

Accessory posterior cerebral artery-posterior cerebral artery anastomosis incidentally diagnosed by magnetic resonance angiography

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Research Article

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Abstract

Purpose

To describe a case of an accessory posterior cerebral artery (PCA)-PCA anastomosis located just distal to the P1-P2 junction.

Methods

A 73-year-old man underwent cranial magnetic resonance (MR) angiography using a 1.5-Tesla scanner. MR angiography was performed using a standard three-dimensional (3D) time-of-flight technique.

Results

Maximum-intensity-projection (MIP) MR angiography showed no pathological arterial lesions. However, the parieto-occipital branch of the right PCA arose from the internal carotid artery (ICA). On MR angiographic source images, a tiny posterior communicating artery (PCoA) arose from the ICA just proximal to the origin of this anomalous artery, indicating that the anomalous artery represented an accessory PCA. Partial MIP images demonstrated a short anastomotic channel between the accessory PCA and normally originating right PCA that supplying the temporal branch located just distal to the P1-P2 junction.

Conclusion

The author reports a case of a congenital short anastomosis between an accessory PCA and the PCA. The accessory PCA most frequently supplies the temporal branch of the PCA; however, in the present case, it supplied the parieto-occipital branch. Although an accessory PCA-PCA anastomosis at the distal P2 segment has previously been reported, the present case demonstrated an anastomosis just distal to the P1-P2 junction. Careful observation of MR angiographic source images is useful for identifying tiny arteries that are not visible on MIP images. Generation of partial MIP images is also valuable for detecting arterial variations.

Introduction

An accessory posterior cerebral artery (PCA), also referred to as a hyperplastic anterior choroidal artery (AChA), arises from the supraclinoid segment of the internal carotid artery (ICA) just distal to the origin of the posterior communicating artery (PCoA) and supplies one of the branches of the PCA [7]. Most accessory PCAs supply the temporal branch of the PCA [1–3, 9, 10, 12]. However, the parieto-occipital and calcarine branches may also arise from the accessory PCA [4–6, 8, 11]. An anastomosis between an accessory PCA and the PCA is extremely rare [11].

Herein, the author reports a case of a right accessory PCA supplying the parieto-occipital branch and anastomosing with the PCA just distal to the P1-P2 junction. Throughout this report, the term “accessory PCA” is used instead of “hyperplastic AChA.”

Case report

A 73-year-old man with vertigo underwent cranial magnetic resonance (MR) imaging and MR angiography using a 1.5-Tesla scanner (MAGNETOM Altea; Siemens Healthineers, Erlangen, Germany). MR angiography was performed using the standard 3-dimensional (3D) time-of-flight (TOF) technique. The imaging parameters were as follows: flip angle, 18°; repetition time, 39.1 ms; echo time, 7.2 ms; slice thickness, 0.7 mm; number of slices, 136; slab thickness, 95.2 mm; field of view, 25.2 × 18.0 cm; and imaging matrix, 304 × 190.

MR imaging showed multiple small ischemic white matter lesions. MR angiography showed no pathological arterial lesions (e.g., steno-occlusive lesions). However, the right parieto-occipital branch of the PCA arose from the supraclinoid segment of the right internal carotid artery (ICA) (Fig. 1). Partial maximum-intensity-projection (MIP) images demonstrated a short anastomotic channel between this anomalous PCA and the normally originating right PCA which supplied the temporal branch (Fig. 2). On MR angiographic source images, the origin of the tiny right posterior communicating artery (PCoA) was identified just proximal to the origin of the anomalous artery, indicating that the anomalous artery represented an accessory PCA. The short anastomotic channel was located just distal to the P1-P2 junction (Fig. 3). A schematic illustration of these arterial variations is presented in Fig. 4.

Neither cranial computed tomography (CT) angiography nor catheter angiography was performed.

Discussion

Using catheter angiography Takahashi et al. [7] reported a prevalence of 2.3% for accessory PCA, indicating that this variation is relatively common. They classified this variation into four types: type 1: hypertrophic uncus branch, type 2: anomalous temporal artery, type 3: anomalous occipitoparietal artery, and type 4: anomalous temporooccipitoparietal artery. In contrast, in a previous MR angiographic study, the author reported an overall prevalence of accessory PCA of 0.55%, with prevalences of 0.47% for type 2 and 0.09% for type 4 [10]. Because type 1 consists of a small artery, it may not be detected by MR angiography. Type 2 was frequently reported [1–3, 9, 10, 12]. Type 3 is less common than type 2; however, several cases, including the present one, have recently been reported [4–6, 8, 11]. The author previously proposed using the terms “accessory PCA” for types 2 and 3 and “replaced PCA” for type 4 [10].

