ARTERIOVENOUS MALFORMATION ASSOCIATED WITH BILATERAL MEDIUM CEREBRAL ARTERY DUPLICATION

M Sabau[1], A Comanescu[1], T Maghiar[1], I Popa[2]
[1]Medicine and Pharmacy Faculty, University of Oradea
[2]"Iuliu Hatieganu" Medicine and Pharmacy University, Cluj Napoca

ABSTRACT

Cranial magnetic resonance angiography (MRA) performed in a 23 old patient who presented for a generalized tonico-clonic seizure revealed the association between an AVM and bilateral duplication of MCA. The duplicated MCA did not supply the AVM.

Key words: arteriovenous malformation, duplicated middle cerebral artery, magnetic resonance angiography

INTRODUCTION

Congenital cerebral vascular abnormalities involving the middle cerebral artery (MCA) are unfrequently found. The 3 most common intracranial variations involving MCA are: duplicated MCA, accessory MCA and fenestrated MCA. (1-3) According to the Teal classification (4) when the 2 vessels originate from the distal end of the internal carotid artery (ICA), the condition is called a duplicated MCA. The term accessory MCA is used when the anomalous vessel originates directly from the anterior cerebral artery (ACA). It runs parallel to the course of the MCA and supplies some of the MCA territory: duplicated MCA typically supplies the anterior temporal lobe and accessory MCA typically supplies anterior frontal lobe.

The association between vascular anomalies and an AVM is an unfrequent finding. We present the case of a young man in whom MRA disclosed bilateral duplication of MCA and an AVM supplied by one of the MCA, but not by the duplicated one.

CASE PRESENTATION

A 23 year old patient, with unremarkable past history, was admitted for a generalized tonico-clonic seizure during the night service of the emergency department. The seizure was accompanied by bitten tongue and loss of sphincterian control, and was followed by a confusional state.

The patient was alert and oriented in time and space; he could not recall the events before getting into the ambulance. A right pyramidal syndrome was revealed on physical examination.

An native CT scan disclosed an inhomogeneous area of hypodensity and hyperdensity with calcifications in the left parietal lobe. CT scan with contrast reveals important enhancement (Figura 1, 2)

The CT was suggestive for an AVM that was confirmed by MRI: the inhomogeneous area had a typical aspect of an AVM with small areas of cavernoma and was situated in the left sylvian fissure with extension deep in the white matter of the parietal lobe. (Figura 3, 4)

Author for correspondence:
Monica Sabau, Medicine and Farmacy Faculty, University of Oradea, 1 December Square, Oradea, Romania
email: sabau.monica@yahoo.com

MRA in arterial and venous time disclosed a giant AVM, supplied by the left MCA, drained through the superficial venous system consisting in the superior longitudinal sinus and the lateral sinus and through the deep venous system consisting in Galien vein and the straight sinus. (Figura 5, 6, 7, 8). Cavernoma areas were present too, and the AVM was intricate in the cerebral tissue. The left abnormal vessel was pushed upright forward by the AVM, and branched out vessels for the parietal and frontal area. It did not feed the AVM.

MRA arterial time disclosed bilateral duplication of MCA. (Figura 5 is the better image for the bilateral duplicated MCA)

