A Case of Lateral Medullary Artery Arisen from the Posterior Meningeal Artery

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Objective: We encountered a patient with lateral medullary infarction during transarterial embolization of the posterior meningeal artery (PMA). We reviewed the anatomic characteristics/imaging findings of this disorder.

Case Presentation: A 69-year-old male. Cerebral infarction involving the lateral medulla occurred during transarterial embolization of a dural arteriovenous fistula. It was considered to be a complication related to occlusion of a lateral medulla-penetrating vessel on microcatheter/guidewire operations in the PMA. When examining images in detail, the blood vessel could be confirmed using DSA and 3D angiography.

Conclusion: When performing embolization, the presence of a brainstem-penetrating vessel originating from the PMA must be considered.

Keywords ▶ posterior meningeal artery, Wallenberg syndrome, ischemic stroke

Introduction

The posterior meningeal artery (PMA) is a dura-mater-nourishing vessel branching from the vertebral artery (VA), ascending pharyngeal artery (APA), or occipital artery (OA). This blood vessel is latently anastomosed with the posterior inferior cerebellar artery (PICA), and, when infusing a substance for embolization into the PMA, it may stray into the PICA. However, no study has confirmed any nerve-nourishing vessel directly originating from the PMA.

In this study, we report a patient with a lateral medulla-penetrating vessel directly branching from the PMA during treatment for a dural arteriovenous fistula. During embolization, microcatheter/guidewire operations induced occlusion of this blood vessel, leading to lateral medullary infarction. The penetrating vessel could be identified using DSA and 3D angiography. For treatment, the vascular course must be considered. We reviewed its anatomic characteristics/imaging findings.

Case Presentation

A 69-year-old male. He consulted a local clinic with dizziness. Cephalic CT and MRI revealed cerebellar hemorrhage and a dural arteriovenous fistula. A diagnosis of left transverse sinus/dural arteriovenous fistula (Cognard type III) was made based on DSA findings (Fig. 1). Gamma knife therapy was performed. As hemorrhage initially occurred, we speculated that additional hemorrhage might occur before the effects of treatment with a gamma knife appear. The patient was referred to our hospital to undergo transarterial embolization targeting a reduction in blood flow.

Under local anesthesia, endovascular treatment was performed. A shunt point was observed at the parasinus of the left transverse sinus, and reflux of veins (such as the inferior vermaxian vein) on the cerebellar surface was noted. The bilateral OAs and left PMA functioned as a main feeder. Transarterial embolization with n-butyl-2-cyanoacrylate (NBCA) was scheduled. Embolization through the bilateral OAs was successfully achieved. Subsequently, embolization of the left PMA was performed using a Marathon (Covidien Japan, Tokyo, Japan) and TENROU (Kaneka Medix, Osaka, Japan), but it was difficult to guide a catheter...
**Fig. 1** Left vertebral arteriography revealed left transverse sinus/dural arteriovenous fistula (Cognard type III): (A) frontal view and (B) lateral view.

**Fig. 2** (A and B) Ischemic symptoms appeared while operating the site indicated by the arrow head. At an adjacent area, a penetrating vessel (thin arrow) was observed. (C and D) A microcatheter strayed into the penetrating vessel (thin arrow). Subsequent angiography showed a reduction in the visualization of this blood vessel. PICA: posterior inferior cerebellar artery; PMA: posterior meningeal artery.
Infarction Occurred from the Posterior Meningeal Artery

Discussion

The PMA branches from the VA, and is distributed in the dura mater of the posterior cranial fossa.1) Furthermore, a lateral medulla-penetrating vessel branches from the VA trunk or PICA.4–6) In the present case, 3D angiography showed a lateral medulla-penetrating vessel branching from the PMA.

Fig. 3 A lateral medulla-penetrating vessel (arrow) branching from the PMA was observed. (A–C) Left lateral/posterior/superior views on 3D angiography. (D and E) MPR axial view. (F) MRI T2WI of a slice corresponding to Image E. PMA: posterior meningeal artery; MPR: multiplanar reformation; T2WI: T2-weighted images

Fig. 4 MRI DWI showed a high-signal-intensity area on the lateral side of the left medulla. DWI: diffusion-weighted imaging
Furthermore, lateral medullary infarction, which may have been related to occlusion of this blood vessel, occurred.

Several studies reported anomalies, such as the PICA branching from the PMA and PMA branching from the PICA. In the embryonic phase, PICA-PMA anastomotic vessels are present as indicated between embryonic-phase blood vessels; embryologically, a PICA-perfused area may be perfused from the PMA. Furthermore, the PMA branching from the VA originates from the epidural area, showing a course into the cranium through the foramen magnum and reaching the dura mater of the posterior cranial fossa. However, the PMA branching from the intradural VA, as demonstrated in the present case, shows a course involving the subdural cavity before reaching the site of dural distribution. At this site, a lateral medulla-penetrating vessel may be present, as reported for the lateral medullary segment of the PICA.

A study reported a patient who underwent transarterial embolization with glue through the middle meningeal artery (MMA), and developed brainstem infarction related to glue straying into the PMA and posterior spinal artery (PSA). According to the study, MMA-PMA peripheral anastomosis may have led to glue aberration into the PSA. Lateral medullary infarction occurred, as demonstrated in the present case. A penetrating vessel branching from the PMA may be distributed at this site.

### Conclusion

Some brainstem-penetrating vessels directly branch from the PMA. When operating a catheter or guidewire at an area proximal to the site at which the PMA reaches the dura mater, much attention must be particularly paid. It must be considered that embolization at this site may cause brainstem infarction.

### Disclosure Statement

There is no conflict of interest for the main author and coauthors.

### References