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Technical Notes & Surgical Techniques

Management of ruptured hidden mirror intracranial aneurysm during mechanical thrombectomy

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ABSTRACT

A 55-year-old woman with acute ischaemic stroke was referred for endovascular treatment after unsuccessful intravenous thrombolysis. Her initial National Institutes of Health Stroke Score (NIHSS) was 20. The right carotid artery stenting was performed because of the inappropriate result of angioplasty of the right internal carotid artery stenosis at origin, followed by recanalization of right internal carotid and middle cerebral arteries. Periprocedural rupture of the wide-neck right bifurcation middle cerebral artery (MCA) aneurysm occurred. Computed tomography (CT) scan confirmed subarachnoid haemorrhage without intracerebral hematoma. Subsequently, the aneurysm was successfully treated by stent-assisted coiling technique. The patient recovered completely and no residual neurological deficit was present 1 month after the treatment. Retrospective CT angiography evaluation unveiled the presence of a small contralateral MCA mirror aneurysm.

1. Introduction

Presently, mechanical thrombectomy is one of the essential treatment options in selected stroke patients with large vessel occlusion (LVO). Regarding the prevalence of aneurysms in the range of 2–5%, every 15–20th patient indicated for thrombolytic stroke treatment has an undiagnosed aneurysm. Given the fact that patients with intracranial aneurysms and stroke share the same risk factors (hypertension, dyslipidemia and smoking), their prevalence in this group of patients is even higher [1]. A case report of the successful management of a periprocedural rupture of mirror wide-neck right bifurcation middle cerebral artery (MCA) aneurysm that occurred during mechanical thrombectomy is presented.

2. Case report

A 55-year–old woman with clinical history of hypertension was admitted to the emergency department with acute ischaemic stroke. Her initial National Institutes Health Stroke Score (NIHSS) was 20. Non-contrast computed tomography (CT) indicated no early ischemic changes (ASPECTS 10), however, the hyperdense media sign on the right side was present. CT angiography confirmed tandem right internal carotid artery (ICA) and MCA occlusion. Seventy minutes after onset of symptoms, intravenous thrombolysis was applied in standard dose, without any clinical improvement. The patient was transferred to the angiography unit where endovascular thrombectomy was initiated with right groin puncture 95 min after symptoms onset. The procedure was performed under local anaesthesia. Due to the unfavourable aortic arch anatomy, a long 6 F sheath was placed into the right common carotid artery (CCA). The right CCA angiogram confirmed severe right ICA stenosis at origin and its distal occlusion (Fig. 1). Internal carotid artery stenosis was treated with distal embolic protection by dual-layer carotid stent implantation (Casper RX, Microvention) because of the inappropriate result of the angioplasty alone. Due to the need of carotid stent implantation, a periprocedural bolus of eptifibatide (10 mL; Integrilin 0.75 mg/mL, GlaxoGroup Limited) was administered intravenously. This was followed by successful aspiration of distal ICA occlusion. The right MCA occlusion was subsequently treated concurrently by thrombectomy device (3 × 20 mm Trevo XP ProVue, Concentric Medical) in combination with aspiration via intermediate catheter located in MCA (6 F Sofia, Microvention). Control injection after stent withdrawal showed complete MCA recanalization (modified treatment in cerebral ischaemia [mTICI] = 3) and extravasation (Fig. 2). A super compliant balloon was positioned inside the distal ICA,

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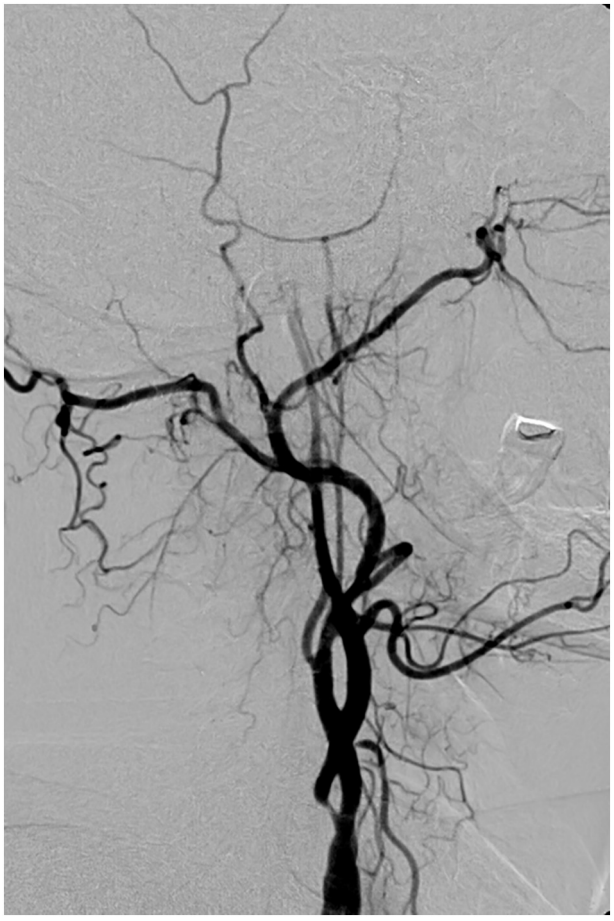

