

## Tonic Convulsion as the Initial Sign of Acute Cerebral Ischemia in an Adult

Kei Jitsuiki MD, Naohide Fujita MD\*, Kouhei Ishikawa MD, Hiroki Nagasawa MD, Ikuto Takeuchi MD, Akihiko Kondo MD, Hiromichi Ohsaka MD. PhD, Kazuhiko Omori MD. PhD, Youichi Yanagawa MD. PhD

Department of Acute Critical Care Medicine, Shizuoka Hospital, Juntendo University, Japan

### \*Corresponding author

Naohide Fujita

### Article History

Received: 22.11.2017

Accepted: 27.11.2017

Published: 30.11.2017

### DOI:

10.36347/sjmcr.2017.v05i11.031



**Abstract:** A 69-year-old man returning home in a car driven by his wife after visiting our hospital due to complications of infection from an operation suddenly lost consciousness. He had right hemiparesis due to a brain stem infarction by atrial fibrillation at 58 years of age. When medical staff checked him at the front of the hospital, he had right tonic convulsion and was comatose. He was in a deep coma, and his systolic blood pressure was 168/116 mmHg, heart rate 96 beats per minute, respiratory rate 30 breaths per minute and SpO<sub>2</sub> level 100% under room air. He received anti-convulsant. Electrocardiogram showed atrial fibrillation, and chest roentgen and cardiac sonography findings were negative. Head computed tomography (CT) revealed an old cerebral infarction at the brain stem. As he remained in a coma, further examinations using head magnetic resonance imaging (MRI) were performed. MRI demonstrated left fronto-temporo-parietal ischemia, and MR angiography revealed occlusion of the left middle cerebral artery. He underwent urgent aspiration thrombectomy, but cerebral ischemia developed into infarction. He was transported to another medical facility for rehabilitation. We herein report a rare case of convulsion as the initial sign of acute cerebral ischemia in an adult. A pre-existing inflammatory condition or brain stem infarction may have affected the rare occurrence of convulsion preceding cerebral ischemia in the present patient. Further studies are warranted to determine whether or not a patient with their first convulsion needs to receive urgent MRI after the confirmation of no significant lesions on CT.

**Keywords:** Convulsion; acute cerebral ischemia; diagnosis

## INTRODUCTION

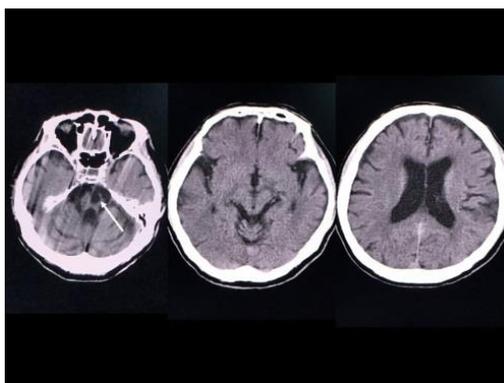
The typical initial signs of cerebral ischemia, such as facial hemiparesis, limb hemiparesis and/or dysphagia/dysarthria, are used for screening purposes in prehospital settings[1-3]. However, the onset of convulsion following hemiparesis is well known as Todd's paralysis and it can sometimes be misdiagnosed as a cerebral ischemic attack [4, 5]. A patient with hemorrhagic stroke or juvenile cerebral ischemia may demonstrate convulsion as an initial symptom; however, it is rare in adult-onset cerebral ischemia. We herein report a case of tonic convulsion as the initial sign of acute cerebral ischemia in an adult.

## CASE PRESENTATION

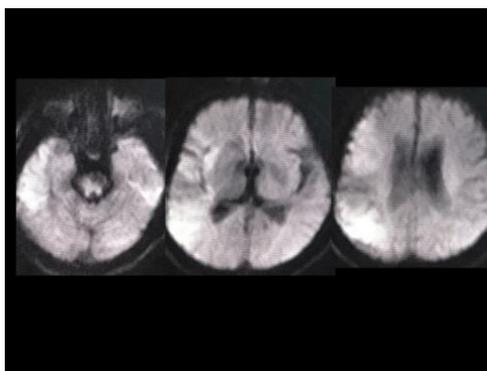
A 69-year-old man returning home in a car driven by his wife after visiting the Department of General Thoracic Surgery at our hospital due to complications of infection from an operation suddenly lost consciousness. He had right hemiparesis due to a brain stem infarction by atrial fibrillation at 58 years of age, and a duodenal ulcer and lung cancer had been removed 1 month earlier. When medical staff checked him at the front of the hospital, he had right tonic convulsion and was comatose. He was transported via stretcher to the emergency room.