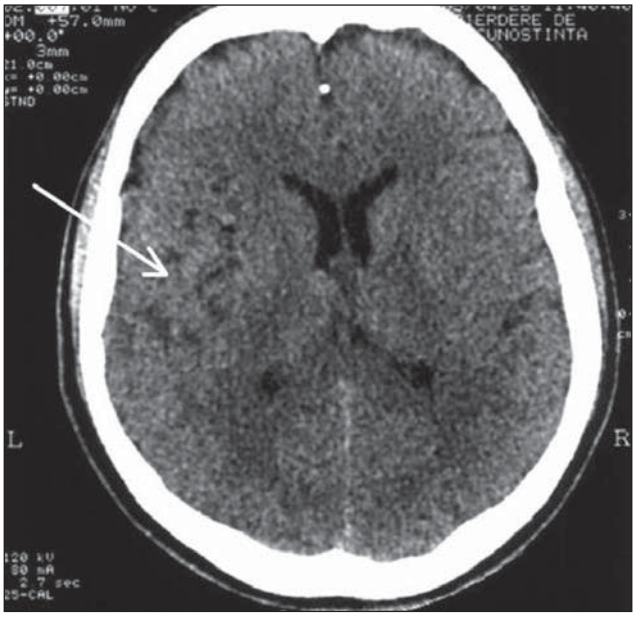

Figure 1. *CT*

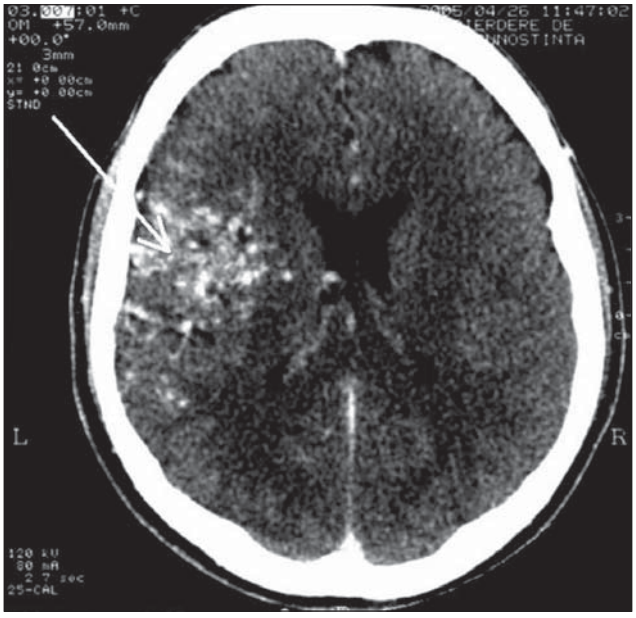

Figure 2. *Contrast CT*

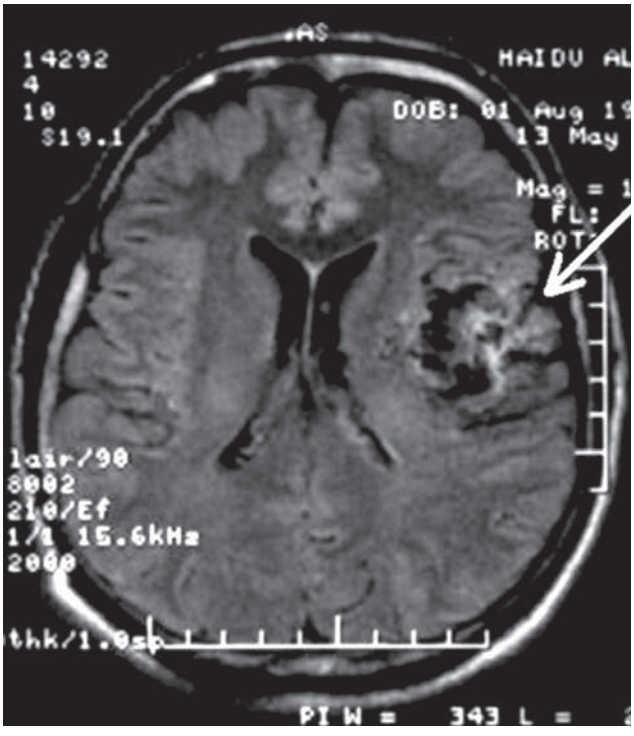

Figure 3. *MRI*

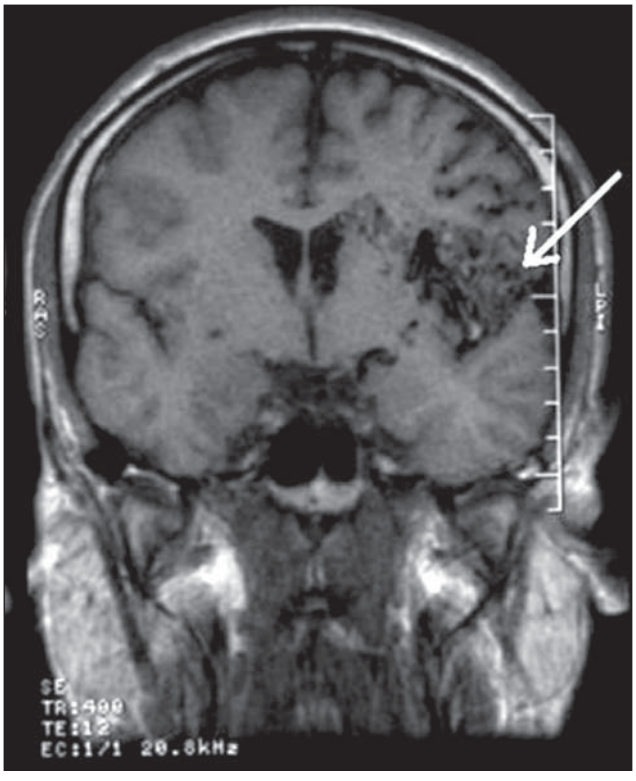

Figure 4. *MRI*

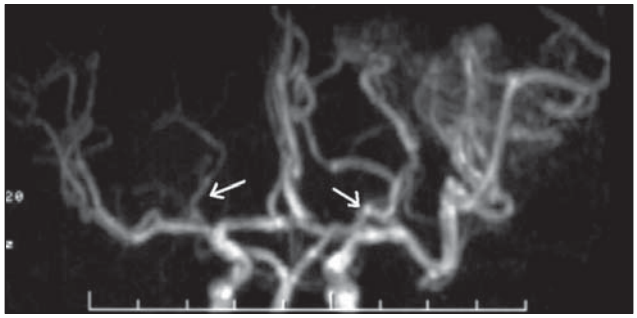

Figure 5. *MRA arterial*

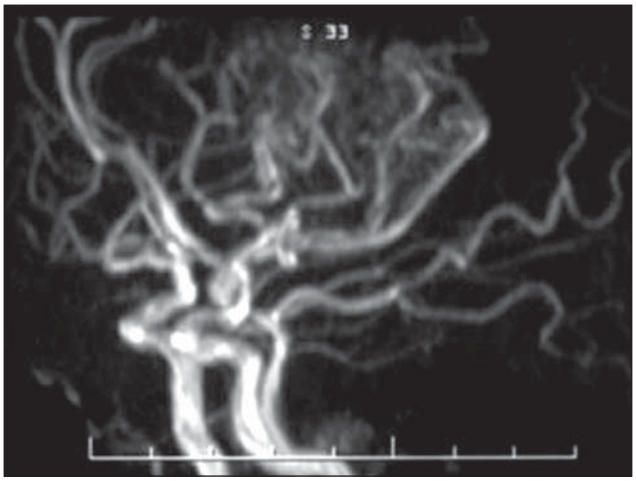

Figure 6. *MRA arterial*

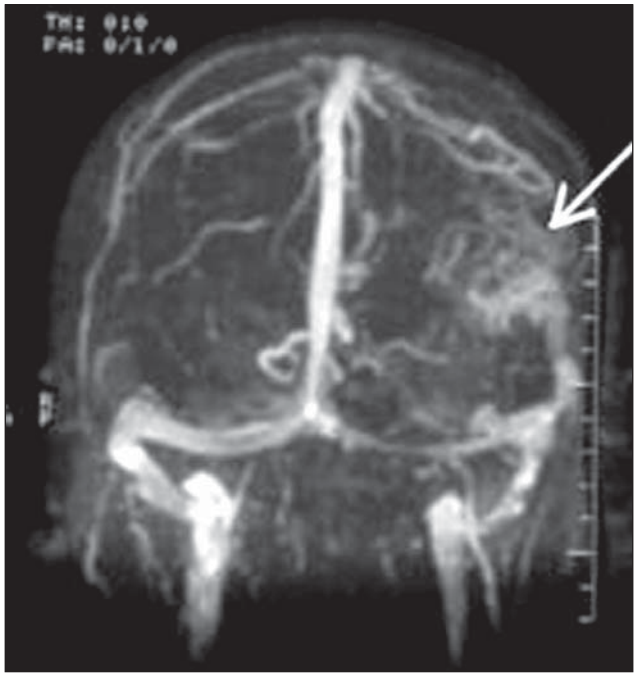

Figure 7. *MRA venous*

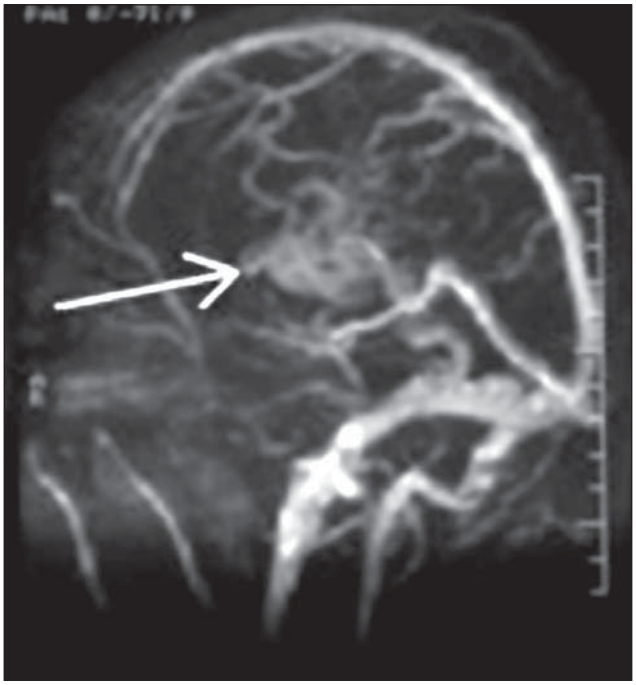

Figure 8. *MRA venous*

DISCUSSION

Embryological, ACA is considered to be continued by ICA. MCA develops subsequent to ACA, so it can be considered a branch of ACA. MCA is defined in the 7-12 mm embryo as a bud of ICA proximal to ACA. In the 16-18 mm embryo MCA becomes more prominent and its branches irrigate the whole hemisphere. (5,6).

A consensus about the development of MCA anomalies is not established yet. First it was Handa, followed then by other authors (6-10) who said that these anomalous vessels (duplicated or accessory MCA) are hypertrophic and/or modified variants of the recurrent artery of Heubner (RAH).

