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Case Report

Supraclinoid internal carotid artery fenestration from which the posterior communicating artery arising with infundibular dilatation at its origin diagnosed by magnetic resonance angiography[☆]

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ABSTRACT

A 72-year-old man with vertigo underwent cranial magnetic resonance (MR) imaging and MR angiography using a 3.0-Tesla scanner. MR angiography showed an aneurysm-like lateral protrusion from the left supraclinoid internal carotid artery (ICA) and infundibular dilatation of the left posterior communicating artery at its origin. After creating both partial maximum-intensity-projection images and partial volume-rendering images, a fenestration of the supraclinoid ICA was found. The posterior communicating artery arose from the fenestrated segment, and its origin was dilated triangularly, indicating infundibular dilatation. Cerebral arterial fenestration is not so rare, but it is rarely found at the ICA. The majority of recently reported cases had an associated aneurysm at the proximal end of the fenestration diagnosed using three-dimensional rotational angiography (3DRA). MR angiography is noninvasive and widely used for the screening of cerebral arterial lesions. Even though 3.0-Tesla scanner, special resolution of MR angiography is much lower than that of the 3DRA. For the diagnosis and confirmation of this rare variation, partial maximum-intensity-projection images and/or partial volume-rendering images are useful.

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Introduction

Cerebral arterial fenestration is not so rare, but it is rarely found at the internal carotid artery (ICA). The supraclinoid segment is the most prevalent. However, because of its rarity, the prevalence has not been reported. The majority of recently reported cases of supraclinoid ICA fenestration had an asso-

ciated aneurysm at the proximal end of the fenestration [1–5], and most patients were examined using three-dimensional rotational angiography (3DRA).

The author herein reports a case of supraclinoid fenestration without an associated aneurysm but with infundibular dilatation of the posterior communicating artery at its origin that arose from the fenestrated segment. This extremely rare variation was diagnosed using magnetic resonance (MR)

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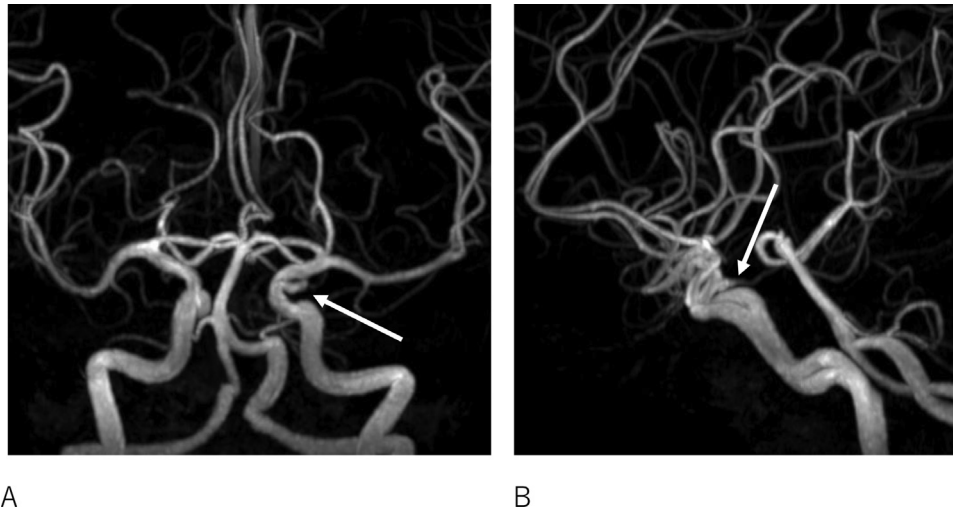


Fig. 1 – Anteroposterior (A) and left lateral (B) projections of maximum-intensity-projection (MIP) magnetic resonance (MR) angiography show an aneurysm-like lateral protrusion from the left supraclinoid internal carotid artery (ICA) and infundibular dilatation of the left posterior communicating artery (PCoA) at its origin (arrows).

angiography with the creation of partial maximum-intensity-projection (MIP) images and partial volume-rendering (VR) images.

Case report

A 72-year-old man with vertigo underwent cranial MR imaging and MR angiography using a 3.0-Tesla scanner (Signa Architect; GE Healthcare, Milwaukee, WI). MR angiography was performed using a standard 3D time-of-flight technique. The imaging parameters were as follows: flip angle, 17°; repetition time, 23.0 s; echo time, 3.4 s; and slice thickness, 0.8 mm.

