Atypical Sneezing Attack Induced by Lateral Medullary Infarction

Hai-Tao Hu,¹ Shen-Qiang Yan,¹ Bruce Campbell² & Min Lou¹

¹ Department of Neurology, School of Medicine, The Second Affiliated Hospital of Zhejiang University, Hangzhou, China

² Department of Medicine and Neurology, Royal Melbourne Hospital, University of Melbourne, Parkville, Vic., Australia

Correspondence

M. Lou, M.D., Ph.D., Department of Neurology, School of Medicine, The 2nd Affiliated Hospital of Zhejiang University, Hangzhou 310009, China.

Tel.: +86-571-87784810;

Fax: +86-571-87784750;

E-mail: loumingxc@vip.sina.com

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Sneezing is a rarely explored symptom in neurological practice. In cats, the sneeze-evoking center is located in the medulla [1]. However, the existence of a sneezing center in humans has not been confirmed. We herein present a case characterized by unprovoked explosive pathological sneezing at the onset of lateral medullary syndrome (LMS) with no discernible delay between the sneezing and other subsequent symptoms. Interestingly, we found this infarction was probably caused by vertebral artery (VA) compression due to a herniated nucleus pulposus.

A 55-year-old woman visited our emergency room due to a 2-h history of sudden-onset sneezing before the visit. Previously well, she suddenly developed unprovoked, unusually violent, and repetitive sneezing while resting in a chair. After approximately 15 sneezes over an interval of a few seconds, she developed an ataxic gait veering to the left, clumsiness in the left limbs, dizziness, and slurred speech. She felt persistent nausea and vomited twice while in transit to the emergency room.

The patient had no history of neurological or cardiac disease, hypertension, diabetes mellitus, smoking, recreational drug use, or head trauma. She did not recall any injury to the neck. A general physical examination performed on admission revealed no notable abnormalities, including blood pressure (132/77 mmHg) and temperature (36.5°C). Neurological examination revealed a normal mental state, dysarthria, left partial Horner syndrome with miosis, left-beating horizontal nystagmus, and slight left limb ataxia. The corneal reflex was normal. Her gait was abnormal with veering to the left. The rest of the examination findings were normal.

A brain magnetic resonance imaging (MRI) scan (3.0 T) was performed immediately. Diffusion-weighted imaging (DWI) revealed slightly increased signal intensity in the left lateral medulla (Figure 1A), indicating the presence of hyperacute infarction. Coronal T2-weighted imaging after 6 days clearly

showed the position of the infarct (Figure 1C). CT angiography (CTA) demonstrated a large intraluminal thrombus (about 4 cm) in the left VA (Figure 1D–F). Focal high-grade stenosis of the left VA due to extrinsic compression was identified at the C5–C6 level (Figure 2A). The thrombus appeared to extend from this stenosis. MRI of the cervical spine revealed that the mass adjacent to the left transverse foramen of the C5–C6 vertebrae was a herniated nucleus pulposus (Figure 2B).

Recombinant tissue plasminogen activator was intravenously infused after the first DWI. The patient experienced dramatic clinical improvement. She was also administered an antiplatelet agent (aspirin 200 mg) 24 h later. When cervical CTA revealed extensive thrombus in the left VA, she received a subcutaneous low-molecular-weight heparin followed by oral warfarin for 6 months. At her 3-month follow-up, the patient reported an inability to sneeze despite the occasional urge to do so. She was able to mimic a sneeze on demand, but could never complete a spontaneous sneeze. At her 6-month follow-up, cervical CTA revealed disappearance of both the thrombus and herniated nucleus pulposus and improvement in antegrade filling in the left VA at the C5–C6 level (Figure 2D). She had also recovered her ability to sneeze.