He was in a deep coma, and his systolic blood pressure was 168/116 mmHg, heart rate 96 beats per minute, respiratory rate 30 breaths per minute and SpO<sub>2</sub> level 100% under room air. He remained in right tonic convulsion with right conjugated deviation and received an infusion of 10 mg of diazepam, after which the tonic convulsion and abnormal ocular position subsided. He also received an infusion of fenitoin. A venous gas analysis revealed combined acidosis with an increased lactate level (8.1 mmol/l). Electrocardiogram showed atrial fibrillation, and chest roentgen and cardiac sonography findings were negative. Head computed tomography (CT) revealed an old cerebral infarction at the brain stem without intracranial hemorrhaging (Figure 1). The main findings of a blood analysis were a white blood cell count of 14,300/mm<sup>3</sup> and C-reactive protein of 9.6 mg/dl.

As he remained in a coma, further examinations using head magnetic resonance imaging (MRI) were performed. MRI demonstrated left fronto-temporo-parietal ischemia (Figure 2), and MR angiography revealed occlusion of the left middle cerebral artery. He underwent urgent aspiration thrombectomy, but cerebral ischemia developed into infarction. He was transported to another medical facility for rehabilitation.



**Fig-1: Head computed tomography (CT) on arrival. The CT scan shows an old cerebral infarction at the brain stem (arrow) without intracranial hemorrhaging**



**Fig-2: Magnetic resonance image (MRI) after admission. MRI (diffusion-weighted imaging) demonstrates left fronto-temporo-parietal ischemia**

## DISCUSSION

This is the rare adult case demonstrating convulsion as the initial sign of cerebral ischemia. The juvenile brain is immature and highly susceptible to seizure, so convulsion as an initial sign of cerebral ischemia is not very rare in young patients [6-8]. While cerebral ischemia has also been reported as a risk factor of convulsion in adults [9-11], only a few case reports have described convulsion as the initial sign of cerebral ischemia [12-14].

Regarding why this case demonstrated the rare initial sign of cerebral ischemia of 'convulsion', Arboix *et al.* examined ischemic stroke of unusual cause and found that the etiologies included hematological disorders, migraine stroke, cerebral infarction secondary to venous thrombosis and inflammatory causes. Independent predictors of ischemic stroke of unusual cause included younger age, seizures, headache, hemianopia and occipital lobe involvement. The present patient had had a pulmonary infection, so the threshold for cerebral ischemia triggering a convulsion might have been reduced. Our patient also had a history of brain stem infarction. The brain stem has the potential to both inhibit and facilitate the occurrence of convulsion [15-17]. This history may therefore have affected his unusual initial signs.

One issue associated with diagnosis is the timing of the MRI examination, as convulsion may be

followed by status epilepticus. This results in a life-threatening situation that requires tracheal intubation [18]. As there are no guidelines concerning the timing of MRI, we usually perform such examinations the day after confirming the continuous ceasing of convulsion if initial CT does not reveal any significant lesions [19]. However, we missed the timing to administer tissue plasminogen activator in the present patient by selecting conservative management in the emergency room. Accordingly, further studies are warranted to determine whether or not a patient with their first convulsion needs to receive urgent MRI after the confirmation of no significant lesions on CT.

## CONCLUSION

We herein report a rare case of convulsion as the initial sign of acute cerebral ischemia in an adult. A pre-existing inflammatory condition or brain stem infarction may have affected the rare occurrence of convulsion preceding cerebral ischemia in the present patient.

## Conflict of interest

We do not have conflict of interest to declare.

## ACKNOWLEDGEMENTS

The drafting of this manuscript was financially supported by Pfizer Inc. and the Ministry of Education, Culture, Sports, Science and Technology (MEXT)-Supported Program for the Strategic Research

Foundation at Private Universities, 2015-2019 concerning [The constitution of total researching system for comprehensive disaster, medical management, corresponding to wide-scale disaster].

