



Case Report

Mechanical thrombectomy for occlusion near a ruptured intracranial aneurysm: A case report

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ABSTRACT

Background: While recent randomized clinical trials have shown the efficacy of mechanical thrombectomy for acute large vessel anterior cerebral occlusion, cases in patients with a subarachnoid hemorrhage (SAH) were excluded from the study.

Case Description: A 58-year-old man presented with a SAH as a result of a ruptured middle cerebral artery aneurysm. Coil embolization was performed, and a right intracranial angiography showed remnants of an aneurysmal neck. However, the following angiography also revealed a thromboembolic complication that occurred in the same territory as the ruptured aneurysm. The patient underwent a rescue mechanical thrombectomy under the working projection. We deployed a retrieval stent without covering the aneurysmal neck. The occluded vessel was recanalized without any hemorrhagic complication. Due to minimal intracerebral infarction, the patient had good outcomes.

Conclusion: Mechanical thrombectomy is a useful option to retrieve a clot from an occluded intracranial vessel located near a ruptured aneurysm. Approaching the clot at the working projection is important to ensure safety in the setting of a ruptured aneurysm.

Keywords: coil embolization, Mechanical thrombectomy, Ruptured aneurysm, Thromboembolic complication

BACKGROUND

While recent randomized clinical trials have demonstrated the efficacy of mechanical thrombectomy for acute large vessel anterior cerebral occlusion, patients with a subarachnoid hemorrhage (SAH) were excluded from the study.^[2] There are no data on the efficacy and safety of mechanical thrombectomy in patients with SAH and ruptured intracranial aneurysms. Here, we report the applicability of mechanical thrombectomy in a patient with a thromboembolic complication, during coil embolization for a ruptured aneurysm in the same vascular territory.

CASE DESCRIPTION

A 58-year-old man was admitted to our emergency department with an acute onset of headache. Computed tomography (CT) showed a diffused SAH [Figure 1a]. The patient was diagnosed with World Federation of Neurosurgical Societies Grade 2 SAH. Digital subtraction angiography

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(DSA) revealed a right-sided ruptured middle cerebral artery (MCA) aneurysm, 2.3×1.9 mm in size [Figure 1b] and a left-sided unruptured MCA aneurysm. He was offered surgery and coiling, but we considered simultaneous bilateral coiling for treatment. Under general anesthesia, a 5 Fr ASAHI FUBUKI Dilator Kit (Asahi Intecc, Nagoya, Japan) was inserted into the right femoral artery. The first activated clotting time (ACT) was 97 s. Following arterial access, 3000 U of heparin was injected, and an ACT of 144 s was achieved. The guiding catheter was inserted in the right internal carotid artery, and a three-dimensional DSA was performed to use the working projection (RAO 111, CAU 32) for separating the aneurysmal neck from the parent artery. After successful coil embolization, the aneurysm transformed into a neck remnant [Figure 1c], with minimal possibility of rerupture.

After removing the microcatheter, a right internal carotid angiography (ICAG) revealed an occlusion at the proximal right MCA M1 segment [Figure 2a]. The ACT was 134 s, and an additional 3000 U of heparin was injected. We replaced the 5 Fr ASAHI FUBUKI Dilator Kit with the 9 Fr introducer sheath and 9 Fr balloon catheter (Tokai Medical Products, Japan). The right ICAG showed that the clot had migrated from the M1 to the M2 segment [Figure 2b]. The working projection was taken, and a 5MAX distal aspiration catheter



Figure 1: (a) A computed tomography revealing a subarachnoid hemorrhage. (b) A digital subtraction angiography revealing a right-sided middle cerebral aneurysm. (arrow: aneurysm). (c) A right internal carotid angiography after coil embolization revealing that the aneurysm became neck remnant (open arrow: coil).

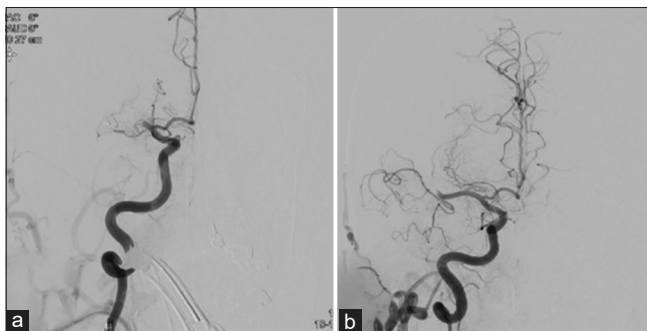


Figure 2: (a) A right internal carotid angiography revealing the occlusion at the right side of the middle cerebral artery M1 portion. (b) After additional heparin was injected, the clot migrated from M1 to M2 portion.

(Penumbra, Inc., Alameda, California, USA) was placed in the right MCA. A microcatheter (Marksman, Medtronic, Minneapolis, MN, USA) with a 0.014 inch outer diameter micro-guidewire (CHIKAI, Asahi Intecc, Nagoya, Japan) safely penetrated the distal M2. The stent retriever (Solitaire 4 \times 20 mm, Medtronic, Minneapolis, MN, USA) was opened in the occluded vessel without covering the aneurysmal neck [Figure 3]. The stent was withdrawn into the intermediate catheter under continuous mechanical aspiration, and the clot was removed using the stent retriever [Figure 4a]. The ICAG showed complete recanalization (Thrombolysis in Cerebral Infarction Scale 3), and the aneurysm was unaffected [Figure 4b]. The time between the onset of occlusion to the recanalization was 59 min. A follow-up CT scan showed no aneurysm rerupture [Figure 4c]. Magnetic resonance imaging (MRI) showed minimal intracerebral infarction [Figure 5a] and magnetic resonance angiography showed the remaining recanalization [Figure 5b]. Following rehabilitation, the patient had no neurological deficits (modified Rankin Scale 0) after 3 months.

