

Successful basilar artery dilatation in pure bilateral cerebral peduncular infarctions using balloon angioplasty



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Dear Editor,

Cerebral infarctions that are limited to the midbrain are very rare. They accounted for 0.6% of 5940 consecutive cerebral infarctions [1] and 8% of 281 posterior circulation infarctions [2]. A previous study of 14 patients with bilateral cerebral peduncular infarctions (BCPI) reported that the patients had severe clinical symptoms, including large artery atherosclerosis (78.6%), vertebrobasilar artery occlusion or severe stenosis (85.7%), collateral patency of the posterior cerebral artery (PCA) (85.7%), and coexisting infarctions in the pons (85.7%) or cerebellum (42.9%). As a result, most of the patients had poor prognoses (92.9%), and 9 of them died [3].

1. Case report

A 65-year-old woman had been admitted to our hospital with dizziness, weakness of the left hand, and slight speech disturbance 5 days earlier. She was receiving medical treatment for hypertension and diabetes mellitus. Her blood pressure was 151/82 mm Hg, and her pulse rate was 120 beats/min and regular. Her other physical findings were normal. A neurological examination revealed mild left-sided hemiparesis, dysarthria, and gait ataxia (NIHSS: 3). Her blood glucose (177 mg/dL), LDL-cholesterol (173 mg/dL), and HbA1c (6.5%) levels were increased. No abnormalities were detected on an electrocardiogram or chest X-ray. On cerebral magnetic resonance imaging (MRI), diffusion-weighted imaging (DWI) and fluid attenuated inversion recovery (FLAIR) showed a high-intensity area in the right cerebral peduncle (Fig. 1A). Magnetic resonance angiography (MRA) showed severe stenosis of the lower basilar artery (BA) and occlusion of the V4 segment of the left vertebral artery (Fig. 1B). The right PCA was supplied by the posterior communicating artery (PcomA), but the left PCA and superior cerebellar artery (SCA) could not be visualized. Based on a diagnosis of a right-sided cerebral peduncle infarction due to atherosclerosis and severe BA stenosis, aspirin and clopidogrel were

prescribed.

From 18 days after onset, severe dysarthria, dysphasia, and right-sided hemiparesis gradually emerged (NIHSS: 5). DWI/FLAIR MRI revealed an additional left-sided cerebral peduncular infarction, producing the so-called pure Mickey mouse ears sign, which was suggestive of BCPI [4], but no infarctions were seen outside the midbrain (Fig. 1C). However, no marked changes were observed on MRA. A right vertebral angiogram showed severe stenosis of the lower BA, and the left PCA and SCA became opaque for a moment during the injection of the contrast medium (Fig. 1D). A left vertebral angiogram showed occlusion of the V4 segment of the left vertebral artery. The left posterior inferior cerebellar artery supplied both cerebellar hemispheres, and the SCA was retrogradely perfused through a leptomeningeal anastomosis (Fig. 1E). The right PCA was supplied by the PcomA, but the P1 segment could not be visualized. The left PCA was retrogradely perfused by the middle and anterior cerebral arteries through a leptomeningeal anastomosis (Fig. 1F), and the left PcomA was hypoplastic. Balloon angioplasty ameliorated the BA stenosis and resulted in excellent flow through the left PCA and SCA (Fig. 1G). The patient underwent rehabilitation and was discharged 9 months after her initial hospitalization. Her mRS was 2, and her condition did not subsequently worsen.

2. Discussion

We consider that pure BCPI are rare, only occurring in the presence of a specific angioarchitecture; i.e., low hemodynamic perfusion around the BA tip. Fu X et al. reported that pure BCPI are related to BA occlusion or severe stenosis and the absence of collateral circulation through the PCA [5]. The cerebral peduncle is supplied by perforating branches from the thalamoperforating artery, peduncular perforating artery, thalamogeniculate artery, and circumflex branches of the P1 or P2 segment of the PCA. In addition, it also receives blood from the PcomA and anterior choroidal artery [6,7]. In this case, we considered that the perforating arteries (mainly the thalamoperforating artery)

Abbreviations: BCPI, Bilateral cerebral peduncular infarctions; PCA, Posterior cerebral artery; DWI, Diffusion-weighted imaging; FLAIR, Fluid-attenuated inversion recovery; MRI, Magnetic resonance imaging; MRA, Magnetic resonance angiography; BA, Basilar artery; PcomA, Posterior communicating artery; SCA, Superior cerebellar artery; PICA, Posterior inferior cerebellar artery; mRS, modified Rankin Scale; LDL, Low-density lipoprotein; HbA1c, Glycated hemoglobin