MR imaging showed multiple nonspecific small white matter lesions, but the findings were otherwise normal. MR angiography showed an aneurysm-like lateral protrusion from the left supraclinoid ICA and infundibular dilatation of the left posterior communicating artery (PCoA) at its origin (Fig. 1). After creating both partial MIP and VR images, a fenestration of the supraclinoid left ICA was found. There was no associated aneurysm, but the left PCoA arose from the fenestrated segment, and its origin was dilated triangularly, indicating infundibular dilatation (Fig. 2). Therefore, the lesions associated with his symptoms could not be identified on either MR imaging or MR angiography.

Finally, he was clinically diagnosed to have benign paroxysmal positional vertigo. Neither computed tomography (CT) angiography nor catheter angiography was performed. The patient was treated conservatively with a good clinical course.

Discussion

Arterial fenestrations result from fusion failure or persistence of the primitive arterial network during the early embryonic

stages. Using 3DRA, van Rooij et al [1] reported that the most common location of cerebral arterial fenestration was the anterior communicating artery. They found only one supraclinoid ICA fenestration among 59 intracranial fenestrations. As mentioned in the Introduction, the most prevalent location of ICA fenestration is the supraclinoid segment, and the majority of supraclinoid ICA fenestrations had an associated aneurysm at the proximal end of the fenestration, probably due to congenital weakness of the arterial wall and hemodynamic stress [1,3–5]. Extremely rarely, intracavernous fenestration of the ICA was reported [6].

Haryu et al [5] classified supraclinoid ICA fenestration into 3 types (Figs. 3A–3C): Type A, where the fenestration is located proximal to the origin of the PCoA; Type B, where the PCoA arises from the distal end of the fenestration; and Type C, where the PCoA arises from the fenestrated segment. Type A includes tiny fenestrations [7,8], whereas Types B and C are usually large, located between the origin of the superior hypophyseal artery (SHA) and the PCoA [5]. One of the 2 channels is usually small in caliber. Our patient had a Type C fenestration without an aneurysm, but there was infundibular dilatation at the origin of the PCoA. Type C supraclinoid ICA fenestration should not be confused with duplicate origin of the PCoA, in which 2 branches of the PCoA arise separately from the supraclinoid ICA and quickly fuse to form a triangular ring (Fig. 3D) [9].

Radiologically, 3DRA is the gold standard for the evaluation of cerebral arterial lesions. Although 3DRA is invasive, for preoperative work up of cerebral aneurysm, it is important and necessary [1–3,5]. CT angiography is less invasive than 3DRA, but its usefulness is limited [7]. MR angiography is noninvasive and widely used for the screening of cerebral arterial lesions. Even though 3.0-Tesla scanner, special resolution of MR angiography is much lower than that of 3DRA. As presented in Fig. 2, the creation of partial MIP and/or VR images is useful and important for the diagnosis of rare arterial variations. Tiny fenestrations mimic an aneurysm [7] or a floating throm-