Fig. 1. Right carotid angiogram showing severe internal carotid artery stenosis at its origin with distal occlusion.

however the next angiogram showed no extravasation and right MCA bifurcation aneurysm 3 mm in size, which was the source of the subarachnoid haemorrhage (SAH). Computed tomography imaging was performed and SAH, without the presence of intracerebral haemorrhage or evidence of early ischemia, was confirmed. Aneurysm treatment was considered beneficial and stent-assisted coiling (Atlas stent and Target coils, Stryker) of right bifurcation MCA aneurysm was conducted under general anaesthesia (Fig. 3). Postprocedural right carotid arteriogram proved patent internal carotid artery, middle and anterior cerebral arteries, without residual thromboembolism and extravasation (Fig. 4). Retrospective CT angiography evaluation unveiled the presence of a small contralateral MCA mirror aneurysm (Fig. 5). The next clinical course was uncomplicated. A follow up CT the next day showed no ischemic changes and no progression of SAH. The patient was set on standard dual antiplatelet therapy and coiling of contralateral mirror aneurysm was conducted during the same hospitalization. The patient fully recovered and her 1 and 3 months follow-ups showed a modified Rankin Scale (mRS) of 0.

3. Discussion

Patients suffering from stroke are diagnosed and treated urgently. The aneurysm can be overlooked by the radiologist, often a resident, who is satisfied with primary findings of LVO. However, this can also happen to experienced interventional radiologists, who are focused on optimal treatment planning [1]. Aneurysm can be suspected if the hyperdense nodular sign is present on preprocedural CT examination and if guidewire moves in unusual ways or makes U-shape turns during the procedure [2]. In our patient, contralateral MCA mirror aneurysm was overlooked and only detected retrospectively. Multiple aneurysms are found in 20–30% of patients with intracranial aneurysms. Incidence of symmetrical bilateral aneurysms, so called mirror aneurysms, is rare and accounts for less than 5% of all aneurysms and there is higher prevalence of mirror aneurysms in women compared to men with a ratio of 3.6 to 1 [3].

The case was further complicated by presence of tandem lesion, which needed to be treated with stent because of the inappropriate result of the angioplasty alone. Standardized antiplatelet therapy in ischemic stroke and tandem lesion is not yet specified by large trials. Need of antiplatelet therapy increases potential risk of intracranial haemorrhage. Use of eptifibatide in these settings was presented without significant increase in risks compared to other drug regimens [4].

Aneurysm rupture during LVO recanalization was described during mechanical thrombectomy with stent retriever [1]. Three critical steps are identified during stent thrombectomy of LVO with aneurysm hidden in the thrombus. The first critical step is the passage of a microguidewire and microcatheter through the occluded artery segment without the possibility of fluoroscopic guidance. The second step is withdrawal of the stent retriever. In our case, as well as in previously described case [1], aneurysm rupture occurred during this part of the procedure. The risk of aneurysm rupture is also high should sudden

