

Acute pontine infarction in a patient with 8-shaped basilar artery fenestration malformation

A case report

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Abstract

Introduction: Cerebrovascular fenestration malformation is a relatively rare vascular dysplasia, and an 8-shaped basilar artery fenestration malformation is even rarer. The characteristics of transcranial Doppler cerebral blood flow in cerebrovascular fenestration malformations have rarely been studied or reported.

Patient concerns: A 58-year-old woman presented with hypertension, diabetes, with no history of smoking or drinking. The patient had no relevant family history. The patient experienced left limb weakness for 2 days, which gradually worsened.

Diagnosis: Head and neck computed tomography angiography revealed an 8-shaped fenestration deformity of the lower segment of the basilar artery with multiple stenoses of the local vessels. Transcranial Doppler cerebral blood flow examination at a depth of 85 cm revealed an eddy current in the lower segment of the basilar artery.

Interventions: Tirofiban was administered intravenously for 3 days and subsequently changed to oral clopidogrel antiplatelet treatment.

Outcomes: The modified Rankin Scale score at 3 months after disease onset was 0, indicating that the patient recovered well after treatment.

Conclusion: A basilar artery 8-shaped fenestration is extremely rare and has seldom been reported. Cerebral vascular fenestration can lead to an acute cerebral infarction and its pathogenesis may include local hemodynamic abnormalities and thrombosis. Eddy currents can be detected by transcranial Doppler cerebral blood flow examination.

Abbreviations: CT = computed tomography, CTA = computed tomography angiography, MRI = magnetic resonance imaging, mRS = modified Rankin Scale, NIHSS = National Institutes of Health Stroke Scale.

Keywords: arterial fenestration malformation, case report, local hemodynamic abnormalities, local thrombosis, transcranial Doppler

1. Introduction

Cerebrovascular fenestration malformation is a relatively rare vascular dysplasia^[1] and an 8-shaped basilar artery fenestration malformation is even rarer.^[2] At present, the pathogenesis of cerebral infarction caused by cerebrovascular fenestration malformations has not been fully clarified^[3,4] and the characteristics of transcranial Doppler cerebral blood flow in cerebrovascular fenestration malformations have rarely been studied or reported. We report a case of acute pontine infarction in a patient with an 8-shaped fenestration deformity of the basilar artery and explore the characteristics of transcranial Doppler cerebral blood flow in a cerebrovascular fenestration malformation.

2. Case presentation

A 58-year-old woman presented with hypertension, diabetes, with no relevant family history and no smoking or drinking history. The patient experienced left limb weakness for 2 days, and the symptoms gradually worsened. The patient presented with unclear speech, left central facial paralysis, and grade 4 muscle strength of the left limb. The left finger-nose test and heel-knee-tibia test were slightly inaccurate. The National Institutes of Health Stroke Scale (NIHSS) score was 3 points. The brain computed tomography (CT) images showed no hemorrhage, while the brain magnetic resonance imaging (MRI) revealed a right pontine acute infarction (Fig. 1A and B). The head and neck CT angiography (CTA) records showed an 8-shaped fenestration

