



Rare case of duplicated middle cerebral artery and acute ischaemic stroke managed successfully with mechanical thrombectomy

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SUMMARY

A man in his early 80s presented with acute onset aphasia and right-sided weakness with an NIH Stroke Scale (NIHSS) of 17. He was last seen normal 9 hours before the presentation. MRI of the brain showed acute infarcts in the left caudate, lentiform nucleus and corona radiata. MRI angiogram (MRA) revealed an occluded left main middle cerebral artery (MCA) and an associated ipsilateral patent duplicated middle cerebral artery (DMCA). Mechanical thrombectomy (MT) was performed, and he was discharged with an NIHSS of 8. In this report, we review and discuss the challenges during the intervention of MCA occlusion in the presence of duplicated MCA, a rare anomaly.

BACKGROUND

Among the intracranial vessel anomalies, duplicated middle cerebral artery (DMCA) is rare. Other common anomalies of middle cerebral artery (MCA) include aplasia or twig-like MCA, MCA fenestration and accessory middle cerebral artery (AMCA).¹ In angiographic and anatomical studies, AMCA and DMCA have an incidence of 0.3%–4.0% and 0.2%–2.9%, respectively.² Existing literature shows DMCA associations with intracranial aneurysms,^{3–5} but its association with ischaemic stroke is rarely reported.^{6,7} In a published report,⁸ AMCA-associated ischaemic stroke has been inappropriately interpreted as DMCA-associated stroke. This is likely due to the confusing classification by Crompton, who first used the terminology ‘accessory middle cerebral artery’ in 1962.⁹ We believe using ‘accessory MCA’ and ‘duplicated MCA’ appropriately is of utmost importance as these two variants of MCA have unique characteristics. They originate at different sites, supply different territories, have different haemodynamic properties and are predisposed to different vascular pathology. Literature search did not reveal any report of thrombolysis in patients with DMCA. Nevertheless, there are few reports of thrombectomy in DMCA-associated stroke.¹⁰ Here, we report a rare and unusual case of a successfully managed MCA occlusion associated with DMCA by mechanical thrombectomy.

CASE PRESENTATION

A man in his early 80s with a medical history of hypertension and diabetes mellitus for 7 years

presented with an acute onset of weakness in the right upper and lower limbs, facial deviation to the left side and inability to speak. These symptoms occurred 9 hours before the presentation.

During the examination, the patient appeared to be of average build. His pulse rate was 66 beats per minute and irregularly irregular, with all peripheral pulses palpable. His blood pressure was measured at 138/70 mm Hg, respiratory rate at 22/minute and oxygen saturation at 97% without needing oxygen support.

Neurological examination revealed a conscious patient with a Glasgow Coma Scale (GCS) score of 10 and a National Institutes of Health Stroke Scale (NIHSS) score of 17. The patient had right hemiparesis, right upper motor neuron (UMN) facial palsy and global aphasia.

INVESTIGATIONS

The routine blood investigations, blood sugar, renal function test, liver function test, lipid profile and tests for HIV, hepatitis B and hepatitis C yielded normal results. ECG revealed atrial fibrillation. MRI showed an acute infarct in the left caudate, lentiform nucleus and corona radiata ([figure 1A–C](#)). Time of flight (TOF) MRA revealed a thin calibre (compared with right-sided normal MCA) MCA-like vessel originating from the left terminal ICA coursing towards the left insula ([figure 1D](#)). A stump of an occluded left-sided true MCA immediately distal to the MCA-like vessel (DMCA) was also noticed ([figure 1D](#) white arrow). Echocardiography showed moderate aortic regurgitation and mild mitral, tricuspid regurgitation without intracardiac clots.

TREATMENT

A mechanical thrombectomy was planned with a triaxial approach as the patient was eligible. Informed consent was obtained from the family. Right-sided femoral artery access was obtained, and a 6F neuro-sheath was placed into the left proximal cervical internal carotid artery (ICA). Diagnostic digital subtraction angiogram (DSA) showed an occluded true MCA ([figure 1E](#)). A smaller bore ACE 60 reperfusion catheter was advanced through the neuro-sheath over a guidewire. With the help of a microcatheter/microguidewire assembly, the ACE 60 catheter was advanced until the level of the clot ([figure 1F](#)). Thrombo-aspiration was performed using a penumbra aspiration pump.