## REFERENCES

1. Studnek JR, Asimos A, Dodds J, Swanson D. Assessing the validity of the Cincinnati prehospital stroke scale and the medic prehospital assessment for code stroke in an urban emergency medical services agency. *Prehosp Emerg Care*. 2013; 17:348-53.
2. Hurwitz AS, Brice JH, Overby BA, Evenson KR. Directed use of the Cincinnati Prehospital Stroke Scale by laypersons. *Prehosp Emerg Care*. 2005; 9:292-6.
3. Lisabeth LD, Brown DL, Hughes R, Majersik JJ, Morgenstern LB. Acute stroke symptoms. *Stroke*. 2009 Jun 1;40(6):2031-6.
4. Brandler ES, Sharma M, McCullough F, Ben-El-D, Kaufman B, Khandelwal P, Helzner E, Sinert RH, Levine SR. Prehospital Stroke Identification: Factors Associated with Diagnostic Accuracy. *J Stroke Cerebrovasc Dis*. 2015; 24:2161-6.
5. Vilela P. Acute stroke differential diagnosis: Stroke mimics. *European Journal of Radiology*. 2017 May 5.
6. Sun D, Wu XM, Wang ZW, Jin RM, Liu ZS, Liu F, Huang S, Wang HQ, Hu JS. A single-site retrospective study of pediatric arterial ischemic stroke etiology, clinical presentation, and radiologic features. *Chinese medical journal*. 2013;126(18):3446-50.
7. Chung JI, Kim AY, Lee SH, Baik EJ. Seizure susceptibility in immature brain due to lack of COX-2-induced PGF2 $\alpha$ . *Exp Neurol*. 2013; 249:95-103.
8. Haut SR, Velísková J, Moshé SL. Susceptibility of immature and adult brains to seizure effects. *Lancet Neurol*. 2004; 3:608-17.
9. Beghi E, D'Alessandro R, Beretta S, Consoli D, Crespi V, Delaj L, Gandolfo C, Greco G, La Neve A, Manfredi M, Mattana F, Musolino R, Provinciali L, Santangelo M, Specchio LM, Zaccara G; Epistroke Group. Incidence and predictors of acute symptomatic seizures after stroke. *Neurology*. 2011; 77:1785-93.
10. Gupta SR, Naheedy MH, Elias D, Rubino FA. Postinfarction seizures. A clinical study. *Stroke*. 1988; 19:1477-81.
11. So EL, Annegers JF, Hauser WA, O'Brien PC, Whisnant JP. Population-based study of seizure disorders after cerebral infarction. *Neurology*. 1996; 46:350-5.
12. Kanazawa A, Noda K, Suzuki H, Ohta S, Mori H, Suda K, Takubo H, Mizuno Y. A 96-year-old man with consciousness disturbance, convulsion, and left hemiplegia of acute onset. *No to Shinkei*. 1999; 51:83-93.
13. Matsuo K, Fujii C, Fuse I, Nakajima M, Takada M, Miyata K. Top of the Basilar Syndrome in a Young Adult Initially Presenting with a Convulsive Seizure. *Internal Medicine* 2011; 50:1425-8.
14. Arboix A, Bechich S, Oliveres M, García-Eroles L, Massons J, Targa C. Ischemic stroke of unusual cause: clinical features, etiology and outcome. *Eur J Neurol*. 2001; 8:133-9.
15. Meurs A, Clinckers R, Ebinger G, Michotte Y, Smolders I. Substantia nigra is an anticonvulsant site of action of topiramate in the focal pilocarpine model of limbic seizures. *Epilepsia*. 2006; 47:1519-35.
16. Hashizume K, Tanaka T, Fujita T, Tanaka S. Generalized seizures induced by an epileptic focus in the mesencephalic reticular formation: impact on the understanding of the generalizing mechanism. *Stereotact Funct Neurosurg*. 2000; 74:153-60.
17. Koch P, Leisman G. A continuum model of activity waves in layered neuronal networks: a neuropsychology of brainstem seizures. *Int J Neurosci*. 1990; 54:41-62.
18. Hill CE, Parikh AO, Ellis C, Myers JS, Litt B. Timing is everything: Where status epilepticus treatment fails. *Ann Neurol*. 2017 Jul 6.
19. Adams SM, Knowles PD. Evaluation of a first seizure. *Am Fam Physician*. 2007; 75:1342-7.