



## Case Report

# Salvage treatment with stenting and temporary balloon occlusion for subarachnoid hemorrhage after stent retrieval following acute proximal M3 occlusion treatment

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Procedure-related subarachnoid hemorrhage (SAH) after mechanical thrombectomy is known to be a clinically benign presentation. However, the treatment in the presence of definite contrast leakage without vessel rupture is controversial. Here, we report a case in which a salvage technique was performed for procedure-related SAH after mechanical thrombectomy for a proximal M3 occlusion.

A 56-year-old female patient presented with global aphasia and right hemiparesis within 2 hours after symptom onset. The initial National Institute of Health Stroke Scale score of the patient was 18 points, and computed tomography (CT) angiography showed that the superior division of the left middle cerebral artery (MCA) was occluded. We decided to treat the patient with mechanical thrombectomy. Control angiography showed a left proximal M3 occlusion. We performed mechanical thrombectomy with a partially deployed technique using a Trevo 3 mm stent (Stryker). Control angiography showed recanalization of the occluded vessel but contrast leakage after stent retrieval. We decided to treat the lesion presenting with contrast leakage with stenting using a Neuroform Atlas 3 mm stent (Stryker). Serial control angiography continued to show contrast leakage of the recanalized artery. We decided to treat the lesion with temporary balloon occlusion using a Scepter C balloon catheter (MicroVention). The patient recovered and had a modified Rankin scale score at discharge of 0.

Given the results of our case, stenting and subsequent repeat temporary balloon occlusion should be considered for SAH with contrast leakage after mechanical thrombectomy, as spontaneous cessation of the arterial bleeding is unlikely.

**Keywords** Thrombectomy, Complication, Subarachnoid hemorrhage

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## INTRODUCTION

Procedure-related subarachnoid hemorrhage (SAH) after mechanical thrombectomy has been known to be a clinically benign presentation because the bleeding tends to spontaneously cease.<sup>1)3)7)</sup> However, in cases where control angiography has shown definite contrast leakage without vessel rupture after mechanical thrombectomy, the decision to treat and the treatment modality have been controversial. We report a salvage technique involving stenting and subsequent temporary balloon occlusion for procedure-related SAH caused by vessel injury based on contrast leakage on control angiography after mechanical thrombectomy for a proximal M3 occlusion.

