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Angiographic and CT-angiographic appearance of middle cerebral artery fenestration in a patient with spontaneous subarachnoid hemorrhage

Fenestracja tętnicy środkowej mózgu w angiografii konwencjonalnej i angio-TK u pacjenta z samoistnym krwotokiem podpajęczynówkowym

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Summary

Background:	Fenestration of middle cerebral artery (MCA) is a rare anatomic variant. We report a case of a patient after subarachnoid haemorrhage (SAH) with MCA fenestration diagnosed with conventional angiography and CT angiography (CTA) without evidence of vascular malformation. To our knowledge this is the first report of MCA fenestration diagnosed with CTA.
Case report:	Thirty-year-old woman was admitted to the hospital due to sudden severe headache. Emergency CT revealed slight SAH. CTA did not show aneurysm or other vascular malformation. However fenestration of proximal right MCA was shown. Initial and follow-up cerebral angiographies confirmed the presence of fenestration and lack of associated vascular malformation.
Conclusions:	Our case illustrates that CTA is a good method to visualize fenestration. In our opinion in patients without intracranial hemorrhage CTA might not be followed by angiography. However in patients with hemorrhage conventional angiography should be performed to exclude small aneurysm at the site of fenestration.
key words:	arterial fenestration • middle cerebral artery • subarachnoid hemorrhage • cerebral angiography • CT angiography
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Background

Fenestration of middle cerebral artery (MCA) is a rare anatomic variant. Its incidence in angiographic examinations ranges between 0.17–0.43% [1–3]. In anatomic studies the incidence is higher – about 1% [4]. The relationship between MCA fenestration and the presence of vascular malformations remains controversial.

We report a case of a patient after subarachnoid haemorrhage (SAH) with MCA fenestration diagnosed with conven-

tional angiography and CT angiography (CTA) without evidence of vascular malformation.

Case report

Thirty-year-old woman, previously healthy, was admitted to the hospital due to sudden severe headache. Neurologically she demonstrated meningeal signs, with no focal deficit.

Emergency CT revealed slight subarachnoid hemorrhage, most prominent in right Sylvian fissure. CT angiography did

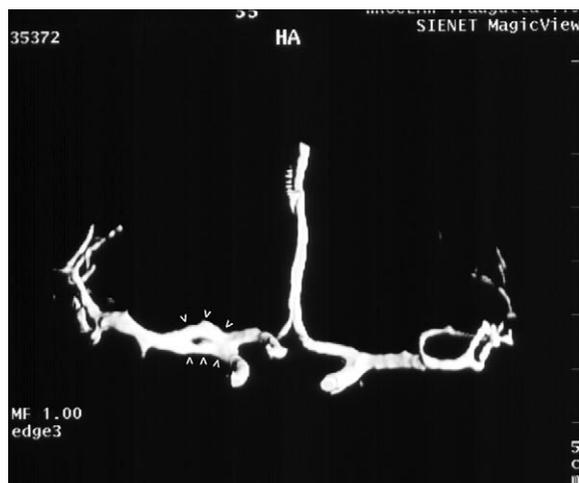


Figure 1. CT angiography (VRT reconstruction) shows fenestration of M1 segment of right MCA (arrows). No aneurysm or other vascular malformation is visible.

Rycina 1. Angiografia TK (rekonstrukcja VRT) wykazuje fenestrację odcinka M1 prawej MCA (strzałki). Nie uwidoczniiono tętniaka ani innej malfemacji naczyniowej.

not show aneurysm or other vascular malformation. However fenestration of proximal MCA was shown (Figure 1).

The patient underwent cerebral angiography which confirmed the presence of right MCA fenestration. The duplicated fragment involved the proximal part of M1 segment, between internal carotid artery (ICA) bifurcation and the first division of MCA (Figure 2). Besides there was small focus of additional opacification in the anterior communicating artery (AcoA) complex which was interpreted as arterial loop but should have been differentiated with small

aneurysm. Therefore follow-up angiography was recommended.

