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CASE REPORT

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Bilateral accessory middle cerebral arteries associated with an aneurysm of the anterior circulation

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An accessory middle cerebral artery is one variation of the intracranial vasculature that may be a source of misinterpretation by clinicians dealing with cerebrovascular diseases. We report a case of an elderly female found to have bilateral accessory middle cerebral arteries, who presented with the rupture of an aneurysm of the anterior part of the circle of Willis. Accessory middle cerebral arteries are rare anatomical findings and the bilateral occurrence is exceedingly rare. We believe this to be the first report of bilateral accessory middle cerebral arteries associated with an aneurysm of the anterior cerebral-anterior communicating arteries. The anatomical and clinical relevance of this variation is described.

Key words: variation, accessory, middle cerebral artery, aneurysm

INTRODUCTION

Variations of the middle cerebral artery (MCA) have been reported by various authors [3, 5–7, 9, 17, 20–22]. One rare variation is an accessory MCA. Some have specified that when this vessel arises from the anterior cerebral or anterior choroidal arteries it should be termed an accessory MCA and that when it arises from the internal carotid artery it should be identified as a duplicated MCA [14, 18]. This arterial variation has been reported to occur in approximately 0.2 to 4% of autopsy and angiographic studies [1–3, 9, 11–13, 19, 21, 22]. Manelfe [12, 20, 24] classified these anatomical curiosities into types 1, 2 and 3, as they originate from the distal internal carotid artery, proximal anterior cerebral artery and distal anterior cerebral artery respectively. This classification has been modified so that types 1 and 2 may be regarded as identical vessels [11, 12].

We report a patient who presented with subarachnoid haemorrhage, in whom magnetic resonance angiography (MRA) revealed bilateral accessory middle cerebral arteries and an anterior cerebral-anterior communicating arterial aneurysm.

CASE REPORT

We report a 67-year-old female who presented with the sudden onset of severe headache and vomiting. Physical examination revealed some mild left upper extremity weakness. Evidence of subarachnoid haemorrhage was seen on a head CT scan. A subsequent MRA revealed a large aneurysm of the anterior cerebral-anterior communicating arterial system and bilateral accessory MCA (Fig. 1–3). On the left side the accessory artery originated from the first segment of the anterior cerebral artery (type 2 accessory MCA), while the right accessory MCA had a common stem with the main MCA (type 1 accessory MCA).

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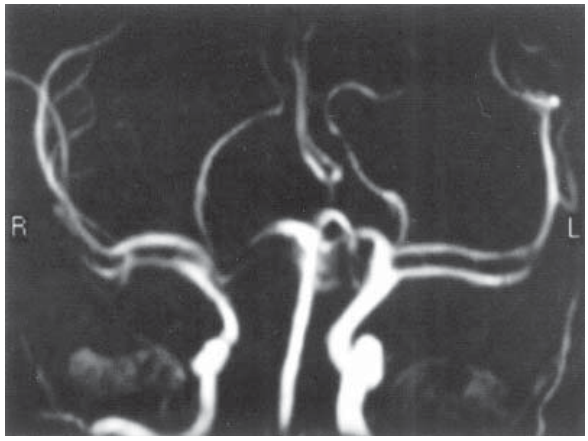

Figure 1. Angiogram (carotid injection), noting the bilateral accessory MCA.

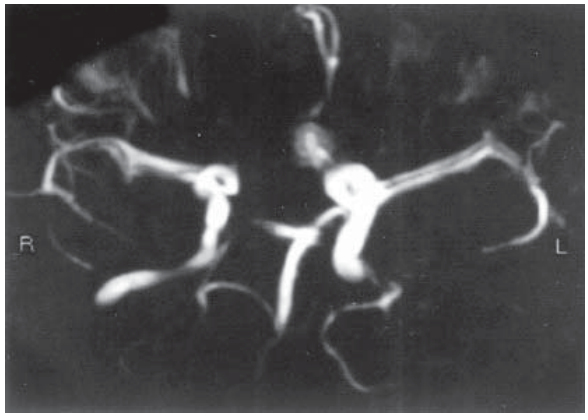

Figure 2. Angiogram again noting the bilateral accessory MCA and anterior cerebral artery complex aneurysm.