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Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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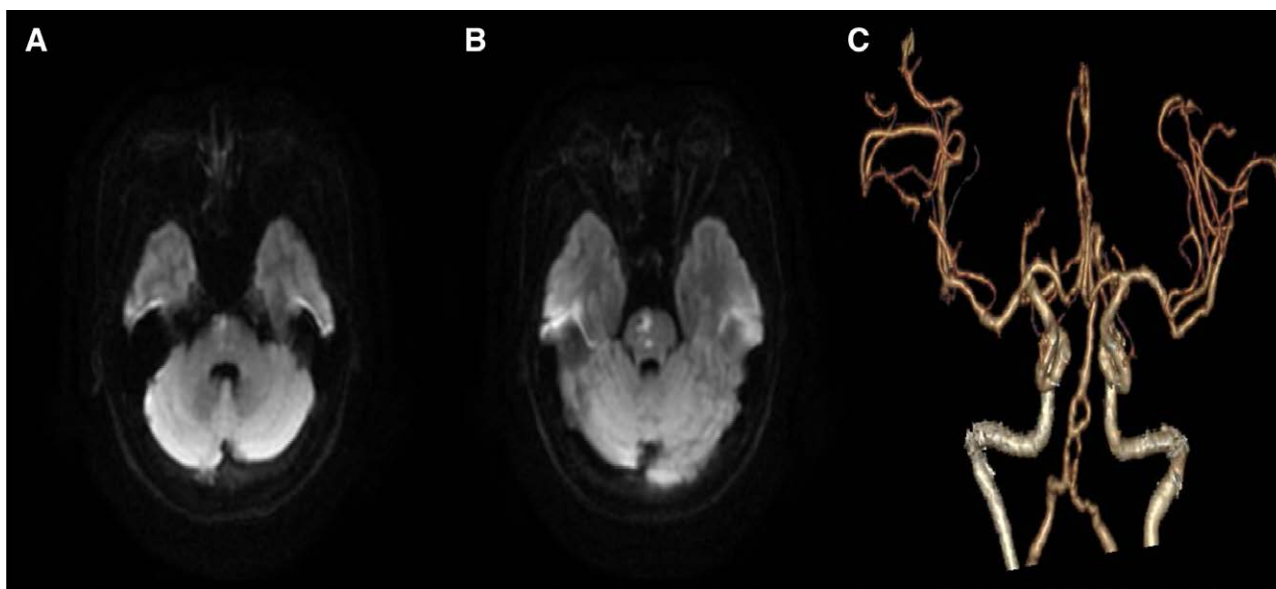


Figure 1. (A, B) Brain magnetic resonance imaging (MRI) findings, suggesting acute right pontine infarction. (C) Head and neck computed tomography angiography (CTA) showing an 8-shaped fenestration deformity in the lower segment of the basilar artery with multiple local stenoses.

