The Journal of Emergency Medicine, Vol. ■, No. ■, pp. 1–3, 2018

0736-4679/$ - see front matter

https://doi.org/10.1016/j.jemermed.2018.07.020

Clinical Communications: Adult

PATHOLOGICAL LAUGHTER AS A SYMPTOM OF MIDDLE CEREBRAL ARTERY STROKE

Gülden Özel, MD,* David Maltête, MD, PHD,*† and Romain Lefaucheur, MD*

*Department of Neurology, Rouen University Hospital and University of Rouen, France and †Institut National de la Santé et de la Recherche Médicale U1073, Rouen Faculty of Medicine, France

Reprint Address: Gülden Özel, MD, Department of Neurology, Rouen University Hospital, Rouen Cedex 76031, France

☐ **Abstract—Background: Pathological laughter is defined as uncontrollable and inappropriate laughter unrelated to an emotion or a mood. This symptom can reveal a stroke. Case Report: We described the case of a 57-year-old patient who presented to the emergency department 2 h after a sudden onset of left hemiparesis preceded by pathological laughter. The left motor weakness was very discrete and underestimated because of severe behavioral changes, that is, laughter, joviality, and motor restlessness. Despite abnormal brain imaging results, symptoms were considered as atypical to evoke a stroke. The patient did not receive intravenous thrombolysis. Brain magnetic resonance imaging performed 2 days after admission confirmed the diagnosis of stroke. Why Should an Emergency Physician Be Aware of This?: Emergency physicians are at the forefront of stroke management. They should be aware that the initial symptom of a stroke can be atypical and lead to misunderstanding the diagnosis. Because the treatment of stroke requires the fastest care, it is important for emergency physicians to know that sudden behavioral troubles and pathological laughter can reveal strokes.** © **2018 Elsevier Inc. All rights reserved.**

☐ **Keywords—stroke; pathological laughter**

INTRODUCTION

Pathological laughter, that is, exaggerated, uncontrollable, and inappropriate laughter unrelated to a true emotion or a congruent mood, is associated with a wide range of brain disorders, including ictal and non-ictal conditions (1). *Fou rire prodromique* is a rare form of prodromal pathological laughter of uncertain pathophysiology that can precede stroke (2). We report the case of a patient who presented a fit of laughter heralding left hemiparesis and hemianesthesia.

CASE REPORT

A 57-year-old right-handed man was admitted after sudden onset of an uncontrolled, involuntary fit of laughter without any feeling of joy. There was no other behavioral change except the laughter reported at this point. According to his wife, the laughter had been of abrupt onset, inappropriate to the situation, and had lasted about 10 min. The patient was able to provide the history of what happened before and during stroke manifestations, including the laughter. He recognized the laughter as abnormal and was unable to stop it. There was no inappropriate crying. He remained conscious and had no abnormal movements. He had a history of dyslipidemia under medication and was a heavy smoker. He had no history of neuropsychiatric disorder.

At admission, the patient presented with behavioral changes, that is, logorrhoea, theatrical behavior, and joviality. He partially criticized his behavior and was partially aware of it. His wife added that he never had a behavioral disorder by the past. First clinical

RECEIVED: 13 December 2017; FINAL SUBMISSION RECEIVED: 2 July 2018;
ACCEPTED: 20 July 2018

examination mainly disclosed severe behavioral changes. Left motor weakness was much very discrete and was not considered as pathological because of the patient's lack of cooperation. Sensory, visual field, and cranial nerves examination was normal. Brain computed tomography (CT) scan with contrast injection was immediately performed and disclosed a severe stenosis of the right internal carotid. Brain CT scan without injection scan revealed no abnormalities. Despite clinical evaluation and brain imaging results, we hypothesized that these symptoms were not related to a stroke and possibly due to a toxic abuse. We therefore decided not to start intravenous thrombolysis. Because of the severe stenosis of the right internal carotid that we thought at this time was of fortuitous discovery, the patient was admitted to our stroke unit. Repeated examination a few hours later revealed new neurological signs with dysarthria and left hypoesthesia. Because of clinical worsening, we then hypothesized that the patient had ischemic stroke and intravenous heparin was initiated. Brain magnetic resonance imaging performed 2 days after symptom onset confirmed the diagnosis of stroke on the right sylvian territory involving the posterior part of the internal capsule and posterior insula (Figure 1). Doppler ultrasonography confirmed the severe right internal carotid artery pre-occlusive stenosis.

The patient underwent a psychological examination that did not reveal any mood disorder. Three weeks after admission, he had totally improved and had not exhibited any episodes of pathological laughter. His wife reported complete resolution of his behavioral changes. He was discharged with anticoagulant medication. Three months after stroke onset, he underwent an uneventful right carotid endarterectomy.

