CASE REPORT

Triplication of the Middle Cerebral Artery Associated with Fenestration of the Anterior Cerebral Artery

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Abstract

A case with anomalies of the intracranial arteries, i.e. triplication of the middle cerebral artery associated with fenestration of the anterior cerebral artery, is reported. The terminology, clinical relevance and etiology of these anomalies are discussed.

Key words: anomalies of the cerebral arteries, cerebral angiography, fenestration of the anterior cerebral artery, triplication of the middle cerebral artery

Introduction

Anomalies of the middle cerebral artery are less common than those of other major cerebral arteries.1 Duplicate, accessory and fenestrated middle cerebral arteries have occasionally been demonstrated by postmortem or angiographic examinations.1–5 In this paper, we describe a rare case of anomalies at the carotid fork: viz. a triplicate middle cerebral artery originating from the terminal portion of the internal carotid artery associated with fenestration at the horizontal segment of the anterior cerebral artery.

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Case Report

A 55-year-old man had suffered from cerebral infarction two years previously, which had resulted in mild left hemiparesis as a sequela. He was admitted to this hospital because of exacerbation of the left hemiparesis.

Cranial CT on admission revealed a low attenuation area in part of the territory

Fig. 1 (A) Anteroposterior (A), lateral (B), and magnified oblique (C) view of a left carotid angiogram showing a triplicate middle cerebral artery (large arrow) originating from the terminal portion of the left internal carotid artery, and fenestration, or large ring formation (small arrow), at the origin of the left anterior cerebral artery.
of the right middle cerebral artery. A right carotid angiogram indicated moderate stenosis of the right internal carotid artery at its origin, but there was no evident stenosis or occlusion in the intracranial arteries. A left carotid angiogram also disclosed moderate stenosis at the origin of the left internal carotid artery. A triplicate middle cerebral artery originating from the terminal portion of the left internal carotid artery and fenestration, or large ring formation, at the origin of the left anterior cerebral artery were demonstrated (Fig. 1). All three middle cerebral arteries, having almost identical diameters, proceeded laterally into the sylvian fissure, where they diverged to perfuse the cortex usually supplied by the middle cerebral artery. Vertebral angiography was not performed. No other vascular anomalies, such as aneurysm, were noted.

Discussion

There was some confusion concerning the terminology of the anomalous middle cerebral artery in early papers.²⁻⁴ It is widely accepted following Teal et al.,⁵ however, that the term “accessory middle cerebral artery” refers to an anomalous branch arising from the anterior cerebral artery, which courses with the middle cerebral artery into the sylvian fissure. An anomalous branch originating from the terminal portion of the internal carotid artery is termed a “duplication of the middle cerebral artery.”⁵ Duplication of the middle cerebral artery is encountered in only 0.7–2.9% of autopsy cases.²⁻⁶,⁷ In the present patient, we observed three middle cerebral arteries, almost identical in diameter, originating directly from the terminal portion of the internal carotid artery. To our knowledge, similar anomalies have not been described previously in the literature, including comprehensive investigations on the circle of Willis.²⁻⁶⁻⁸ We therefore designate this rare anomaly as a “triplication of the middle cerebral artery.” Fenestration of the anterior cerebral artery has occasionally been documented in some papers.²⁻⁹,¹⁰ The fenestrated anterior cerebral artery observed in the present case was characteristic in that the size of the fenestration was larger than those of previously reported cases,⁹,¹⁰ and may better be termed ring formation of the anterior cerebral artery. Although cerebral infarction occurred in the contralateral hemisphere, the anomalies themselves appeared to be incidental. Aneurysms have been reported to be associated with some cases of duplicate middle cerebral artery,²⁻³ or fenestrated anterior cerebral artery,¹⁰ but no aneurysm was noted in the anterior circulation in the present case.

The etiology of triplication of the middle cerebral artery remains unknown. The close location of the triplicate middle cerebral artery and fenestrated anterior cerebral artery at the terminal portion of the internal carotid artery suggests an abnormality of vascular development. In detailed investigations on the development of the cranial arteries by Padget,¹¹ several twigs representing the middle cerebral stem are described
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as arising from the primary cranial division of the internal carotid artery in embryos of approximately 7–12 mm. Triplication of the middle cerebral artery could be a remnant of such primitive twigs.

References