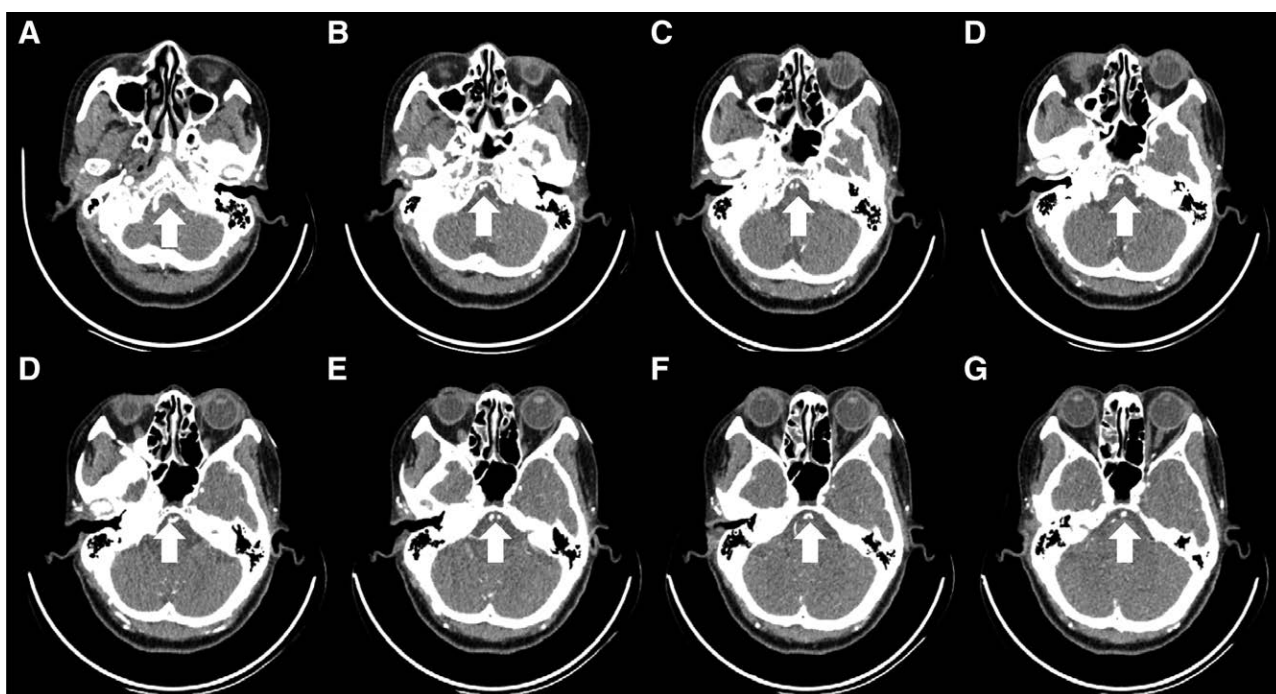


Figure 2. The original CTA images suggested an 8-shaped fenestration deformity in the lower segment of the basilar artery (as shown by the white arrow). The bilateral vertebral arteries merged at the intersection to reach the basilar artery (A). The basilar artery divided into 2 trunks in the lower segment and merged after traveling for some distance (B–D). After merging, the basilar artery divided into 2 trunks again, which in turn finally merged into a single trunk again (E–H). CTA = computed tomography angiography.

deformity of the lower segment of the basilar artery with multiple stenoses of the local vessels (Fig. 1C). To rule out the possibility of aneurysm or dissection, we carefully reanalyzed the original CT angiography image in detail with the assistance of the imaging diagnostic physician. The bilateral vertebral arteries merged at the intersection where the basilar artery was formed (Fig. 2A), and then divided into 2 trunks in the lower segment and subsequently merged again after continuing for a certain distance (Fig. 2B–D). After the merge, the basilar artery further divided into 2 trunks before merging once more (Fig. 2E–H).

Ultimately, an 8-shaped fenestration deformity was observed in the lower segment of the basilar artery. Although cerebral angiography is the gold standard for the diagnosis of cerebrovascular fenestration malformation, the patient and her family members refused to undergo the procedure. Transcranial Doppler cerebral blood flow examination at a depth of 85 cm revealed an eddy current in the lower segment of the basilar artery (Fig. 3).

The patient's symptoms gradually worsened but did not rapidly reach a peak. Combined with the above-mentioned findings, the pathogenesis of the patient did not indicate a cardiogenic

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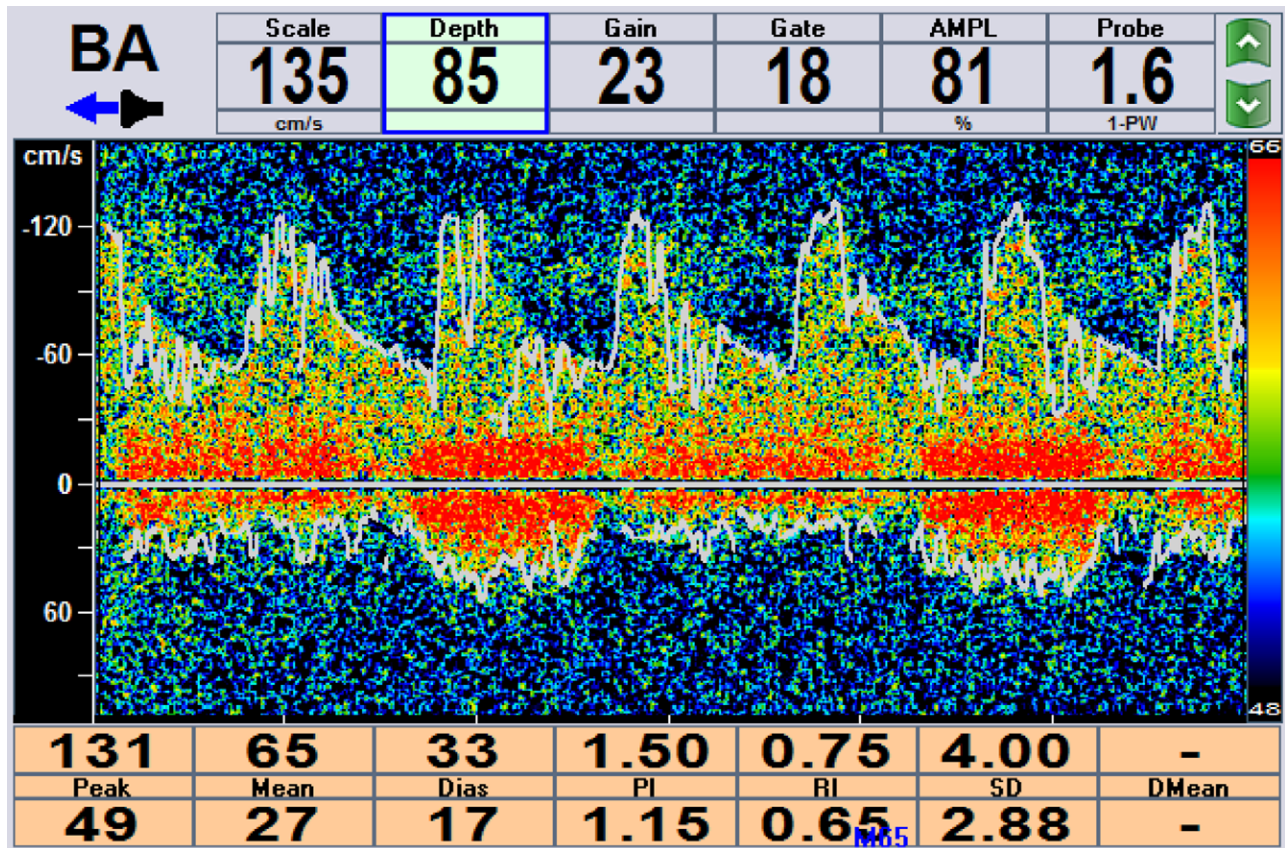