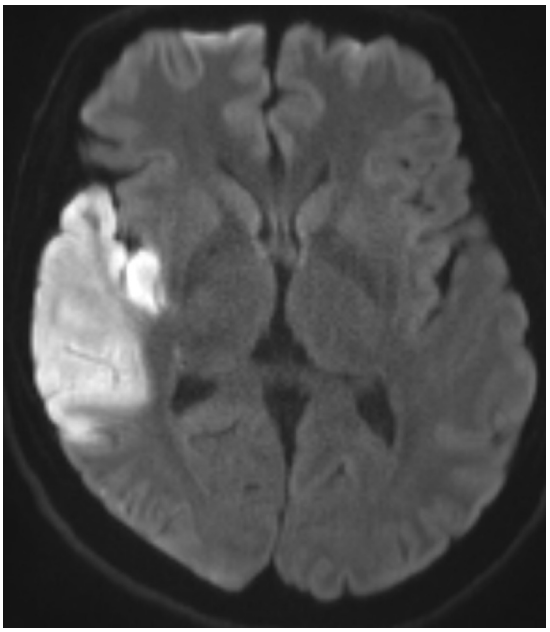

Figure 1. Diffusion-weighted magnetic resonance imaging demonstrating infarct of the right sylvian artery.

DISCUSSION

We report the rare case of a patient who presented *fou rire prodromique* that reveals stroke. This atypical presentation called into question the diagnosis of stroke and therefore optimal management was not proposed because the patient did not receive intravenous thrombolysis.

Pathological laughter is a rare neuropsychiatric disorder associated with a wide range of brain disorders, including vascular pseudobulbar palsy, tumors, amyotrophic lateral sclerosis, and multiple sclerosis (1,3). *Fou rire prodromique* is a pathological laughter occurring as the first manifestation of stroke. It is described as a transient symptom lasting for a few seconds to 30 min. The periodicity of recurring symptoms varies greatly (4). It has been reported after ischemic and hemorrhagic strokes involving mostly internal capsule, lenticular nucleus, thalamus, and brainstem (5,6). It has also been associated with strokes restricted to the external and extreme capsular regions. The neural correlates of laughter seem to depend on two different pathways: "involuntary" emotional or excitatory pathway, which involves amygdala, temporal cortex, thalamic/subthalamic areas, and brainstem; and "voluntary" or inhibitory pathway, which involves motor cortical cortex, pyramidal tract to ventral brainstem (5). A lesion affecting the voluntary pathway, even unilateral, can induce pathological laughter by disinhibition of the "involuntary" pathway (5). In our case, the patient presented a *fou rire prodromique* heralding an infarct of right sylvian artery territory involving pyramidal tract (posterior arm of the internal capsule) and temporal cortex. A similar case of *fou rire prodromique* heralding a left internal carotid artery occlusion has already been described (6).

Treatments of stroke have changed in the last few years. Indeed, intravenous administration of tissue-type plasminogen activator and mechanical thrombectomy have changed the management and prognosis of stroke. The benefit of these procedures in acute ischemic stroke has been demonstrated, and the clinical efficacy is time-dependent. Thus, these treatments require a fast diagnosis of stroke in order to start thrombolysis within 4.5 h of onset or thrombectomy within 6 h of stroke onset associated with occlusion of a large cerebral artery in the anterior circulation (7). In our observation, this pathological laughter misled us, despite arguments in favor of a stroke on brain imaging.

WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

Emergency physicians are at the forefront in the management of stroke. They should be aware that the initial manifestations of a stroke can be polymorphic and sometimes misunderstand the diagnosis. Because the treatment of stroke requires the fastest care, it is important for emergency physicians to know that behavioral troubles and pathological laughter can reveal strokes.

REFERENCES

1. Coelho M, Ferro JM. Fou rire prodromique. Case report and systematic review of literature. Cerebrovasc Dis 2003;16:101–4.
2. Gondim FA, Parks BJ, Cruz-Flores S. "Fou rire prodromique" as the presentation of pontine ischaemia secondary to vertebrobasilar stenosis. J Neurol Neurosurg Psychiatry 2001;71:802–4.
3. Lago A. Fou rire prodromique and ischemic stroke. Stroke 1998;29:1067–8.
4. Osseby G, Manceau E, Huet F, et al. 'Fou rire prodromique' as the heralding symptom of lenticular infarction, caused by dissection of the internal carotid artery in a 12-year-old boy. Eur J Paediatr Neurol 1999;3:133–6.
5. Dulamea AO, Matei C, Mindruta I, Ionescu V. Pathological laughter as prodromal manifestation of transient ischemic attacks—case report and brief review. BMC Neurol 2015;15:196.
6. Carel C, Albucher JF, Manelfe C, Guiraud-Chaumeil B, Chollet F. Fou rire prodromique heralding a left internal carotid artery occlusion. Stroke 1997;28:2081–3.
7. Powers WJ, Derdeyn CP, Biller J, et al. 2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke 2015;46:3020–35.