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Case report

Manual aspiration thrombectomy through proximal and distal supporting technique for the treatment of procedural distal A2 emboli: A technical case report

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ABSTRACT

Disrupted clots that form during endovascular treatment for acute ischemic stroke can cause distal embolization. It is not easy to recanalize occluded vessels resulting from distal emboli. In particular, endovascular treatment of distal A2 emboli is very challenging because it is difficult to access such a distal location and maintain microcatheter stability throughout the procedure. We report a case of successful recanalization of A2 occlusion caused by procedural-induced distal emboli through a proximal and distal supporting technique.

1. Introduction

Following the reports of several randomized trials, mechanical thrombectomy is now regarded an effective treatment modality for acute ischemic stroke [1,2]. Moreover, with the application of newly developed devices and techniques, higher recanalization rates and better clinical outcomes have been achieved. However, despite favorable results for mechanical thrombectomy, various procedure-related complications might occur. Among these, a fragmented clot created during mechanical thrombectomy may occlude or reduce the flow, not only of distal downstream arteries but also of side branches to the primary occlusion vessel, and present a possible obstacle to patient recovery. Here, we present a case of successfully recanalization of A2 obstruction resulting from procedural distal emboli through a proximal and distal supporting technique and provide detailed technical guidance.

2. Case report

A 77-year-old woman was hospitalized 1 h experiencing sudden-onset stuporous mental deterioration. The patient had no history of chronic disease except for a 5-year history of arrhythmia and had been taking a 2-mg warfarin tablet daily. On detailed neurologic examination, the patient showed dysarthria, central facial paralysis, and left-side limb weakness

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Fig. 1 – (A) Lateral right common carotid artery (CCA) angiogram showing distal CCA occlusion. An 8-F guiding catheter is located just below the occlusion site (arrow). (B) Anteroposterior right internal carotid artery (ICA) angiogram after aspiration thrombectomy for CCA occlusion shows obstructions of the M2 inferior branch (arrow) and ipsilateral A2 segment (arrow head). (C) A microcatheter is advanced distally through the emboli up to the level of the distal A3 segment (arrow) and a reperfusion catheter is advanced into the emboli (arrow head).

(muscle power scored as 1/5 in both the left upper and left lower limbs). Routine blood test and blood chemistry were all within the normal range, and the patient's National Institute of Health Stroke Scale (NIHSS) score was 18. Brain computed tomography (CT) did not show any abnormalities but total occlusion of the right distal common carotid artery (CCA) was noticed on CT angiography. Initially, the patient was treated with intravenous recombinant tissue plasminogen activator (rtPA; 0.9 mg/kg body weight) 1.5 h after onset, but after completion of the rtPA thrombolysis there was no improvement in the patient's neurologic condition (unchanged NIHSS score from baseline). Therefore, we planned subsequent endovascular treatment.

After femoral artery puncture, a 100-cm 8 F guide catheter (Guider Softip; Stryker, Natick, MA, USA) was advanced to the distal CCA (just beneath the occlusion site) as distally as possible through a triple coaxial system, which was assembled by combining the outermost 80-cm 8 F shuttle sheath (Shuttle-SL; Cook, Bloomington, ID, USA) and inner 125-cm selection catheter (Headhunter; Cook) (Fig. 1A). Aspiration thrombectomy was performed through a 5MAX Penumbra reperfusion catheter (Penumbra, Alameda, CA, USA). Subsequent distal subtraction angiography (DSA) revealed obstructions of the M2 inferior branch and ipsilateral A2 segment that seemed to be caused by distal emboli (Fig. 1B). First, manual aspiration thrombectomy for the M2 inferior branch was performed with a 4MAX Penumbra reperfusion catheter, resulting in successful recanalization. Subsequently, a 4MAX Penumbra reperfusion catheter was advanced to the level of the emboli on the A2 triaxially over a Rebar 18 microcatheter (EV3, Irvine, CA, USA) with a Synchro 0.014-inch guidewire (Stryker, Freemont, CA, USA) under roadmap guidance. At the level of the emboli, the microguidewire and microcatheter were advanced more distally through the thrombus up to the level of the distal A3 segment to achieve sufficient support to track the reperfusion catheter. The reperfusion catheter was advanced over this platform into the emboli (Fig. 1C). After removal of the microwire and microcatheter, manual aspiration thrombectomy was performed with a 20-cc syringe while the Penumbra reperfusion catheter was gently advanced and wedged tightly against the emboli. After the first attempt the solid blood clot was aspirated (Fig. 2A) and complete revascularization was confirmed on the final angiography (Fig. 2B).

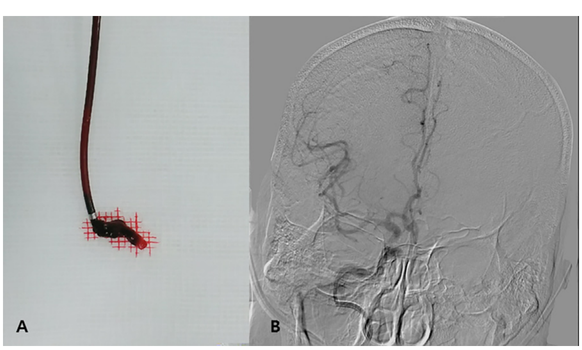

Fig. 2 – (A) Image of the clot in right A2 retrieved by manual aspiration thrombectomy. (B) Final anteroposterior right internal carotid artery (ICA) angiogram shows complete revascularization of the ipsilateral anterior cerebral artery (ACA).