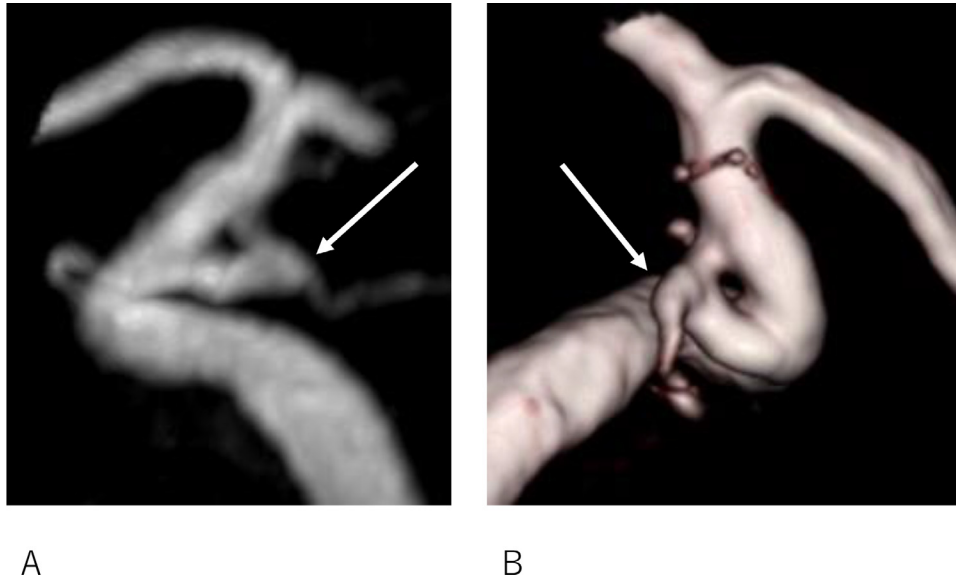


Fig. 2 – Lateral projection of partial MIP MR angiography of the left ICA (A) and posteroanterior projection of partial volume-rendering MR angiography of the left ICA (B) clearly show fenestration of the supraclinoid ICA from which the PCoA arises association with infundibular dilatation at its origin (arrows). ICA, internal carotid artery; MIP, maximum-intensity-projection; MR, magnetic resonance; PCoA, posterior communicating artery.

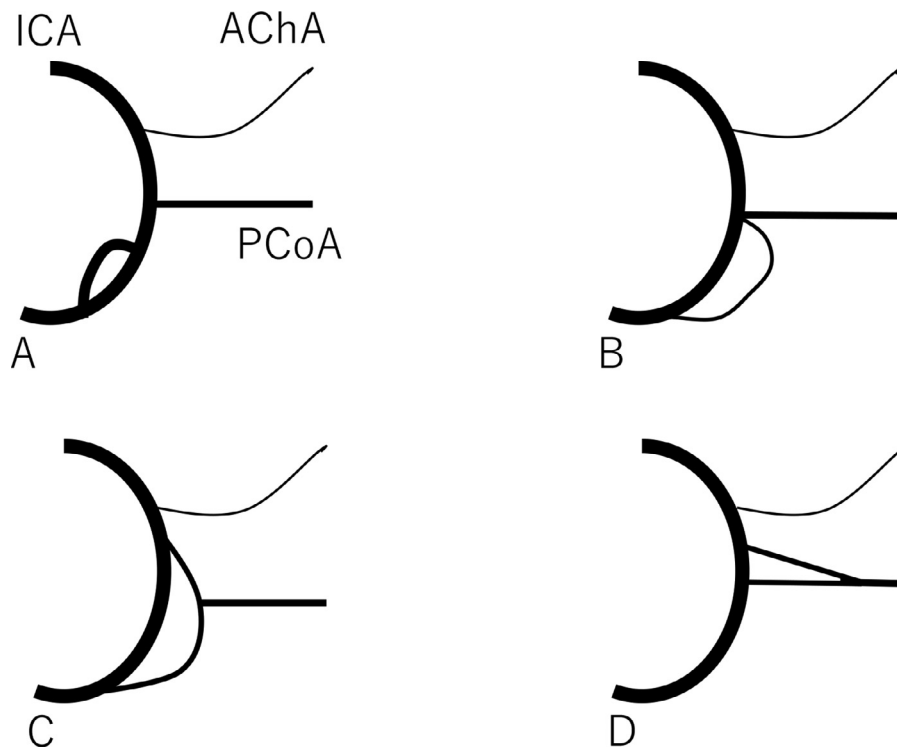


Fig. 3 – Schematic illustrations of the supraclinoid ICA fenestration (Modified from References 5 and 9). (A) Haryu's type A, fenestration is located proximal to the origin of the posterior communicating artery (PCoA). (B) Haryu's type B, the PCoA arises from the distal end of the fenestration. (C) Haryu's type C, the PCoA arises from the fenestrated segment. The present case has type C fenestration, and there is infundibular dilatation at the origin of the PCoA. (D) Duplicate origin of the PCoA, not a fenestration of the ICA. AChA, anterior choroidal artery; ICA, internal carotid artery.

bus [8]. The fenestration of our patient was large, but it was initially suspected of being an aneurysm on anteroposterior projection of routine MR angiography. While extremely rare, the possibility of fenestration should be considered in cases with an ICA aneurysm at the level of the SHA.

As in my patient, cases with a funnel-shaped origin of the PCoA are defined as “infundibular dilatation”, which is also seen at the origins of the anterior choroidal artery and hypoplastic P1 segment of the posterior cerebral artery [10]. Small aneurysms should not be confused with this common variation.

Conclusion

The author diagnosed a case of supraclinoid ICA fenestration using MR angiography. The PCoA arose from the fenestrated segment, and its origin had an infundibular dilatation. For the diagnosis and confirmation of this rare variation, partial MIP and/or VR images are useful.

Patients consent

Informed consent was obtained from the patient for publication of the Case Report.

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