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Case Report

Ruptured hidden intracranial aneurysm during mechanical thrombectomy: A case report

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ABSTRACT

Background: Acute ischemic stroke (AIS) patients have a higher prevalence of cerebral aneurysm than a healthy reference population. However, it was recently reported that cases of an unknown hidden aneurysm in AIS patients with large-vessel occlusion are rare. We report a rare case of subarachnoid hemorrhage (SAH) during mechanical thrombectomy (MT) using a stent retriever for AIS.

Case Description: A 46-year-old patient with the right internal carotid artery terminal occlusion presented with the left-sided hemiparesis, hemispatial neglect, and dysarthria and underwent MT. Initial thrombectomy using a stent retriever and reperfusion catheter was unsuccessful. Angiography just before the second attempt showed SAH. Fortunately, we achieved recanalization of the thrombolysis in cerebral infarction 2b and hemostasis by lowering the blood pressure followed by coil embolization of the ruptured aneurysm. Only a few cases of ruptured aneurysms have been reported during MT using a stent retriever. Stent withdrawal is suspected to cause aneurysm rupture in cases with an unknown hidden middle cerebral artery bifurcation aneurysm.

Conclusion: Preinterventional detection of a hidden aneurysm is difficult. Therefore, surgeons must always consider the possibility of a hidden aneurysm rupture in vessels distal to the occlusion site and make adequate preparations for the prompt treatment of ruptured aneurysms after MT.

Keywords: Aneurysm, Ischemic stroke, Stent retriever, Subarachnoid hemorrhage, Thrombectomy

INTRODUCTION

Patients with cerebral aneurysm suffering from acute ischemic stroke (AIS) were found to have a prevalence of 5.6% according to a recent study (in a population of 127 AIS patients), which was higher than the worldwide prevalence, calculated in healthy reference populations (from over 20 countries with no comorbidities and an average age of 50 years).[7,9] During mechanical thrombectomy (MT), aneurysm ruptures may have catastrophic outcomes, since using a stent retriever for AIS patients with large-vessel occlusion (LVO) is often performed in combination with intravenous tissue plasminogen activator (IV tPA). Particularly, an unknown hidden aneurysm poses a potential danger in recanalization attempts because its detection before MT is difficult. We present a case of an unknown hidden ruptured middle cerebral artery (MCA) aneurysm during MT.

CASE DESCRIPTION

A 46-year-old female presented with the left-sided hemiparesis, hemispatial neglect, and dysarthria (National Institutes of Health Stroke Scale [NIHSS] score, 11). Right intracranial internal carotid artery (ICA) occlusion was suspected based on magnetic resonance angiography (MRA) at 343 min from the onset of these symptoms. We did not, however, detect a cerebral aneurysm on MRA. The patient was not eligible for IV tPA therapy due to the time constraints and subsequently received endovascular therapy by MT under local anesthesia.

Conventional angiography revealed terminal occlusion of the ICA [Figure 1]. The microcatheter passed through the occlusion site, and contrast injection showed that it was guided distal to the occlusion site; an MCA aneurysm was also revealed [Figure 2a]. The stent retriever (Trevo 4 × 30 mm; Stryker Neurovascular, Fremont, CA, USA) was deployed from the MCA M2 segment proximally to cover the thrombus [Figure 2b], and the reperfusion catheter (Catalyst 6; Stryker Neurovascular, Fremont, CA, USA) was placed at the ICA terminal. Recanalization of the anterior cerebral artery was achieved on the first attempt, but the MCA M1 proximal occlusion remained [Figure 2c]. At the second attempt, the same two thrombectomy devices were employed in a manner similar to that in the first attempt. Angiography performed after the stent retriever deployment showed subarachnoid hemorrhage (SAH) [Figure 3a], possibly caused by the rupture of the aneurysm during withdrawal of the first stent or during microguidewire manipulation, until the second stent was deployed. We immediately lowered the blood pressure and carefully carried out MT by withdrawing the stent retriever and the reperfusion catheter simultaneously. In the angiography after the second MT, we confirmed that the bleeding due to the ruptured MCA aneurysm had stopped and recanalization of thrombolysis in cerebral infarction (TICI) 2b was achieved [Figure 3b]. Flat-panel detector computed tomography (FDCT) showed SAH and extravasated contrast medium [Figure 3c]. Shortly thereafter, coil embolization of the ruptured aneurysm was performed under general anesthesia [Figure 4]. The NIHSS score after a month from the onset showed improvement, dropping from 11 to 6, since the initial assessment.

