Association of cerebral arteriovenous malformation with cerebral arterial fenestration

**Abstract** Cerebral arteriovenous malformations (AVMs) are rarely associated with other vascular lesions. Our goal was to examine the incidence of the coexistence of cerebral AVMs and cerebral arterial fenestrations. During the past 18 years, 51 patients with a cerebral AVM were examined with selective cerebral angiography in our institution. We retrospectively reviewed these cerebral angiographies and noted associated cerebral arterial fenestrations. We found five fenestrations distributed among 3 patients. In each patient one fenestration was located in the vertebral artery (VA). In 1 patient there were additional basilar and left middle cerebral artery fenestrations. Vertebral artery angiography was performed in 43 of the 51 patients; thus, the frequency of coexistence of AVM and VA fenestration was 7% (3 of 43). Although the clinical significance may not be great, we found a noteworthy incidence of associated VA fenestrations in AVM cases.

**Key words** Cerebral arteriovenous malformation · Vertebral artery · Arterial fenestration · Cerebral angiography

**Introduction**

Vertebrobasilar artery fenestrations are the most common fenestrations of the cerebral arteries, followed by middle cerebral artery (MCA) fenestrations [1]. The angiographically determined incidence of fenestrations is reported to be 0.3–0.6% for the basilar artery (BA) and 0.2–2.2% for the vertebral artery (VA) [1, 2, 3]. Basilar artery fenestrations are relatively frequently associated with an aneurysm at the proximal end of the fenestration [1, 4, 5]. Vertebral artery fenestrations are rarely associated with cerebral arteriovenous malformation (AVM) [6, 7, 8]. However, to our knowledge, there is no previous paper which reports the incidence of the coexistence of a cerebral AVM and a cerebral arterial fenestration.

**Materials and methods**

Between January 1982 and December 1999, 51 patients with cerebral true AVM who were treated at our institution underwent selective cerebral angiography. Cavernous angiomas, capillary tel-angiectasias, and developmental venous anomalies were not included in this study. There were 24 men and 27 women whose ages ranged from 5 to 74 years (mean age 37 years). The AVMs were located supratentorially in 44 patients and infratentorially in 7. Among these 51 patients, a total of 76 carotid and 43 VA angiographies were performed with biplane stereoscopic projections or monoplane digital subtraction angiography. A total of 119 angiograms were reviewed retrospectively by an experienced neuroradiologist (A.U.). Informed consent for this study was not obtained because this was not an experimental prospective study; it was a clinical retrospective study.

**Results**

We found five fenestrations among three patients. Each of them had one VA fenestration; one had an additional BA and left MCA fenestrations. The frequency of coexisting AVM and VA fenestration was 7% (3 of 43).
**Fig. 1 a, b** Case 1. Lateral and anteroposterior projections of left vertebral angiography. Small arrows indicate a faintly opacified arteriovenous malformation (AVM) in the left medial frontoparietal lobes. A true duplication-type fenestration of the left VA is apparent at the level of the craniovertebral junction (large arrows).

Case 1

A 19-year-old man initially experienced a generalized tonic–clonic convulsion. Cranial CT showed a slightly increased attenuation lesion in the medial part of the left frontoparietal lobes. Subsequent left internal carotid angiography demonstrated a large cerebral AVM fed mainly by the left anterior cerebral artery. Left VA angiography was also performed, and it showed a true duplication type of fenestration of the left VA at the level of the craniovertebral junction (Fig. 1). Surgical removal of the AVM was performed.

Case 2

A 58-year-old healthy man suddenly experienced severe neck pain followed by severe occipitalgia and several episodes of vomiting. Emergency cranial CT showed a subarachnoid hemorrhage. On the day after the CT, four-vessel cerebral angiography was performed, and left VA angiography demonstrated not only an AVM supplied mainly by the anterior spinal artery at the cervicomedullary junction, but also a true duplication type of fenestration of the left VA at its terminal portion (Fig. 2). Since the bilateral carotid angiograms showed no abnormality, we concluded that the AVM was the source of the subarachnoid hemorrhage. The AVM was treated conservatively.