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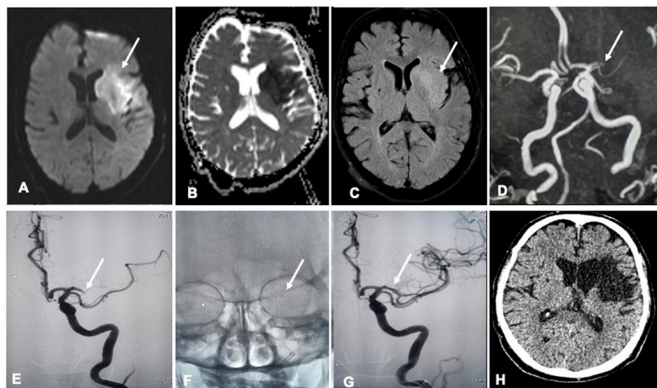


Figure 1 MRI and digital subtraction (DSA) images of the stroke patient with left duplicated MCA axial diffusion weighted imaging (DWI). (A) Apparent diffusion coefficient (ADC) (B) and FLAIR (C) showed restriction on the left caudate, lentiform nucleus and corona radiata. TOF MR-angiography (D) showed complete cut-off of distal larger trunk of proximal MCA (white arrow), with smaller proximal trunk. DSA run of left internal carotid artery (E) showed complete cut-off of distal larger trunk of proximal MCA (white arrow), the smaller proximal trunk with normal flow. Fluoroscopy image (F) showed ACE 60 aspiration at the occlusion site (white arrow). Final angiogram (G) showed complete recanalisation of the distal occluded trunk (white arrow) with duplicated left MCA. Follow-up CT scan (H) after 1 month showed gliotic changes in the previous infarct.

After a single pass, recanalisation of the occluded true MCA was achieved. The check angiogram showed complete recanalisation of the left-sided true MCA (figure 1G). After the procedure, the patient was shifted to the ward. He was treated with atorvastatin, amlodipine, telmisartan, metformin and acarbose for management of hypertension and diabetes mellitus. He also received physiotherapy during his hospital stay and was advised to continue at home after discharge.

OUTCOME AND FOLLOW-UP

He was discharged on the ninth day with an NIHSS of 8. On follow-up at 2 weeks, his neurological condition has remained stable.

DISCUSSION

We considered the MCA-like artery as DMCA and the occluded vessel as true MCA in agreement with the classification by Teal.¹¹ Post-thrombectomy, the anatomy of both arteries was visible with the presence of a duplicated MCA. DMCA has critical clinical implications. First, the occluded MCA may be missed. This can happen because patent DMCA can be erroneously considered a true MCA. Missed vessels may be discovered only after thrombectomy.¹² Intriguingly, a smaller stump may be confused with an aneurysm.¹³ Misdiagnosis can delay or stop patients from undergoing thrombectomy, one of the established treatments for stroke.¹⁴ Second, the size of true MCA may vary in the presence of DMCA. Normative data on MCA diameter in our population is lacking. In a study involving participants from the Indian subcontinent, an examination of 340 MCAs revealed the normal outer diameter of the middle of the trunk of MCA to be between 2 and 5 mm (mean 3 mm).¹⁵ In our case, during DSA, the measurements just after the origin of the vessels revealed the main MCA to be 2.4 mm and the DMCA to be 2.17 mm, nearly half the size of the healthy right-sided MCA (4.2 mm). Considering the relatively lesser size of the occluded MCA, we

used an ACE 60 catheter with a distal outer diameter (OD) of 5.4 F (French) instead of an ACE 68 catheter with distal OD of 6 F. A recent meta-analysis has established that the direct aspiration technique is safe, efficient and an alternative to primary stent retriever.¹⁶ We were fortunate to achieve complete recanalisation without complication after a single-pass aspiration. However, there is a lack of strong evidence regarding the types of thrombectomy techniques used in this setting.

Third, DMCA supplies a territory, typically the anterior temporal lobe. This knowledge can help better interpretation of clinical syndrome, utilise appropriate rehabilitation protocols, prognosticate a case and, importantly, allow communication effectively with patient's relatives. Moreover, if MT fails and the associated anomalous vessel is injured, there may be a life-threatening complication because of the expected extensive infarct. Although our patient substantially improved, residual neurological deficits were inevitable due to delayed presentation. We believe early intervention in cases like ours will have a more favourable outcome.

Patient's perspective

We are very thankful to the hospital and the team of doctors involved in our case. Being in a developing country, we initially considered going for treatment to our neighbour country. It's a pride for our country that this type of advanced emergency treatment is available and patients are getting benefits. We are fortunate to go home after successful treatment for such a devastating disease.

Learning points

- ▶ Recognition of true middle cerebral artery (MCA) occlusion in the presence of a duplicated MCA is essential in stroke for the early institution of the best treatment, such as mechanical thrombectomy.
- ▶ Aspiration thrombectomy effectively removes clots from occluded MCA in the presence of duplicated vessels.
- ▶ Smaller bore catheters can be used in smaller calibre vessels in duplicated MCA.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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