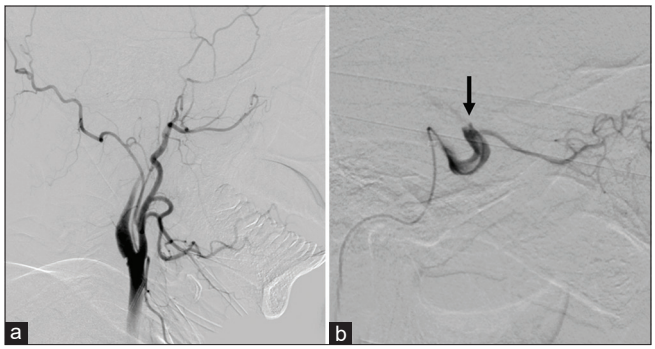

Figure 1: Lateral view of conventional angiography showing (a) the bifurcation of the right common carotid artery and (b) the right internal carotid artery terminal occlusion. The black arrow indicates the occluded site.

DISCUSSION

There are few reports about the prevalence of aneurysms in AIS patients who underwent MT[9,10] or embolectomy[3] by open craniotomy for LVO, and the prevalence of aneurysm-related vessel occlusion is at 3.7–7.2% not low. However, cases of aneurysms that are undetected before MT and hidden distal to the occlusion site or causing SAH by their rupture may be rare. In the 300 MT cases reported by Zibold *et al*.,[10] the numbers of unknown hidden aneurysms distal to the occlusion site and of aneurysms leading to SAH due to their rupture were 3 (1%) and 1 (0.3%), respectively. In

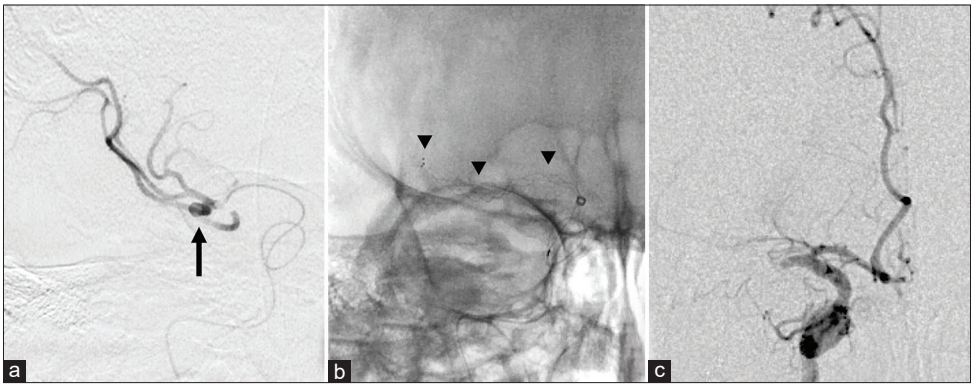

Figure 2: (a) Contrast injection through microcatheter-guided distal to the occlusion site depicted a middle cerebral artery (MCA) bifurcation aneurysm. The black arrow indicates the aneurysm. (b) The stent retriever is deployed from the MCA M2 segment proximal to the internal carotid artery terminal (ICA-T), and the reperfusion catheter is placed at the ICA-T. The arrowheads show the stent retriever. (c) Angiography performed after the first attempt showing persistence of the MCA M1 proximal occlusion.

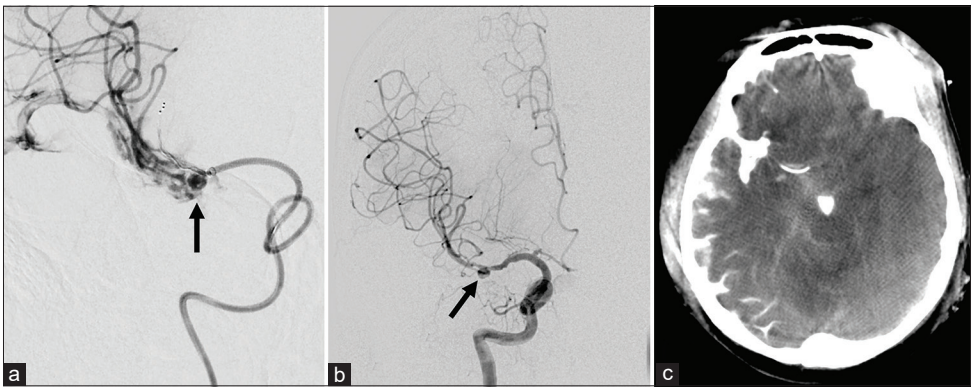

Figure 3: (a) Angiography performed immediately before the second mechanical thrombectomy (MT) showing subarachnoid hemorrhage around the middle cerebral artery aneurysm. (b) Angiography performed after the second MT showing recanalization of the thrombolysis in the cerebral infarction 2b and hemostasis achievement. (c) Subarachnoid hemorrhage and extravasated contrast medium as seen on flat-panel detector computed tomography.