Teal (4) does not confirm that theory, emphasizing that these arterial variants also have perforating branches, have parallel course with MCA, they coexist with RAH and they may be multiple.

Manelfe (cited by 3, 11) sais that MCA initially is a bud of ICA and ACA which develops lately as a distinct entity. Distinct buds may develop from that primary axis, being situated before or after MCA.

According to that, Manelfe describes 3 types of accessory MCA, type 1 corresponding to the duplicated MCA after Teal, type 2 and type 3 originating proximally or distally in A1 and corresponding to type 1 and 2 after Teal.

The duplicated MCA has a parallel course to MCA and usually supplies the anterior region of the temporal lobe. The accessory MCA distributes to the frontal lobe.

Analysing the vascular abnormality of this patient, respectively the origin of the 2 vessels in the ICA, according to previous reports (1-13), it is duplication that will be defined after the classification of Teal, the one which is accepted now.

The both vessels have initially a parallel course to MCA. The AVM dislocates upwards and forwards the branches of the duplicate MCA, thus they distribute to parietal and posterior frontal areas on the left hemisphere. The duplicated MCA distributes to the temporal lobe on the right hemisphere, just right according to the above mentioned description.

We could not define the deep branches, their sizes being smaller than the sensibility of the method. It was obvious that the duplicated MCA did not supply the AVM.

The presence of these abnormalities of MCA may consist circulatory supply (14), or, on the contrary, lead to lesions with atypical localization, requiring great efforts for diagnosis and treatment. (15)

Numerous cases of association between accessory MCA or duplicated MCA with aneurisms or with moya-moya are reported. (16-21)

The association between these abnormalities and an AVM consists an unfrequent finding as AVM is rarely known to be associated with other types of vascular abnormalities (22,23).We found one similar, but not identical reported case, in which the duplication was unilateral and the duplicate MCA was feeding the AVM (24).

CONCLUSION

The presented case is a rare association: AVM and bilateral duplication of MCA.

