroke presentation to seizures during hospitalization post stroke [9]. However, that study defined seizures occurring at ischemic stroke presentation (SSP) as the seizure occurred within 24 h of stroke onset. This designation differs from what we designate as a SSP. Even in children designated as being SSP, there is only one paper studying 13 ischemic stroke children patients initially presenting with a seizure [3]. In that article, SSP was defined as any clinically evident seizure observed by a parent/guardian or medical provider occurring as the heralding sign of the stroke or within 1 h of the onset of other stroke symptoms, which also does not conform to our definition of SSP.

In the Emergency Department, it is difficult to reach a diagnosis as to whether or not specific clinical signs are reflective of a seizure or a ischemic stroke in some patients. Specifically, if both seizures and

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hemiparesis are initially apparent, it is problematic to obtain a tentative differential diagnosis between Todd's paralysis with epilepsy and ischemic stroke with SSP. Furthermore, even if convulsive seizures are initially apparent, a tentative differential diagnosis between epilepsy and posterior circulation of transient ischemic stroke (TIA) is also difficult. To mitigate these uncertainties, it is necessary to clarify the characteristics of SSP patients.

We provide here a retrospective analysis defining the SSP incidence in adult patients at the First Affiliated Hospital of Wenzhou Medical University, located in Wenzhou, a medium sized city in eastern China. Our study compared differences between the clinical characteristics of SSP patients and non SSP patients, as well as to analyze the outcomes between these two groups.

2. Methods

2.1. Patient selection

We conducted a retrospective study of all inpatient records stored in the Department of Neurology electronic medical records system from January 2007 to December 2016. Firstly, we used the first discharge diagnosis “ischemic stroke” according to I63 code of ICD-10 [10]. Secondly, among these ischemic stroke patients, we used “seizure” or “epilepsy” as a keyword regarding discharge diagnosis to identify those inpatients with early-onset seizure post-stroke. Finally, we examined the first course record based on our hospital electronic medical records system to select SSP patients, and non SSP patients who had early-onset seizure post-stroke but those without SSP were also identified. These two groups of patients were followed up from March to May 2017. Initial diagnostic studies systematically included routine cerebral CT when stroke occurred within 24 h and either a cerebral CT was repeated or MRI scanning was performed within 5 days after stroke. Furthermore, after a stroke, a standard electroencephalogram (EEG) was performed within at least 48 h after seizure. The exclusion criteria included a history of epileptic seizures or patients who had a stroke before this onset. Other criteria for exclusion included cerebral tumours, aneurysms, arteriovenous malformation, sinus thrombosis, transient ischemic attacks, severe metabolic abnormalities and a history of substance abuse.

2.2. Ischemic stroke definition and stroke subtype

Ischemic stroke definition is based on a statement by the AHA/ASA [11]. Stroke subtype is classified according to brain imaging results. We reviewed all neuroimaging and determined the infarct location according to the following categories: 1) vascular distribution - anterior circulation, posterior circulation or both, 2) cortical, subcortical or both, for supratentorial infarcts. Our routine MRI stroke protocol included axial diffusion-weighted imaging (DWI) and axial fluid attenuated inversion recovery (FLAIR). The locations of lesions were defined by areas of high signal intensity on DWI. We also used TOAST classification for further etiological classification [12].

2.3. Definition of seizures and seizure subtype

Seizures are defined according to the definition of the International League Against Epilepsy (ILAE) criteria as paroxysmal disorders of the central nervous system, followed or not by loss of consciousness and/or with or without motor involvement [13].

The seizure type classification separated these individuals into either a partial seizure or generalization seizure. Partial seizure with secondary generalization was placed in the generalization group.

Status epilepticus is defined as one continuous and unremitting seizure lasting for > 5 min or recurrent seizures without restoration of consciousness for > 5 min [14].

2.4. Baseline data collected

Several baseline characteristics were recorded at stroke onset: demographics, known hypertension (or patients taking antihypertensive medications), atrial fibrillation, diabetes mellitus (fasting glucose ≥ 7.0 mmol/l or patients treated with oral anti-diabetic agents), hyperlipidemia (total blood cholesterol over 6 mmol/l or statin therapy), and stroke severity on admission was assessed using the National Institutes of Health Stroke Scale (NIHSS).

2.5. Clinical follow-up

After seizure onset, outcomes were monitored. Our evaluation entailed either clinical visits, or assessment by telephone. We recorded the survival state of patients.

2.6. Statistical analysis

Categorical variables were analyzed using the χ^2 test, continuous variables were analyzed using the Student *t*-test, and non-normally distributed continuous variables were analyzed using the Mann-Whitney rank sum tests. Kaplan–Meier methods estimated mortality risk. Differences were considered statistically significant at $P < 0.05$. All analyses were carried out with the SPSS package 16.0.

2.7. Ethics

The Research Ethics Board at the First Affiliated Hospital of Wenzhou Medical University approved the study design.

3. Results

3.1. Demographics and clinical presentations

From January 2007 to December 2016, 20,947 ischemic stroke patients were admitted to the Department of Neurology at our hospital. Among these patients, there were 91 (0.43%) patients diagnosed with early-onset seizure post-stroke. Among these, there were 35 patients (0.16%) designated as SSP patients. On the other hand, 56 (0.27%) patients were non SSP patients. Thirty three out of the 35 SSP patients received both CT and MRI scans within 3 days after stroke onset, and the other 2 patients received CT scan at the time of stroke onset and again within 5 days after stroke onset because they had several complicating conditions. Fifty three out of 56 non SSP patients received both CT and MRI scans within 3 days after stroke onset, and another 3 patients received a CT scan at the time of stroke onset and again within 5 days later because of several complicating conditions. In these 91 patients, their ages were 64.45 ± 12.50 years. There were 64 men and 27 women, with a gender (M/F) ratio of 2.3:1. 17 (18.7%) patients had atrial fibrillation, 73 (80.2%) patients had anterior circulation infarction, 16 (17.6%) patients had posterior circulation infarction, 2 (2.2%) patients had both anterior circulation infarction and posterior circulation infarction. 46 (50.5%) patients had generalization seizures and another 45 (49.5%) had partial seizures. All of the seizures were motor seizures (Table 1).

There was no difference in the ischemic stroke risk factors between SSP and non SSP patients that were attributable to any history of hypertension, diabetes mellitus, hyperlipidemia, and atrial fibrillation ($P > 0.05$). The percentage of posterior circulation infarction in SSP patients (25.7%) was higher than that in non SSP (12.5%) patients ($P < 0.05$) and the percentage of SSP patients being treated with anti-epileptic drugs at discharge in (17.1%) was lower than that in non SSP patients (37.5%) ($P < 0.05$). We also evaluated if there was any difference in the lesion localization between the SSP and non SSP groups. The percentage of temporal lobe lesions in SSP patients was less than that in the non SSP patients ($P < 0.05$), but the brain stem and

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