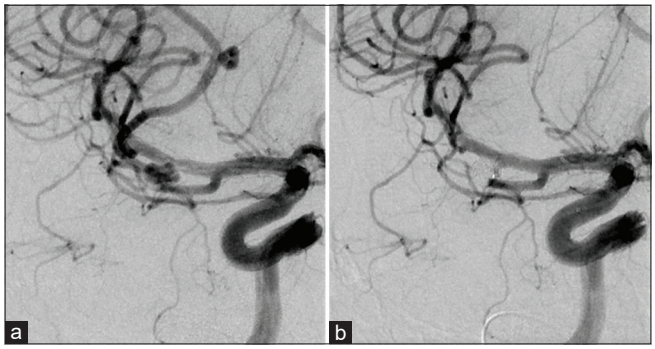

Figure 4: (a) Pre- and (b) postcoil embolization of the ruptured middle cerebral artery aneurysm.

the case series by Zhou *et al*. including 124 patients,[9] SAH due to the rupture of an aneurysm was observed in 1 patient (0.8%), and in this patient, a causal relationship between aneurysm rupture (basilar artery) and stent use (the occluded MCA) did not exist. Our case of a ruptured hidden aneurysm distal to the occlusion site while performing MT was the only one among 119 MTs (0.8% prevalence) in over 4 years, indicating that our results are similar to findings in previous reports.

In our case, the rupture of the aneurysm was possibly caused by the withdrawal of the first stent or by the microguidewire manipulation until the second stent was deployed. By checking the recorded video of the operation, we confirmed that the microguidewire moved smoothly and seemed to keep the correct intra-arterial positioning. Only a few cases of ruptured aneurysms during MT using a stent retriever have been reported.[8,10] Those cases had an unknown hidden MCA bifurcation aneurysm as in our case, and the stent withdrawal was suspected as the cause of those ruptures. Thus, an unknown hidden MCA bifurcation aneurysm might be at a higher risk of rupture when a stent retriever is used, compared to a known aneurysm or an aneurysm proximal to the occlusion site.

It is concerning to note that there is no clear procedure to manage the rupture of a hidden aneurysm at vessels distal to the occlusion site (those that have not been recanalized). As reported by Zihold *et al*.,[10] occlusion of the prebifurcational MCA by coiling should be considered as one of the options to prioritize stopping SAH. However, this method can lead to a complete MCA infarction requiring decompressive craniotomy. Furthermore, if the patient is not eligible for IV tPA therapy, surgical clipping by open craniotomy can be an alternative option. This method makes it possible to remove a thrombus at the occlusion site in addition to the clipping of a ruptured aneurysm.[3,5] However, it would take more time to prepare to switch to the surgical clipping method than continuing with endovascular therapy, and a better prognosis is not expected with recanalization. In our case, MT was conducted to perform coil embolization of the ruptured aneurysm. We could, fortunately, achieve TICI 2b recanalization and hemostasis, which was followed by successful coil embolization. However, it must be kept in mind that this procedure may have been at risk of worsening the SAH due to the increase in blood flow by recanalization.

Preinterventional detection of a hidden aneurysm is difficult. It has been reported that the vasculature distal to the occlusion site can be detected by contrast-enhanced FDCT in the angiography suite.[2] While this method may be useful, it has the disadvantage of lengthening the duration of the operation. In our case, we identified the hidden aneurysm by contrast injection through the microcatheter to confirm correct intra-arterial positioning before the first stent was deployed. In the first attempt, although we placed the tip of the stent distal to the occlusion followed by careful withdrawal of the stent, our procedure resulted in the rupture of the aneurysm. Contrast injection through microcatheter distal to the occlusion site

could easily detect hidden aneurysms before stent withdrawal. It might help us in the selection of safer methods for MT, such as a direct aspiration first pass technique[1,6] or deployment of a stent retriever proximal to the aneurysm.[4] We should have switched from using the stent retriever to these safer alternatives once the hidden aneurysm was confirmed during MT. If the recanalization had not been achieved after several attempts, MT using a stent retriever might have been an option after adequate preparation for the prompt treatment of a ruptured aneurysm.

CONCLUSION

We must consider the possibility of a hidden aneurysm rupture in vessels distal to the occlusion site that has not been recanalized, and accordingly, preparation for the prompt treatment of that ruptured aneurysm after MT is necessary. In this case, had the aneurysm distal to the occlusion site been identified before MT, a safer therapy, an alternative to the MT method, might have been warranted.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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