## CASE REPORT

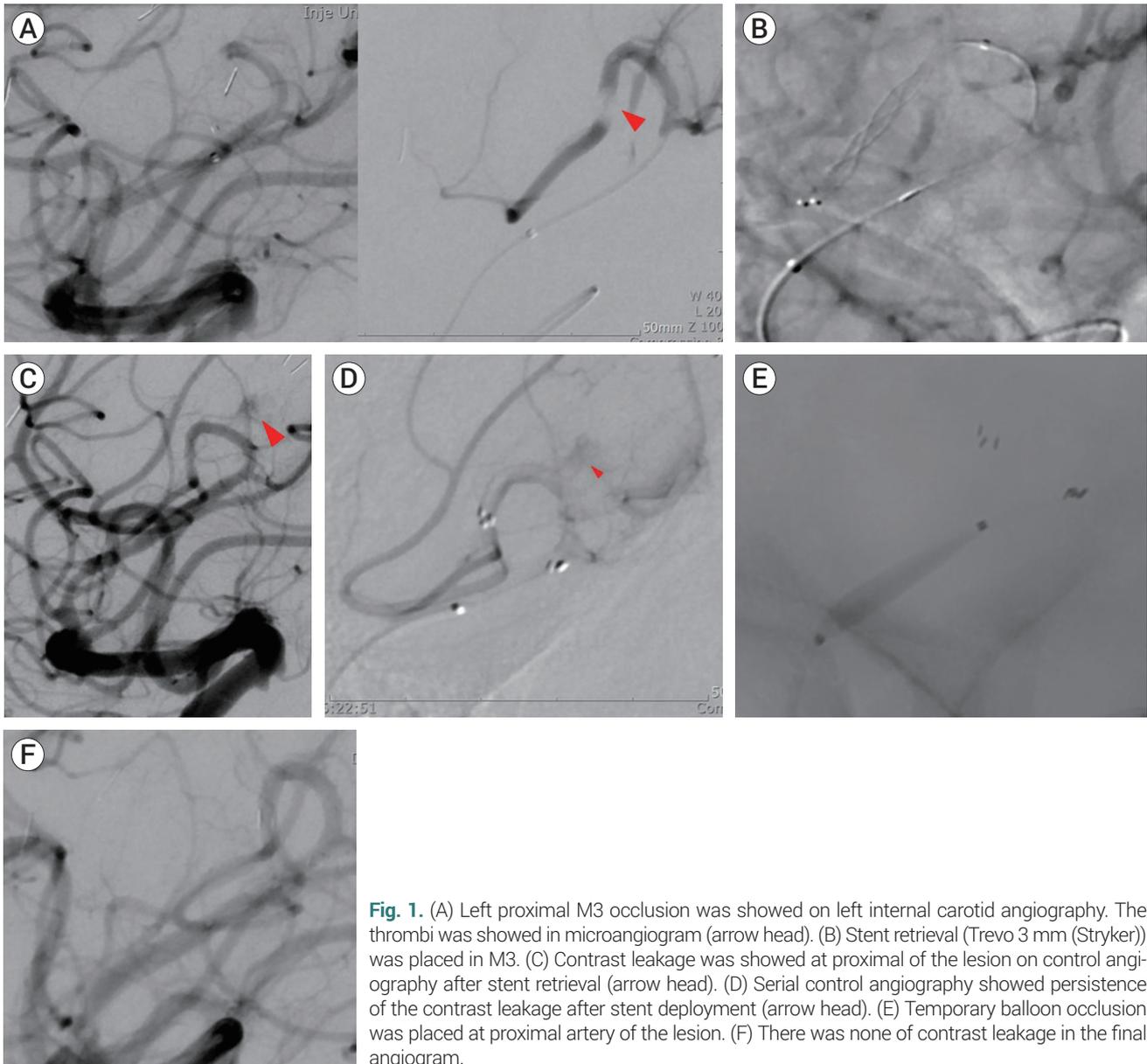
A 56-year-old female patient presented with global aphasia and right hemiparesis within 2 hours after symptom onset. Intracranial hemorrhage was not observed on initial brain Computed tomography (CT). The initial National Institute of Health Stroke Scale (NIHSS) score of the patient was 18 points, and CT angiography showed that the superior division of the left middle cerebral artery (MCA) was occluded. A CT perfusion scan showed flow/volume map mismatch in the left MCA territory. We decided to treat the patient with intra-arterial tissue plasminogen activator (tPA) and mechanical thrombectomy.

Control angiography showed left proximal M3 occlusion (Fig. 1A). The SL-10 microcatheter (Stryker, Kalamazoo, MI, USA) was passed through the lesion smoothly using Synchro 014 microwire (Stryker, Kalamazoo, MI, USA) which had a looping shape. We performed mechanical thrombectomy with a partially deployed technique using a Trevo 3 mm stent (Stryker, Kalamazoo, MI, USA) (Fig. 1B). Control angiography showed recanalization of the occluded vessel but contrast leakage in proximal artery nearby by the lesion after stent retrieval (Fig. 1C), and subsequent dynamic CT showed SAH. We decided to treat the lesion presenting

with contrast leakage primarily with stenting using a Neuroform Atlas 3 mm stent (Stryker, Kalamazoo, MI, USA) to promote healing in the injured artery. Serial control angiography continued to show contrast leakage of the recanalized artery (Fig. 1D). We tried to treat the lesion with temporary balloon occlusion using a Scepter C balloon catheter (MicroVention, Aliso Viejo, CA, USA). Balloon was placed proximal artery nearby by the lesion. And it fully inflated during 5 minutes (Fig. 1E). Serial control angiography showed no further contrast leakage after repeated twice temporary balloon occlusion (Fig. 1F). CT showed that the SAH had increased in size after mechanical thrombectomy (Fig. 2). And anti-platelet medication (Aspirin 100mg qd.) was medicated next day for preventing of in-stent thrombosis. The clinical status of the patient was stable. Therefore, additional treatment involving external ventricular drainage to control the increased intracranial pressure was not performed. The modified Rankin scale score at discharge was 0, and the patient demonstrated no focal neurological deficits.