The patient's symptoms gradually disappeared and she was discharged from the hospital 30 days after the onset of the disease.

Three months later she was admitted again to perform follow-up angiography. On admission, no clinical and neurological symptoms were found.

Follow-up carotid angiography in routine and additional projections allowed exclusion of aneurysm in AcoA complex. Again, no other vascular malformations were visualized. The appearance of right MCA fenestration did not change comparing with previous study.

Discussion

The most frequent fenestrations of intracranial arteries are that of vertebral (VA) and basilar (BA) arteries. Angiographic incidence of VA fenestration is reported to be 0.2–2.2% and BA fenestration 0.3–0.6% [5]. MCA fenestration, according to Uchino et al. is the third most common one [5]. This is compatible to material of Sanders et al. who analyzed 5190 cerebral angiograms and found 38 fenestrations in 37 patients (0.71%) including 16 located on BA, 10 on VA and 9 on MCA (0.17%) [1]. Gailloud et al. found 5 MCA fenestration in the material of 1466 cerebral angiograms (0.43%) [2].

The relationship between fenestration and cerebral aneurysms and other vascular malformations remains unclear. Most of the authors claim that fenestrations do not influence the incidence of vascular malformations. Sanders et al. found 13 aneurysms in 37 patients with fenestration, but only one of them was located at the site of fenestration [1].



Figure 2. Right carotid angiography, arterial phase: a) non-subtracted image; b) subtracted image. Fenestrated fragment is well demonstrated (arrows). No aneurysm or vascular malformation is visible.

Rycina 2. Angiografia prawej tętnicy szyjnej, faza tętnicza. a) obraz bez subtrakcji; b) obraz z subtrakcją. Dobrze uwidocznienie fenestracji (strzałki). Nie uwidoczniono tętniaka ani innej malfemacji naczyniowej.

They conclude that incidence of the aneurysms at the site of fenestration does not exceed that of other circle of Willis's bifurcations. Gailloud et al. described 5 cases of MCA fenestration, none of them was associated with vascular malformation [2]. Finlay et al. performed hemodynamic studies of the fragments of fenestrated vessels and found no difference between edges of fenestration and bifurcations of other cerebral arteries [6].

On the other hand several authors described some cases of fenestrations associated with vascular malformations. Uchino et al. found 5 fenestrations in 51 patients with arteriovenous malformations, one of them located on MCA [4]. San-Galli et al. reported 4 cases of fenestrations of variable cerebral arteries associated with intracranial aneurysms [7]. Ueda et al. described a patient with MCA fenestration and four cerebral aneurysms, one of them located at the site of bifurcation [8]. Lazar et al found MCA fenestration during the operation of internal carotid artery (ICA) aneurysm [3]. Deruty et al. presented a patient with ruptured aneurysm of ACoA and unruptured aneurysm of fenestrated MCA [9].

Most of the cases mentioned above have been not associated with intracranial hemorrhage. The only case of ruptured aneurysm at the site of MCA fenestration we found in the literature was described by Nakamura et al. [10]. They reported ruptured aneurysm located at proximal end of MCA fenestration, confirmed angiographically and surgically.

In our case there was hemorrhage in the Sylvian fissure on the side of fenestrated MCA, however no aneurysm has been found both on first and follow-up angiography and on CTA. The possible reason is microaneurysm which could not be visible on vascular studies. The other possibilities are worse resistance of the fenestrated vessel's wall (despite the results of Finlay et al. studies mentioned above) or incidental coincidence of SAH and fenestration.

To our knowledge there were no previous reports concerning CT angiography in arterial fenestration. In our case visualization of fenestration with CTA was not inferior to angiographic appearance.

Conclusions

We believe our case illustrates that CTA is a good method to visualize fenestration. In our opinion in patients without intracranial hemorrhage CTA might not be followed by angiography. However in patients with hemorrhage conventional angiography should be performed to exclude small aneurysm at the site of fenestration.

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