Time from groin puncture to recanalization was 45 min. After the procedure, the patient showed a fully recovered mental status and intact left-side muscle power. The patient's NIHSS score improved from 18 to 1 and she was discharged on post-procedure day 10 with daily 2 mg warfarin. The patient eventually showed a modified Rankin Scale 0 at 3 months after discharge.

3. Discussion

Embolic complications resulting from mechanical thrombectomy for acute ischemic stroke are not uncommon and have been reported in previous studies [3]. Emboli to previously unaffected vessels or distal downstream vessels might worsen the clinical symptoms or hamper neurologic recovery. Several studies have described that mechanical thrombectomy with flexible and large-bore catheters via a manual aspiration technique known as ADAPT tended to be more efficient for reducing distal emboli than stent-based thrombectomy [3]. Also, Chueh et al. suggested proximal flow control with a balloon guide catheter during mechanical thrombectomy to

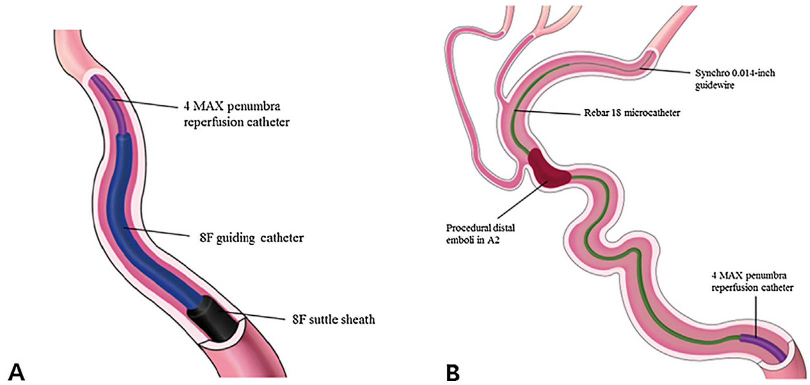

Fig. 3 – Schematic illustration of the proximal and distal supporting technique. (A) The 8-F guiding catheter is placed as distal as possible in the internal carotid artery (ICA). (B) Through this platform, a 4 MAX reperfusion catheter is advanced over a Rebar 18 microcatheter with a Synchro 0.014-inch guidewire. The microcatheter and microwire are advanced more distally through the emboli up to the level of the distal A3 segment to achieve sufficient distal support.

reduce the risk of distal emboli [4]. Nonetheless, it is almost impossible to completely prevent embolic complications during mechanical thrombectomy. In general, it is difficult for interventionists to remove procedural distal emboli that form in relatively small vessels during mechanical thrombectomy. In particular, in cases of distal ACA emboli it is even more difficult to extract the clot because the ACA usually shows a tortuous vascular course and many acute angles during the path of the vessel. However, if ACA emboli are not removed they can induce cerebral infarction on ACA territory, resulting in various neurologic sequelae such as motor dysfunction, urinary incontinence, sensory deficit, or dysphasia [5]. Moreover, because the distal ACA is responsible for blood supply of the supplementary motor area, occlusion of blood flow of the distal ACA might cause severe motor weakness that could have a serious impact not only on functional outcome, but also on quality of life [5]. Therefore we attempted manual aspiration thrombectomy for procedural A2 emboli via a proximal and distal supporting technique. First, we advanced an 8-F guiding catheter with a larger bore than that commonly used in mechanical thrombectomy; this is our first technical tip to achieve maximal proximal support. As a result we could manipulate the microcatheter and microwire freely by minimizing the resistance resulting from the tortuous aortic arch and aorta brachiocephalic junction (Fig. 3A). As the second technical tip, we used a 153-cm long Rebar 18 microcatheter, which is more than 3 cm longer than other commercial microcatheters. In this way, we could achieve extra catheter length to manipulate and advance more distally inside the Penumbra reperfusion catheter. As the third technical tip, we advanced the microcatheter and microwire more distally through the emboli up to the level of distal A3 to obtain sufficient distal support (Fig. 3B). During this process we advanced the microwire ahead of the microcatheter only at acute angles. For a relatively straight course, we advanced the macrocatheter ahead of the microwire in order to prevent perforation of the vessel. Through this proximal and distal supporting technique, we could track and advance the reperfusion catheter into the procedure-related A2 emboli and obtain successful recanalization and a favorable functional outcome without any neurologic deficit.

Conflict of interest

None declared.

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Ethics

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; uniform requirements for manuscripts submitted to Biomedical journals.

REFERENCES

[1] IMS II Trial investigators. The Interventional Management of Stroke (IMS) II Study. Stroke 2007;38:2127–35.
[2] Nogueira RG, Lutsep HL, Gupta R, Jovin TG, Albers GW, Walker GA, et al. Trevo versus Merci retrievers for thrombectomy revascularisation of large vessel occlusions in acute ischaemic stroke (TREVO 2): a randomised trial. Lancet 2012;380:1231–40.
[3] Todo A, Minaeian A, Sahni R, Chao KH. Incidence and outcome of procedural distal emboli using the Penumbra thrombectomy for acute stroke. J Neurointerv Surg 2013;5:135–8.
[4] Chueh JY, Kuhn AL, Puri AS, Wilson SD, Wakhloo AK, Gounis MJ. Reduction in distal emboli with proximal flow control during mechanical thrombectomy: a quantitative in vitro study. Stroke 2013;44:1396–401.
[5] Nagamine Y, Fukuoka T, Hayashi T, Kato Y, Deguchi I, Maruyama H, et al. Research article: clinical characteristics of isolated anterior cerebral artery territory infarction due to arterial dissection. J Stroke Cerebrovasc Dis 2014;23:2907–13.