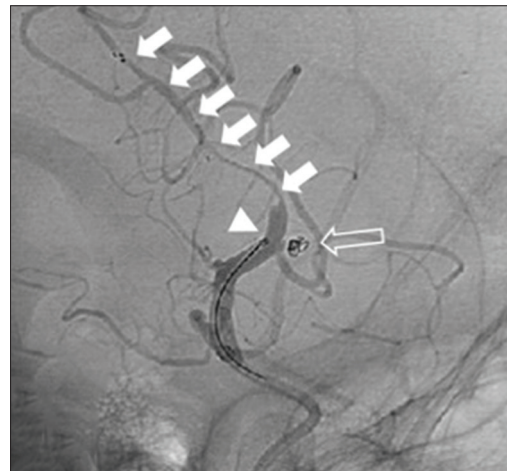


Figure 3: A right internal carotid angiography at the working projection revealing that the stent retriever was deployed in the occluded vessel without covering aneurysmal neck (arrowhead: distal marker of the microcatheter, arrow: stent, open arrow: coil).



Figure 4: (a) A photograph of the clot as retrieved by the stent. (b) A right internal carotid angiography revealing complete recanalization of the occluded middle cerebral artery. (c) A follow-up computed tomography revealing no hematoma development.

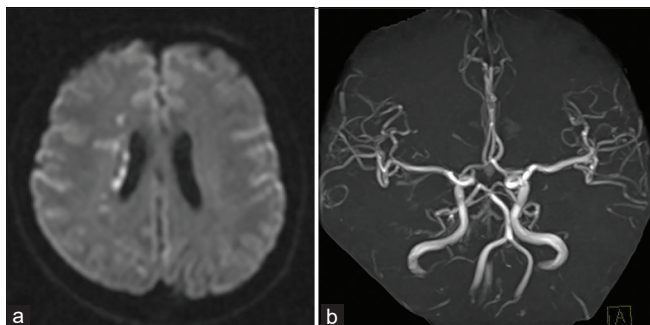


Figure 5: (a) A follow-up magnetic resonance image revealing minimal intracerebral infarction and (b) magnetic resonance angiography revealing complete recanalization of the occluded middle cerebral artery.

DISCUSSION

Our case demonstrates two major findings. First, clots occurring near a ruptured aneurysm during thromboembolic complications can be retrieved using a mechanical thrombectomy. Thromboembolism is major complication of coil embolization for a ruptured aneurysm, with an incidence rate of 6–10%.^[6,7] Although the thromboembolic risk is higher during coil embolization than during direct surgery, the former has the advantage of being minimally invasive and allows simultaneous contralateral surgery in the case of multiple aneurysms.^[6] The limited use of antiplatelet/general heparinization and hypercoagulability has been proposed to cause the increased incidence in thromboembolic events.^[5] Two case reports have shown that mechanical thrombectomy was effective for an MCA M1 embolic occlusion during coil embolization for a ruptured anterior communicating artery aneurysm.^[1,10] However, unlike these cases, the thromboembolic occlusion occurred in the same vascular territory and near the aneurysm in our case. Because the coil embolization was already performed, and the right ICAG showed a neck remnant, we administered hemostatic therapy and decided to perform a mechanical thrombectomy. Since the duration of recanalization strongly affects the outcome,^[3] the ability of the stent retrieval system to immediately restore flow may be beneficial. We exchanged catheter devices with a balloon to achieve flow control to prevent distal embolic complications.^[4] Due to the risks associated with undergoing repeated mechanical thrombectomy, it was safer to perform fewer maneuvers. While a forced-suction technique was another option for recanalization, this requires penetration of an aspiration catheter to the location of clot. While this technique can be used if the clot was located at the proximal vessels such as ICA or MCA M1, this is not suitable for a distal clot. While intra-arterial thrombolytic intervention was reported as a useful treatment strategy, hemorrhagic complication can occasionally occur.^[9] Therefore, it may be risky to infuse tirofiban near a ruptured aneurysm.

Second, using the working projection for coil embolization is important to ensure safety while performing a mechanical thrombectomy. When the clot is located at the same territory as the ruptured aneurysm, care needs to be taken to ensure that the aneurysm does not rebleed during the mechanical thrombectomy maneuver. Initially, as the shorter time for recanalization took priority, the working projection was not obtained. The working projection could show the position of the aneurysm in relation the clot. When the micro-guidewire penetrated the distal segment of the aneurysm, the maneuver would be safer under a working projection than under a general angle. Furthermore, the wall of the aneurysmal vessel was fragile and therefore needed less pressure on the aneurysmal neck to prevent rerupture. A previous report showed that high-resolution MRI of the vessel wall could detect vessel damage and that the segmental enhancement was found at the site of the retrievable stent placement.^[8] Because the stent retriever will inevitably make direct contact with the arterial wall to capture the clot, this can cause endothelial and medial wall injuries, especially at site of stent deployment.^[8] It was possible to deploy the stent retriever without covering the aneurysmal neck using a working projection. Therefore, using the working projection is an easy and useful technique to safely undergo mechanical thrombectomy, when a ruptured aneurysm is in the same vascular territory.

CONCLUSION

This case highlighted two important findings. Mechanical thrombectomy for thromboembolic complications when a ruptured aneurysm is in the same vascular territory should be considered for revascularization and using the working projection for coil embolization is required for safely undergoing this procedure, when the ruptured aneurysm is near the clot.

Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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