There are several potential embryonic anastomoses between the primitive AChA and PCA [4, 7]. These embryonic connections may account for the various types of accessory PCA. The author previously reported a case of accessory PCA-PCA anastomosis at the distal P2 segment [11]. In contrast, the

present case demonstrated a short anastomosis just distal to the P1-P2 junction. To identify this anastomosis, generation of partial MIP images proved useful (Fig. 2).

For a definitive diagnosis of accessory PCA, identification of the origin of the PCoA just proximal to the origin of the anomalous artery is significant. For this identification, MR angiographic source images are particularly useful for this purpose (Fig. 3). Identification of the normal AChA arising distal to the anomalous artery is also important for differentiating accessory PCA from fetal type PCA or true duplicated PCA [2, 10]. However, Endo et al. [3] recently reported a case of accessory PCA associated with duplicated AChA.

Accessory PCA can be associated with other arterial variations including left vertebral artery arising from distal thoracic aorta [1], duplicate origin of the middle cerebral artery (MCA) and accessory anterior cerebral artery [8] and accessory MCA [9]. These associated vascular variations are likely incidental findings.

Conclusions

The author reports a case of an accessory PCA-PCA anastomosis located just distal to the P1-P2 junction. Careful observation of MR angiographic source images together with generation of partial MIP images is useful for identifying this rare arterial variation.

Declarations

Conflict of interest

The author declares no competing interests.

Ethical approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent for publication

The patient gave his written informed consent for the publication of publishing of his data and figures.

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Author Contribution

AU designed the study and drafted the manuscript. AU critically reviewed the manuscript and read and approved the final manuscript.

Data availability

Not applicable.

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Figures

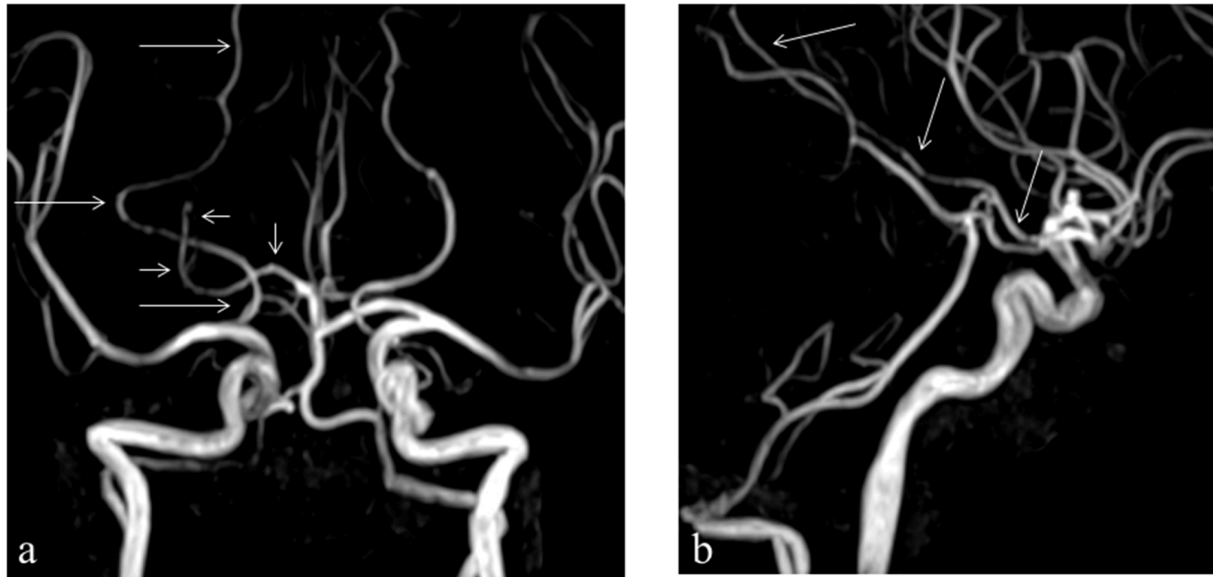


Fig. 1

Figure 1

Anteroposterior (**a**) and right lateral (**b**) projections of maximum-intensity-projection (MIP) images of cranial magnetic resonance (MR) angiography.

