Radiology Case Reports 18 (2023) 4419–4421

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Fenestration of the superior cerebellar artery diagnosed by magnetic resonance angiography ☆

Yuki Sonoda, MD[a,*], *Akira Uchino, MD, PhD*[b], *Shinya Kohyama, MD, PhD*[c], *Yasutaka Baba, MD, PhD*[a]

[a] *Department of Diagnostic Radiology, Saitama Medical University International Medical Center, 1397-1, Yamane, Hidaka, Saitama 350-1298 Japan*
[b] *Department of Radiology, Saitama Sekishinkai Hospital, 2-37-20 Irumagawa Sayama, Saitama 350-1305, Japan*
[c] *Department of Endovascular Neurosurgery, Saitama Medical University International Medical Center, 1397-1, Yamane, Hidaka, Saitama 350-1298 Japan*

ARTICLE INFO

Article history:
Received 2 March 2023
Revised 28 August 2023
Accepted 5 September 2023
Available online 9 October 2023

Keywords:
Arterial variation
Fenestration
Magnetic resonance angiography
Superior cerebellar artery

ABSTRACT

We herein report a case of fenestration of the superior cerebellar artery (SCA), which was incidentally diagnosed by magnetic resonance (MR) angiography. A 65-year-old woman was referred to our hospital for unruptured cerebral aneurysms. MR angiography revealed 2 unruptured aneurysms. It also showed fenestration of the left SCA near its origin from the basilar artery, as well as several other vascular variations: a left common carotid artery arising from the brachiocephalic trunk, and a right vertebral artery terminating to the right posterior inferior cerebellar artery. Yearly observation was chosen as a treatment strategy due to the small size of the cerebral aneurysms. According to previous reports, SCA fenestration is an extremely rare variation. This is the second case of SCA fenestration diagnosed by MR angiography in the relevant English-language literature.

Introduction

Fenestrations of cerebral arteries are rare variations caused by incomplete obliteration of several anastomoses in a primitive vascular network or partial failure of the union of paired primitive embryologic arteries. It refers to a vascular segment that separates into 2 channels, each of which unites into a single lumen distally. Fenestration of cerebellar arteries is rare [1–8]. A number of radiological and anatomical studies have been reported, and only 6 cases of superior cerebellar artery (SCA) fenestration have been reported in the relevant English-language literature [3,4,9]. We herein report a case of fenestration of the SCA that was diagnosed incidentally by magnetic resonance (MR) angiography.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

* *Corresponding author*.
E-mail address: ysonoda.diagrad@gmaill.com (Y. Sonoda).

https://doi.org/10.1016/j.radcr.2023.09.023

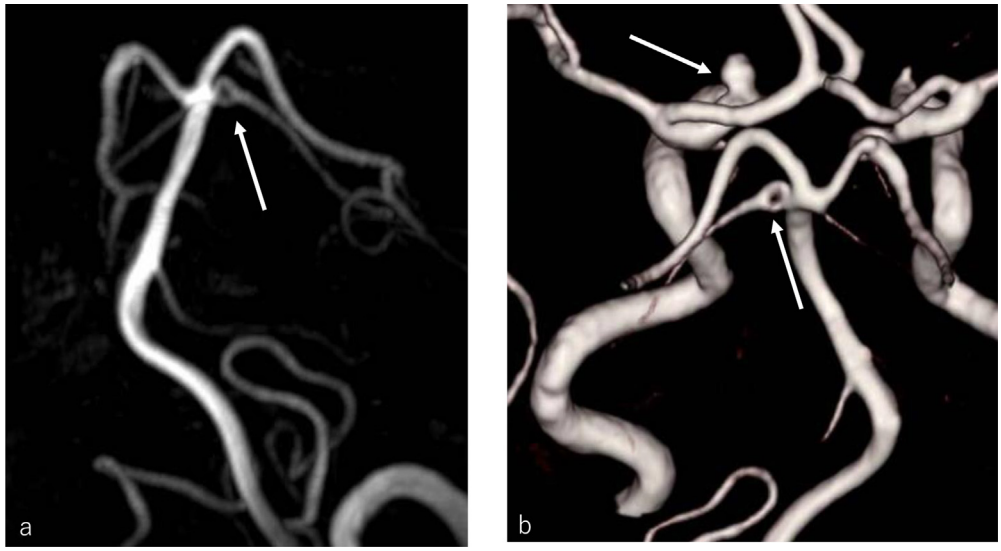

Fig. 1 – A maximum-intensity-projection image of anteroposterior (A) and a volume-rendering image of posteroanterior (B) projections of cranial magnetic resonance angiography. Cerebral arteries comprising the anterior circulation are removed in (A). A single trunk arising from the distal left side of the basilar artery divided into 2 channels near its origin and converged into one channel again, indicating fenestration of the left superior cerebellar artery (SCA) (long arrow). A saccular aneurysm at the ophthalmic segment of the left internal carotid artery was also observed (short arrow). No variations were found in the right SCA or bilateral posterior cerebral arteries.