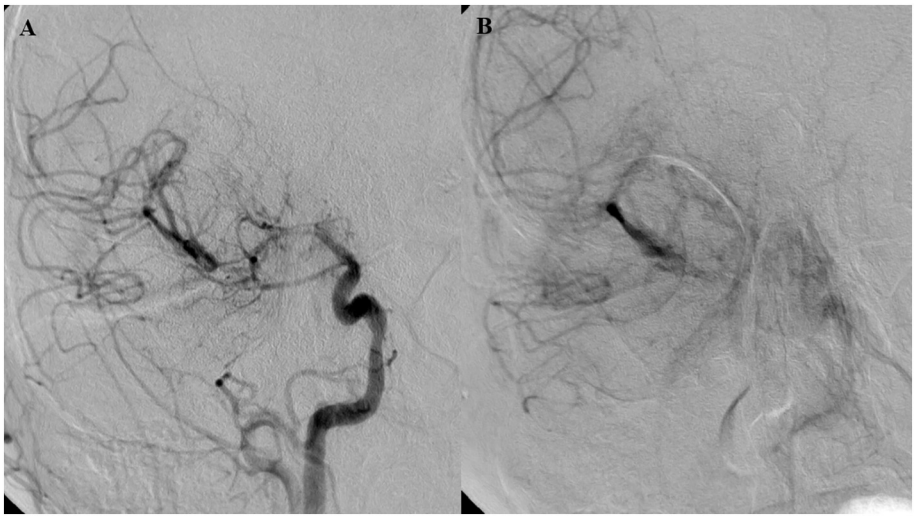

Fig. 2. The right ICA angiogram – oblique view: contrast extravasation at right MCA bifurcation in arterial (A) and parenchymal phase (B).

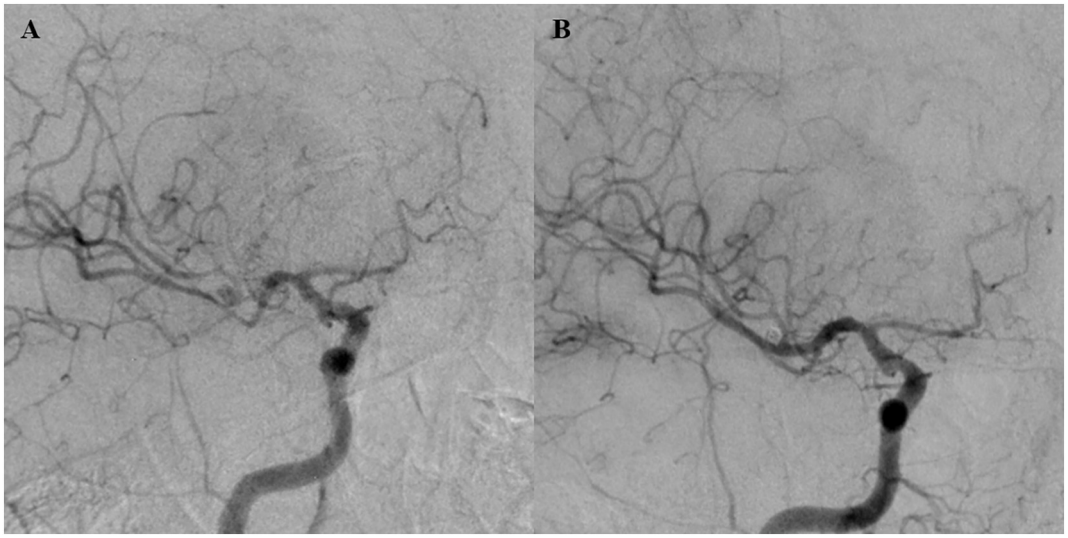

Fig. 3. The right ICA angiogram – oblique view: wide-neck right MCA bifurcation aneurysm (source of SAH) before (A) and after stent-assisted coiling (B).