The parieto-occipital branch of the right posterior cerebral artery (PCA) arises from the right internal carotid artery (ICA) (*long arrows*). The temporal branch of the right PCA is supplied by normally originating PCA (*short arrows*). The left PCA arises from the ICA, indicating a fetal type PCA.

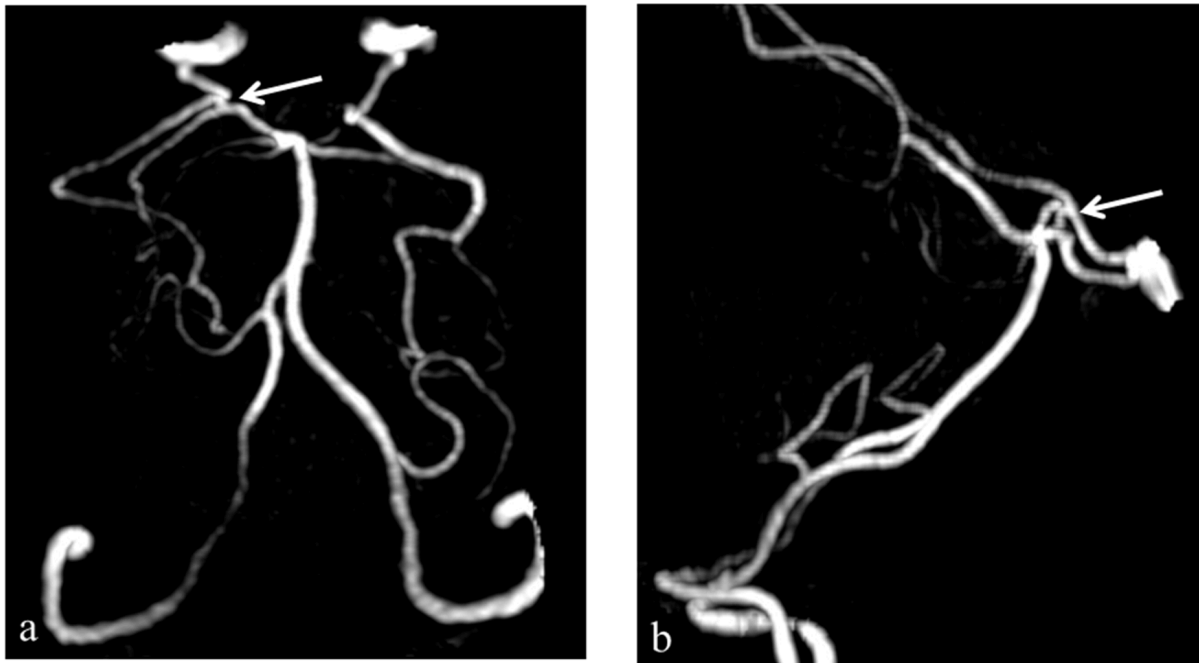


Fig. 2

Figure 2

Inferosuperior (**a**) and right lateral (**b**) projections of partial MIP images of the vertebrobasilar and PCA system.

There is a short anastomotic channel between the two right PCAs (*arrows*).