Case report

A 65-year-old woman was referred to our hospital due to unruptured cerebral aneurysms that were growing in size. Her significant medical history included endometriosis, hypertension, and dyslipidemia. MR angiography images of the aortic arch, neck, and head were obtained using a 3-Tesla scanner (Achieva 3.0 T Philips Medical Systems, Best, the Netherlands). A standard time-of-flight technique was used. The imaging parameters were as follows: repetition time, 21.0 ms; echo time, 3.45 ms; flip angle, 18°; and slice thickness, 0.6 mm. MR angiography revealed fenestration of the left SCA near its origin (Fig. 1). It also showed a 5-mm saccular aneurysm at the ophthalmic segment of the left internal carotid artery, a 4-mm saccular aneurysm at the M1/M2 junction of the left middle cerebral artery, the left common carotid artery originating from the brachiocephalic trunk, and the right vertebral artery continuing to the right posterior inferior cerebellar artery.

Digital subtraction angiography (DSA) was performed to clearly illustrate the configurations of the 2 unruptured aneurysms. It concomitantly revealed that the left SCA originated from the end of the basilar artery (BA) as a single trunk, divided into 2 channels, and coalesced into a single lumen (Fig. 2). Aside from the fenestration, no other SCA anatomical variations were found on either side. Yearly observation was chosen as a treatment strategy for the unruptured aneurysms.

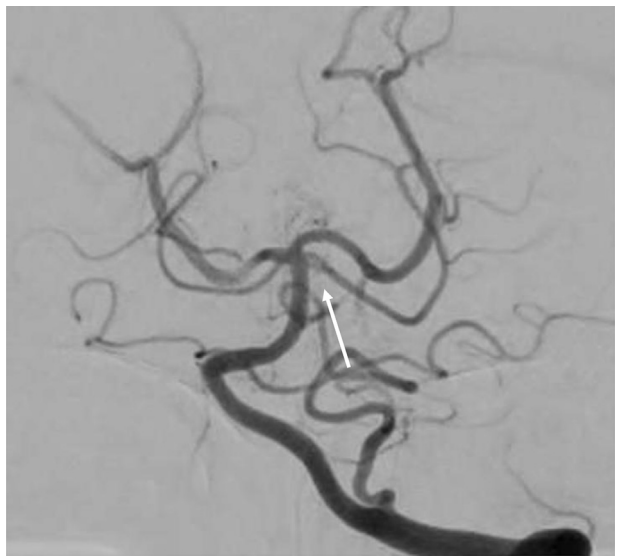

Fig. 2 – Left vertebral digital subtraction angiography in Towne projection shows fenestration of the left SCA (arrow).

Discussion

The SCA typically stems from the upper part of the BA and divides into 2 trunks: the rostral trunk and the caudal trunk. The

rostral trunk supplies the cerebellar vermis, part of the pineal gland, and the superomedial surface of the cerebellar hemisphere, while the caudal trunk perfuses the surface lateral to the area supplied by the rostral trunk [10].

While the SCA is considered to be most consistent of the infratentorial arteries, several variations have been reported. Duplication of the SCA refers to 2 distinct arteries arising from the BA, and ending as the rostral and caudal trunks. Early bifurcation is defined as bifurcation occurring in the proximal part of the anterior pontomesencephalic segment of the SCA. SCA-posterior cerebral artery (PCA) common trunk describes a circumstance where the P1 segment of the PCA and the SCA share an origin. In a previous study utilizing computed tomography (CT) angiography, the prevalence of duplication, early bifurcation, SCA-PCA common trunk, and SCA arising from the P1 segment of the PCA was reported to be 17.6%, 9.4%, 4.9%, and 4.7%, respectively [11]. Porzionato et al. [12] reported a unique case with a double origin of the SCA, where 2 distinct SCAs arising from the BA converged into one artery before bifurcating into the rostral and caudal trunks. Care must be taken to differentiate double origin of the SCA from SCA fenestration, where the artery arises as a single trunk from the BA before splitting into 2 channels.

There have been 6 cases of SCA fenestration reported in the relevant English-language literature: one case diagnosed by MR angiography [9]; 1 case diagnosed by 3-dimensional DSA in a retrospective study of 208 consecutive cases [3]; and 4 cases diagnosed by CT angiography in a retrospective study of 395 consecutive cases [4].