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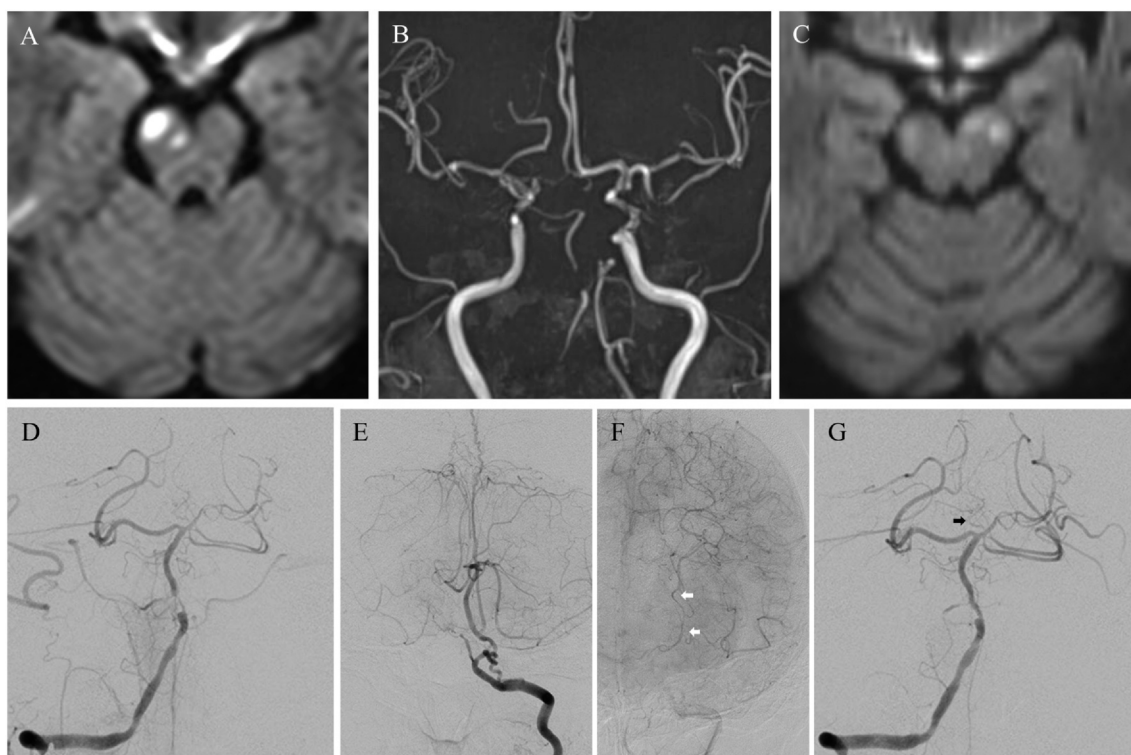


Fig. 1. MRI and angiographic findings.

(A) A diffusion-weighted image obtained 5 days after the onset of the patient's condition, showing a right-sided cerebral peduncle infarction.

(B) MRA image showing severe stenosis of the lower basilar artery (BA) and occlusion of the V4 segment of the left vertebral artery.

(C) A diffusion-weighted image, obtained after 18 days, showing a recurrent left-sided cerebral peduncular infarction.

The infarction produced the so-called Mickey Mouse ears sign, which was suggestive of bilateral cerebral peduncular infarctions.

(D) A right vertebral angiogram showing severe stenosis of the lower BA.

(E) A left vertebral angiogram showing occlusion of the V4 segment of the left vertebral artery (arrow), the left posterior inferior cerebellar artery supplying both cerebellar hemispheres, and retrograde filling of the superior cerebellar artery (SCA) through a leptomeningeal anastomosis.

(F) A left carotid angiogram showing retrograde filling of the left posterior cerebral artery (PCA) (arrows) from the middle and anterior cerebral arteries through a leptomeningeal anastomosis.

(G) A right vertebral angiogram obtained after balloon angioplasty for the BA stenosis. The stenosis had been ameliorated, and excellent flow was seen through the left PCA and SCA. The arrow indicates the thalamoperforating artery coming from the left P1 and supplying the bilateral cerebral peduncles.

coming from the left P1 supplied the bilateral cerebral peduncles. In addition, the left P1 segment functioned as a hemodynamic watershed zone between the antegrade flow from the BA and the retrograde flow from the SCA/PCA, and no collateral flow was seen from the aplastic right P1 or hypoplastic left PcomA, resulting in this extremely rare case of BCPI.

Two cases of pure BCPI without coexisting infarctions outside the midbrain have been reported previously [5,8]. In one of these cases, although antiplatelet drugs were administered, progressive occlusion of the vertebrobasilar artery caused the patient's symptoms to worsen, resulting in his death on the 11th day [5]. To the best of our knowledge, this is the first report of a case of pure BCPI in which balloon angioplasty produced a favorable outcome. BCPI are caused by both severe vertebrobasilar artery stenosis and poor collateral circulation from the PCA. Although there is insufficient evidence to support the use of balloon angiography to treat BA stenosis [9], it might prevent the prognosis of BCPI from worsening. Therefore, we consider that the Mickey mouse ears sign is an indicator of a need for reperfusion therapy.

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Declaration of Competing Interest

None.

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