REFERENCES

1. Uchino A, Kato A, Takase Y, Kudo S – Middle cerebral artery variations detected by magnetic resonance angiography, Eur Radiol, 2000;10:560-563
2. Umansky F, Durovny H, Ausman JJ, Diaz FG, Mirchandami HG: Anomalies and variations of the middle cerebral artery: a microanatomical study, Neurosurg, 1998;22:1023-1024
3. Kim M.S, Hur J W, Lee J W, Lee HK – Middle Cerebral Artery Anomalies Detected by Conventional Angiography and Magnetic Resonance Angiography, J Korean Neurosurg Soc, 2005;37: 263-267
4. Teal S J, Runbaugh L C, Bergeron RT, SEgall I H – Anomalies of the Middle Cerebral Aartery: Accessory, Duplication and Early Bifurcation, Am J. Rontgenology, 1973;118 (3):567-575
5. Komiyama M, Nakajima H, Nishikawa M, Yasui T- Middle Cerebral Artery Variations: Duplicated and Accessory Arteries, Am J Neuroradiol 1998;19 (1):45–49
6. Arslan EB, Öztürk A, Oðuz KK. Incidental bilateral accessory middle cerebral arteries on MR imaging and MR angiography, Diagn Interv Radiol 2007;13:10-12
7. Handa J, Shimizu Y, Matsuda M, Handa H – The accessory middle cerebral artery: report of furter two cases, Clin Radiol, 1970:21: 415-416
8. Tran-Dinh H. The accessory middle cerebral artery: a variant of the recurrent artery of Heubner (A. centralis longa)? Acta Anat1986;126:167–171
9. Takahasi S, Hoshino F, Uemura K, Takahashi A, Sakamoto K – Accesory middle cerebral artery is a variant form of the recurrent artery of Heubner?, Am J Neuroradiol, 1989;10:563-565
10. Hong J T, Huh PW, Cheng DD, Kye DK, Cheo KS, Kim DS, et all – Accesory middle cereral artery, J Korean Neurosurg Soc, 1997;26:435-438
11. Abanou A, Lasjaunias P, Manelfe C, Lopez-Ibor L. The accessory middle cerebral artery (AMCA): diagnostic and therapeutic consequences, Anat Clin 1984;6:305–309
12. Park IS, Huh PW, Lee GS, Choi CR – Duplication of the middle cerebral artery – case report, J Korean Neurosurg Soc, 1993;22:1026-1028
13. Tacconi L, Johnson FG, Symon L- Accesory middle cerebral artery – case report, J Neurosurg 1995;83:916-918
14. Mueller DD, Sato Y, Yuh WT – Accesory middle cerebral artery as a source of collateral blood flow, Am J Neuroradiol, 1991;12:1223-1224
15. Gao F, Jiang WJ. Transient ischemic attack associated with stenosis of accessory middle cerebral artery: a case report. Clin Neurol Neurosurg. 2009;111(7):588-590.
16. Yasargil MG, Smith RD. Association of middle cerebral artery anomalies with saccular aneurysms and moyamoya disease. Surg Neurol 1976;6:39–43
17. Elmac I, Balacioglu F, Ekinci G, Erzen C, Pamir N – Middle cerebral artery duplication associated with multiple intracranian aneurismus. Case report, J Neurosurg Sci, 2001;45: 232-234
18. Han D M, Gwok H S, Chung C K – Aneurysm at the origin of accessory middle cerebral artery associated with meddele cerebral artery aplasia: case report, Surg Neurol, 1994;42:388-391
19. Stabler J: Two cases of accessory middle cerebral artery including one with aneurysmus at the origin, Br J Radiol, 1970;43:314-318
20. Nakamura T, Houkin K, Saitoh H, Abe H. Aneurysm of the anterior communicating artery associated with accessory middle cerebral artery--case report, Neurol Med Chir (Tokyo). 1997;37(10):747-51.
21. Kwak R, Kuwahara K, Niizuma H, Suzuki J. Anomalies of the middle cerebral artery with intracranial saccular aneurysms: duplication and fenestration. Neurol Surg 1979;7:691–696
22. Uchino A, Kato A, Abe M, Kudo S. Association of cerebral arteriovenous malformation with cerebral arterial fenestration, Eur Radiol. 2001;11(3):493-496
23. Nakai Y, Yasuda S, Hyodo A, Yanaka K, Nose T. Infratentorial arteriovenous malformation associated with persistent primitive trigeminal artery--case report., Neurol Med Chir (Tokyo). 2000;40(11):572-4.
24. Noguchi S, Shigemori M, Hara K, Ishibashi A, Watanabe M, Kuramoto S. (A case of duplication of the middle cerebral artery associated with arteriovenous malformation of the temporal lobe) No Shinkei Geka. 1988;16(1):81-4.