In previous studies, the prevalence of cerebral artery fenestration ranged from 0.7% to 41% [1–8]. This difference may arise from the different methodologies and various patient populations. Fenestration of the cerebellar artery is rare. Pekcevik et al. [11] suggested that cerebellar arteries are small vessels and that fenestration of these vessels may facilitate occlusion. In such cases, cerebral infarction does not occur due to the presence of the other channel. In rare cases, vascular complications involving fenestration, such as aneurysm formation at its proximal bifurcation, may occur. However, the clinical significance of SCA fenestration is limited, since it is usually asymptomatic.

The SCA is usually small and its proximal part travels in a limited infratentorial space. This poses a diagnostic challenge in MR angiography and CT angiography. With these imaging modalities, blood vessels can appear to be fused together, when smaller vessels are located in close proximity. Moreover, variations that resemble SCA fenestration, such as duplication and early bifurcation, account for a quarter of such cases. Unless an SCA fenestration is sufficiently large and takes a form that is distinct from other variations that it resembles, it may be difficult to detect or accurately diagnose by CT angiography or MR angiography. A reliable estimation of the prevalence of SCA fenestration would require investigations involving a large number of cadavers or DSA studies. No case of SCA fenestration was reported in a study that utilized 10,927 consecutive DSA images [5], or a cadaver study that investigated 333 brains [8].

Conclusions

The author diagnosed a case of fenestration of the SCA using MR angiography. This is the seventh case reported in the relevant English-language literature.

Patient consent

Informed consent was obtained from the patient for publication of the case report.

REFERENCES

[1] Sanders WP, Sorek PA, Mehta BA. Fenestration of intracranial arteries with special attention to associated aneurysms and other anomalies. AJNR Am J Neuroradiol 1993;14:675–80.

[2] Bharatha A, Aviv RI, White J, Fox AJ, Symons SP. Intracranial arterial fenestrations: frequency on CT angiography and association with other vascular lesions. Surg Radiol Anat 2008;30:397–401. doi:10.1007/s00276-008-0340-7.

[3] van Rooij SBT, van Rooij WJ, Sluzewski M, Sprengers MES. Fenestrations of intracranial arteries detected with 3D rotational angiography. AJNR Am J Neuroradiol 2009;30:1347–50. doi:10.3174/ajnr.A1563.

[4] Bayrak AH, Senturk S, Akay HO, Ozmen CA, Bukte Y, Nazaroglu H. The frequency of intracranial arterial fenestrations: a study with 64-detector CT-angiography. Eur J Radiol 2011;77:392–6. doi:10.1016/j.ejrad.2009.09.015.

[5] Cooke DL, Stout CE, Kim WT, Kansagra AP, Yu JP, Gu A, et al. Cerebral arterial fenestrations. Interv Neuroradiol 2014;20:261–74. doi:10.15274/INR-2014-10027.

[6] van Rooij SBT, Bechan RS, Peluso JP, Sluzewski M, van Rooij WJ. Fenestrations of intracranial arteries. AJNR Am J Neuroradiol 2015;36:1167–70. doi:10.3174/ajnr.A4236.

[7] Wu X, Chen X, Zhu J, Chen Q, Li Z, Lin A. Imaging detection of cerebral artery fenestrations and their clinical correlation with cerebrovascular diseases. Clin Imaging 2020;62:57–62. doi:10.1016/j.clinimag.2020.01.012.

[8] Krystkiewicz K, Ciszek B, Szylberg Ł, Tosik M, Harat M. Morphological analysis of cerebral artery fenestrations and their correlation with intracranial aneurysms. World Neurosurg 2021;156:e85–92. doi:10.1016/j.wneu.2021.08.137.

[9] Uchino A. Cerebral arterial variations and anomalies diagnosed by MR angiography. In: Takahashi S, editor. Neurovascular imaging. London: Springer-Verlag; 2010. p. 225–8. doi:10.1007/978-1-84882-134-7_5.

[10] Hardy DG, Peace DA, Rhoton AL Jr. Microsurgical anatomy of the superior cerebellar artery. Neurosurgery 1980;6:10–28.

[11] Pekcevik Y, Pekcevik R. Variations of the cerebellar arteries at CT angiography. Surg Radiol Anat 2014;36:455–61. doi:10.1007/s00276-013-1208-z.

[12] Porzionato A, Macchi V, Massaro L, Morra A, Sarasin G, Rambaldo A, et al. Double origin of the superior cerebellar artery associated with homolateral haemorrhagic infarction of cerebellum. Folia Neuropathol 2016;54:410–17. doi:10.5114/fn.2016.64820.