Sneezing is a complex protective respiratory reflex that arises from irritation by mechanical or chemical stimuli of the nasal mucous membrane. Support for the existence and location of a sneezing center comes from experiments demonstrating increased c-fos-like protein in specific areas in the cat brain stem after induced sneezing [1]. In humans, neither the existence nor the location of a sneezing center has been confirmed. In the present case, the rare presentation of sneezing as the initial symptom of an acute LMS was reported. Sneezing at the onset of LMS is usually interpreted as a cause of LMS because a violent sneeze could potentially result in a VA dissection that results in the

Figure 1 (A) Diffusion-weighted imaging (DWI) on the first day revealed slightly increased signal intensity in the left lateral medulla (arrow). (B) Apparent diffusion coefficient (ADC) was hypointense in the corresponding location (arrow). (C) Coronal T2-weighted imaging after 6 days showing a hyperintense signal proximal to the interpolaris–caudalis area of the trigeminal spinal tract and nucleus (arrow). (D–F) Axial, sagittal, and coronal CT angiography demonstrated a large intraluminal thrombus (about 4 cm) in the left vertebral artery (arrow).

development of LMS [2]. However, there was no delay between sneezing and the other brain stem symptoms in our patient, as would be expected if the symptoms were caused by a secondary thrombus over a dissected artery. In addition, the sneezing was unusual for this patient, and the intensity and duration of the sneezes seemed odd. Furthermore, there was no history of neck trauma or neck pain and no conclusive evidence for vertebral artery dissection. The abnormal sneeze paroxysms in concert with the acute neurological deficits also implied a thromboembolic event [3]. Her initial paroxysm may have been secondary to infarction along the afferent trigeminal pathway anywhere in the ventromedial descending trigeminal nucleus or in its projections to a medullary sneezing center, which led to a disengaged sneeze reflex [4]. There are reports of the inability to sneeze secondary to medullary neoplasm, with recovery after surgery [5]. Moreover, another report demonstrated that dysphagia and sneeze reflex improved at similar rates, suggesting that human sneeze center may lie close to the swallowing center [6]. After the deficits, our patient developed an inability to sneeze either spontaneously or after stimulation of the distal right nasal fossa by a cotton tip. Therefore, the presence of sneezing at the onset of LMS does not necessarily imply that dissection is the underlying mechanism.

Furthermore, this case may provide evidence for the existence of a human sneeze area or center located in the lateral medulla.

A spinal disk herniation caused by a tear in the outer fibrous ring of an intervertebral disk allows the nucleus pulposus to bulge out beyond the damaged outer rings. Tears are almost always posterolateral in nature because of the presence of the posterior longitudinal ligament in the spinal canal. Positional vertebrobasilar insufficiency has been related to a herniated cervical disk in some cases [7,8], while VA stenosis caused by lateral bulging of the nucleus pulposus is rare. In our case, the wall of the left VA was compressed to an angle of almost 90 degrees by the nucleus pulposus, resulting in congested blood flow and subsequent thrombus formation. Fortunately, the thrombus disappeared after anticoagulant therapy.

At her 6-month follow-up, cervical CTA revealed disappearance of the herniated nucleus pulposus and no stenosis of the left VA. The nucleus pulposus consists of chondrocyte-like cells, collagen fibrils, and proteoglycan aggrecan that aggregate through hyaluronic chains. Aggrecan is negatively charged and hydrophilic, allowing it to draw water into the nucleus pulposus. Previous studies have noted the disappearance or an obvious decrease in the size of the herniated nucleus pulposus

Figure 2 CT angiography before treatment (A) and contrast-enhanced MR angiography (C) identified focal high-grade stenosis of the left vertebral artery due to extrinsic compression at the C5–C6 level. (B) MRI of the cervical spine revealed that the mass adjacent to the left transverse foramen of the C5–C6 vertebrae was a herniated nucleus pulposus. (D) CT angiography after 6 months revealed disappearance of both the thrombus and herniated nucleus pulposus and improvement in antegrade filling in the left vertebral artery at the C5–C6 level.

with conservative management, and resorption was considered as the mechanism of regression of the herniated nucleus pulposus [9,10].

Abrupt and pathological sneezing patterns should be recognized because they may indicate the possibility of ischemic stroke, particularly in the lower brain stem. This symptom may be a warning of a potentially devastating neurological event, and awareness of sneezing in individuals with stroke could lead to an enhanced understanding of this underreported phenomenon. Furthermore, cervical disk rupture should be included in the differential diagnosis of extrinsic compression of the VA, especially in young and middle-aged adults with no common vascular risk factors.

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Conflict of Interest

The authors declare no conflict of interest.

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