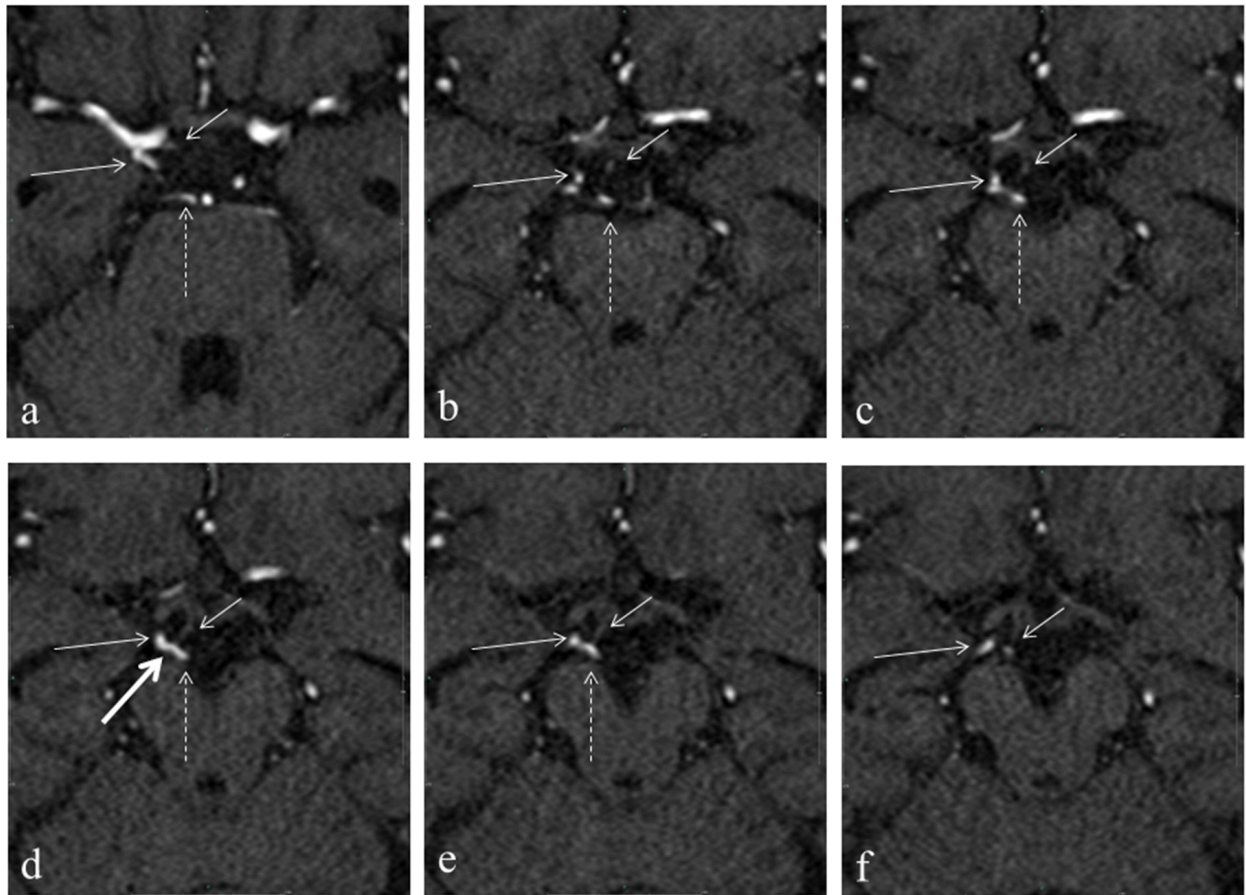


Fig. 3

Figure 3

MR angiographic source images (**a-f**).

There is a tiny right posterior communicating artery (PCoA) (*short arrows*). The anomalous right PCA arises from the ICA just distal to the origin of the PCoA, indicating that the anomalous artery is an accessory PCA (*long arrows*). There is a normally originating right PCA supplying the temporal branch (*dotted arrows*). The *large arrow* in panel **d** indicates anastomotic site between the two PCAs.

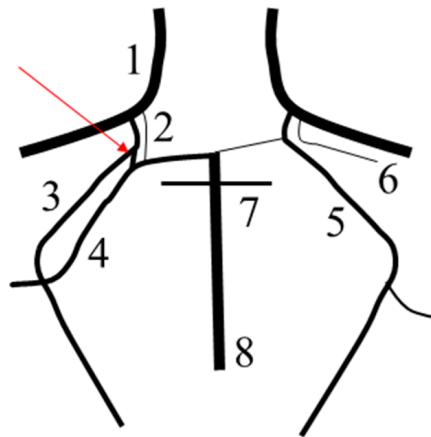


Fig. 4

Figure 4

Schematic illustration of arterial variations of this patient (inferosuperior projection).

1: right internal carotid artery, 2: right posterior communicating artery, 3: right accessory posterior cerebral artery (PCA) supplying parieto-occipital branch, 4: right PCA supplying temporal branch, 5: fetal type left PCA, 6: left anterior choroidal artery, 7: superior cerebellar artery, 8: basilar artery.

The *red arrow* indicates the anastomosis between the right accessory PCA and the right PCA.