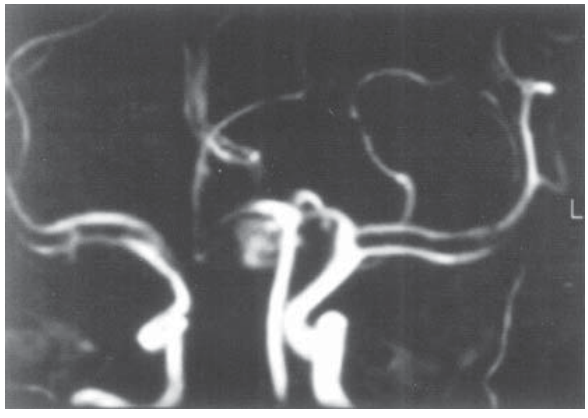

Figure 3. Angiogram demonstrating another angle of the bilateral accessory MCA and aneurysm of the anterior circulation.

This patient has not undergone surgery and continues to be treated conservatively. She continues to have some mild left upper extremity weakness.

DISCUSSION

Variations of the MCA are usually found as an incidental angiographic finding [8, 11]. Umansky et al. [22] found only three cases of accessory MCA (one type 1 and two type 2) after dissecting 104 brains. Variations such as these may lead to erroneous interpretations of transcranial Doppler findings and inadvertently affect the management of stroke patients [23]. Some have postulated that the presence of an accessory MCA may provide a collateral blood supply to the territory of the main MCA and partly compensate for its occlusion, thus leading to an improved prognosis in patients with disease of this vessel [11, 23].

An accessory MCA has been regarded by some as the remnant of the recurrent artery of Heubner [7, 10, 11, 22]. However, the coexistence of these two vessels has confused this theory. Takahashi et al. [18] concluded that an accessory MCA often (44%) has perforating branches and that this vessel could be considered a persistent form of various descendants of anastomotic channels between the anterior cerebral artery and the MCA, one of which is a normal predecessor of the recurrent artery of Heubner. It is of note that Loukas et al. [15] found a double recurrent artery of Heubner in 17% of 69 human brains. Grand and Hopkins [6] have stated that accessory MCAs are merely early branches of MCA and supply the anterior temporal region and give rise to large perforators. These authors go further to say that true accessory MCAs originate from the A2 segment of the anterior cerebral artery. Manelfe hypothesised that accessory MCAs are simply additional outward buds of the internal carotid or anterior cerebral arteries [12]. Yamamoto et al. [24] postulated that true accessory MCAs are residual congenital arteries. Komiyama et al. [12] speculated that the accessory MCA is a ramification of the early branches of the MCA that may occur either proximal or distal to the origin of the main MCA trunk. They also postulated that early proximal and distal branches supply the anterior temporal and frontal lobes respectively and both may have perforating branches. However, the so-called early branches of MCA are reportedly cortical rather than perforating and the perforating branches of the first segment of MCA arise from the posteromedial aspect of this artery.

Bilateral accessory MCAs appear to be extremely rare. Gibo et al. [5] reported one duplicated and one accessory MCA in the same case. Jain [9] described one case of bilateral duplicated MCAs from 300 brains. Neither of these two cases was described as being associated with an intracranial aneurysm. Interestingly,

Uchino et al. [20] reported a case of a right accessory MCA that was associated with a contralateral fenestrated MCA. Dong et al. [4] reported a patient with a fenestrated anterior cerebral artery, a left duplicated MCA, and a right accessory MCA. This patient was also found to have a saccular aneurysm at the origin of the left internal carotid artery. Uchino et al. [21] also reported a patient with an accessory MCA, duplicated MCA, and the rupture of a saccular aneurysm associated with the duplicated vessel. Whether these aneurysms are the results of congenital defects in the arterial wall or stem from acquired haemodynamic disturbances is controversial [8, 16]. It is not known if the incidence of rupture of aneurysms associated with these MCA variations is greater or not [16]. It is notable that Yamamoto et al. [24] found an arteriovenous malformation at the origin of a duplicated MCA and that 7 out of 14 true accessory MCAs (Manelfe type 2 or 3) were associated with aneurysms of the anterior communicating artery. We are unaware of other cases such as ours that report bilateral accessory MCAs with an aneurysm of the anterior cerebral-anterior communicating parts of the circle of Willis.

Clinicians and radiologists dealing with cerebrovascular diseases should consider the variations of MCA in the interpretation of clinical and neuroimaging findings.

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