Figure 3. Transcranial Doppler cerebral blood flow examination at a depth of 85 cm revealed an eddy current in the lower segment of the basilar artery.

cerebral embolism. The patient’s right pontine infarction was located in the blood supply region that corresponded to the fenestration malformation of the basilar artery. Moreover, the anterior inferior cerebellar artery was considered to originate from the fenestration malformation. Therefore, the 8-shaped fenestration malformation of the lower segment of the basilar artery was considered the most likely cause of the right pontine acute infarction. Through transcranial Doppler cerebral blood flow examination at a depth of 85 cm, we observed an eddy current in the lower segment of the basilar artery. The pathogenesis of cerebral infarction may involve local hemodynamic abnormalities and local thrombosis. In terms of treatment, tirofiban was administered intravenously for 3 days and subsequently changed to oral clopidogrel antiplatelet treatment. After 1 week of treatment, the patient’s symptoms were completely relieved and she was discharged. The NIHSS score at discharge decreased to 0 points, indicating that treatment was effective. At follow-up, the patient had no new symptoms of acute cerebral infarction and the modified Rankin Scale (mRS) score at 3 months after onset was 0. Written informed consent was obtained from the patient for publication of this case report and its accompanying images.

3. Discussion

Cerebrovascular fenestration malformation refers to the limited repeated division of cerebral blood vessels into 2 branches before converging again after a certain distance.^[4] The incidence of cerebrovascular fenestration malformation is between 1.13% and 2.1%,^[5,6] among which basilar artery fenestration malformation is the most common.^[7]

According to Wu et al,^[5] cerebrovascular fenestration malformations are classified according to shape into slit-like, convex-lens-like, duplication, and irregular types. In the present

case, the basilar artery fenestration deformity was considered irregular. Stark et al^[2] reported a novel case of basilar artery double fenestration, which was complicated with an aneurysm and vertebral artery dissection. Our case of pontine infarction secondary to a basilar artery 8-shaped fenestration deformity is quite rare and has not been reported widely in the world. To the best of our knowledge, our case may be the first report of pontine infarction secondary to a basilar artery 8-shaped fenestration deformity in the world.

Several studies have reported cases of cerebrovascular fenestration associated with acute cerebral infarction and transient ischemic attack with a pathogenesis that may involve local hemodynamic abnormalities and local thrombosis.^[8,9] Transcranial Doppler cerebral blood flow examination at a depth of 85 cm of our patient revealed an eddy current in the lower segment of the basilar artery. We speculated that the specific pathogenesis of the acute pontine infarction may involve local hemodynamic abnormalities and local thrombosis. However, the specific pathogenesis of acute cerebral infarction caused by a fenestration malformation needs to be further explored by enrolling more cases.

In summary, basilar artery 8-shaped fenestrations have rarely been reported in the previous literature. Cerebral vascular fenestration can lead to an acute cerebral infarction and its pathogenesis may include local hemodynamic abnormalities and thrombosis. Eddy currents can be detected using transcranial Doppler cerebral blood flow examination.

Author contributions

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 Methodology: W.Z., W.X.

Project administration: W.Z.

Supervision: J.H.

Writing – original draft: W.Z., W.X.

Writing – review & editing: W.Z., W.X.

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