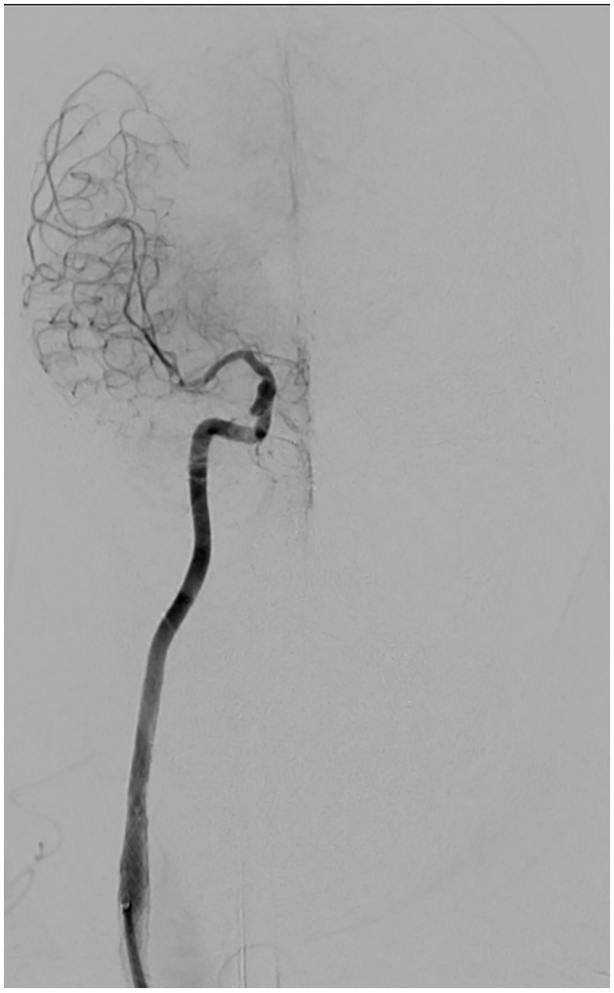

Fig. 4. Postprocedural right carotid arteriogram displays patent internal carotid artery, middle and anterior cerebral arteries without residual stenosis, thromboembolism and extravasation.

reperfusion after LVO recanalization occur.

Using only aspirational thrombectomy during ADAPT technique, SAH was not proven [5]. In this technique, forces affecting vessel wall

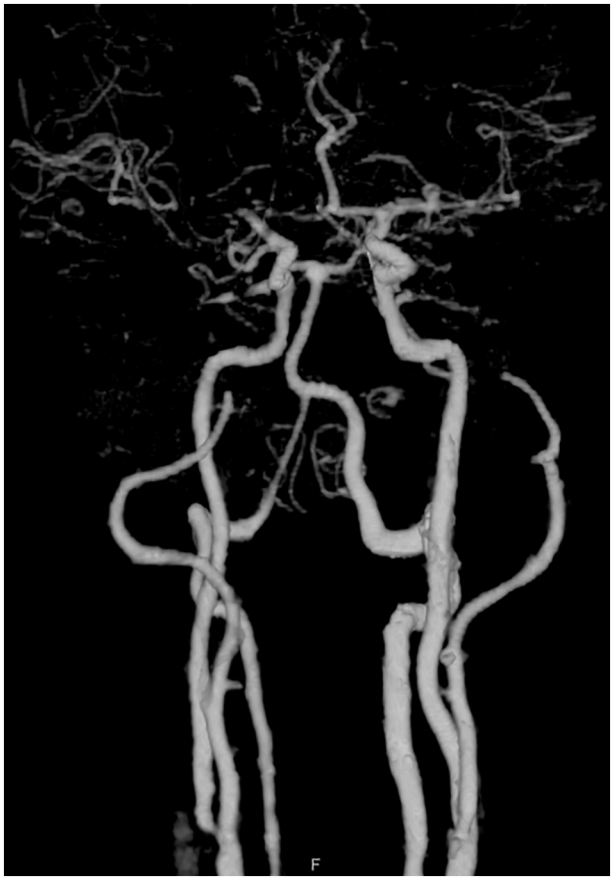

Fig. 5. CTA: Left middle cerebral artery aneurysm, severe right internal carotid artery stenosis at its origin with distal occlusion.

are lower. This is most probably a direct effect of aspiration on the proximal end of the thrombus, in comparison with the stent, which is opposed against the vessel wall, and its radial force effects not only the thrombus, but also the vessel wall. An animal study showed damage in all vessel wall layers during stent thrombectomy, with the endothelium being the most damaged [6]. Aspiration-only thrombectomy has a lower risk of traumatic injury to the vessel because the thrombus is not crossed with guidewire without fluoroscopic guidance.

The true risk of rupture of aneurysm hidden in the thrombus for stent thrombectomy and aspirational thrombectomy is unknown. However, based on the aforementioned mechanical factors, ADAPT technique appears to be less traumatizing and appropriate when the aneurysm is hidden in the thrombus in LVO [1].

4. Conclusions

Pretreatment detection of hidden aneurysm within the thrombus in stroke with LVO is difficult. Mirror aneurysm on contralateral MCA can increase suspicion of possible aneurysm in an occluded segment. Older hypertensive woman are at risk of coincidental aneurysm and stroke with LVO as well as the presence of mirror aneurysm, as evident in our case report. In case of suspicion of hidden aneurysm inside occlusion of cerebral artery, we suggest first using aspiration thrombectomy.

Conflict of interest statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

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