## DISCUSSION

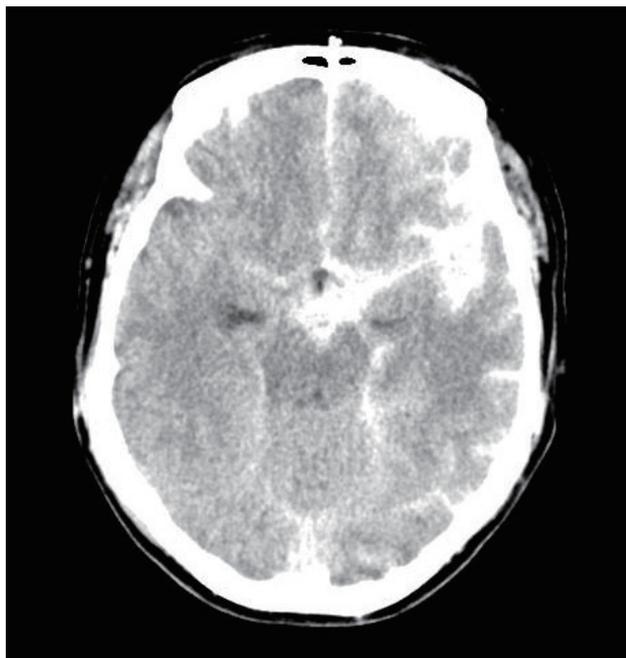
Procedure-related SAH after mechanical thrombectomy has been reported as a benign clinical feature that does not require additional surgical procedures.<sup>1)3)5)7)</sup> In one case, SAH after mechanical thrombectomy was suggested to be related to injury of the arterial wall during stent retrieval, but no definite offending lesion was usually observed,<sup>7)</sup> this was attributed to the spontaneous cessation of the SAH. If contrast leakage was observed during the intervention, it was caused by vessel perforation or dissection. Generally, injury of the intracranial vasculature presenting with bleeding should be controlled because spontaneous cessation of the bleeding is unlikely. Accordingly, SAH with contrast leakage of the offending lesion after mechanical thrombectomy should be treated reasonably. However, the decision to treat or the treatment modality for procedure-related SAH after mechanical thrombectomy with contrast leakage is not well known.<sup>1)3)7)</sup>



**Fig. 1.** (A) Left proximal M3 occlusion was showed on left internal carotid angiography. The thrombi was showed in microangiogram (arrow head). (B) Stent retrieval (Trevor 3 mm (Stryker)) was placed in M3. (C) Contrast leakage was showed at proximal of the lesion on control angiography after stent retrieval (arrow head). (D) Serial control angiography showed persistence of the contrast leakage after stent deployment (arrow head). (E) Temporary balloon occlusion was placed at proximal artery of the lesion. (F) There was none of contrast leakage in the final angiogram.

In our case, we believed the cause of SAH was perforation or dissection of parent artery which injured by stent strut. This is because the size of the retrieved stent was larger than that of the occluded artery, which injured the intima of the occluded artery during stent retrieval. It has been reported that procedure-related SAH more frequently develops after mechanical thrombectomy in small-diameter intracranial arteries.<sup>6)</sup> To prevent intimal injury during stent retrieval in the smaller-diameter, distal occluded artery, we deployed the stent partially

in the occluded M3 artery with the goal of reducing the friction between the stent and the occluded artery. Nevertheless, procedure-related SAH with contrast leakage developed after mechanical thrombectomy with partially deployed stent retrieval for the M3 occlusion. The other cause of SAH was stretching of branch artery. The artery shaped like loop was transformed to straight shape during stent retrieval. At that time, small perforator artery in parent artery shaped like loop was stretched and cut down.



**Fig. 2.** Computed tomography showed a subarachnoid hemorrhage in left sylvian fissure.

To stop the bleeding, we tried intracranial artery stenting and temporary balloon occlusion. Because arterial injury presenting with contrast leakage has been generally treated with stenting and subsequent temporary balloon occlusion during angioplasty in intracranial atherosclerotic stenosis,<sup>2)4)</sup> we applied this strategy to the SAH with contrast leakage after mechanical thrombectomy in our case. After stenting, the blood was an undercurrent in a dead space between stent and intima, it was easily created the hematoma. And cessation of blood flow by temporary balloon occlusion promotes clot formation theoretically, with the deployed stent acting as a scaffold for platelet aggregation into the injured artery. If control angiography shows contrast leakage of the injured artery after repeated temporary balloon occlusion, sacrifice of the injured artery should be considered because spontaneous cessation of the arterial bleeding is unlikely.

## CONCLUSION

In our case of SAH with contrast leakage after mechanical thrombectomy, stenting and subsequent repeated

temporary balloon occlusion was considered because spontaneous cessation of the arterial bleeding was unlikely.

## Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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