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Case Report

Case of effective suction to secure the true lumen for acute occlusion after carotid endarterectomy ☆

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ABSTRACT

During or following carotid endarterectomy, dissection and occlusion of the internal carotid artery can occur. In cases of stenosis or almost complete occlusion, recanalization is relatively easy; however, in cases of complete occlusion, advancing a guidewire into the true lumen may be challenging. Few reports on how to address this problem have been published. Here, we report a case of suction-enabled advancement of the wire into the true lumen during endovascular treatment of an acute occlusion of the internal carotid artery after carotid endarterectomy. An 80-year-old man underwent carotid endarterectomy; the next morning, he exhibited aphasia and right-sided paralysis, and magnetic resonance images showed left cerebral infarction and left internal carotid artery occlusion. The patient was transferred to our hospital for recanalization. Imaging with contrast material showed that the left internal carotid artery was completely occluded. During recanalization, futile attempts were made to advance the wire into the true lumen. The occlusion was aspirated, and angiography then showed an inflow of contrast material into the vessel, which indicated slight distal widening; this widening allowed the wire to move into the true lumen. The occlusion extended distally, and 2 stents were placed over the entire lesion. Good recanalization was eventually achieved.

Introduction

Arterial dissection can occur during or after carotid endarterectomy (CEA). The rate of iatrogenic arterial dissection during or after this procedure is approximately 0.8%, and it is reported to be caused by a ballooning of the arterial shunt or temporary clipping of the artery [1–3]. When dissection occurs, adhesion of a thrombus to the flap at the dissection site may cause acute occlusion. According to some reports, stent implantation is effective in treating arterial dissection following CEA [1,4,5].

In many cases of occlusion of the internal carotid artery (ICA), insertion of the wire into the true lumen is difficult. The

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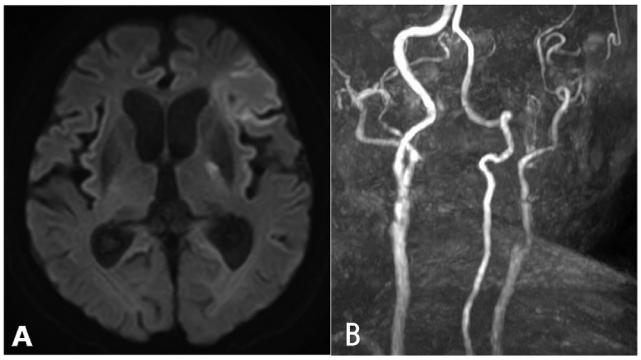

Fig. 1 – Preoperative images. Diffusion-weighted imaging at symptom onset (A) showed a pale, high-signal area in the frontal lobe. Magnetic resonance angiography (B) did not show the origin of the internal carotid artery.

literature contains few reports about what action should be taken when the true lumen cannot be entered smoothly.

Here, we report a case of ICA occlusion caused by arterial dissection that was discovered the day after CEA surgery. Although a suction catheter was effective in obtaining access to the true lumen, it was difficult to reopen the ICA because the dissection had extended distally.

Case report

An 80-year-old man underwent CEA at another hospital for left ICA stenosis. When the intraoperative shunt was used, the balloon on the side of the ICA was moved to adjust blood flow, but the surgery was completed without any major problems. The patient exhibited no abnormal neurological manifestations immediately after the surgery, but aphasia and right-sided paralysis appeared 13 hours after the procedure. Diffusion-weighted magnetic resonance imaging showed cerebral infarction in the left hemisphere and magnetic resonance angiography showed occlusion of the left ICA; for this reason, the patient was transported to our hospital (Sagamihara Kyodo Hospital) for endovascular treatment (Fig. 1).

Treatment

Before commencement of treatment, the patient received aspirin, 200 mg, and clopidogrel, 300 mg. Angiography of the left common carotid artery showed complete occlusion distal to the endarterectomy site (Fig. 2A). First, a 9-Fr balloon guiding sheath (Optimo; Tokai Medical Products, Inc., Aichi, Japan) was advanced into the common carotid artery proximal to the occluded site. We attempted to pass a microcatheter (Marksman; Medtronic, Irvine, CA) and a 0.014-inch micro-guidewire (ASAHI CHIKAI 14; Asahi Intecc Medical, Aichi, Japan) through the occluded segment, but the micro-guidewire could not penetrate the lesion. We then advanced an aspiration catheter (ACE 68; Penumbra, Alameda, CA) to the occlusion and performed direct aspiration for 2 minutes.

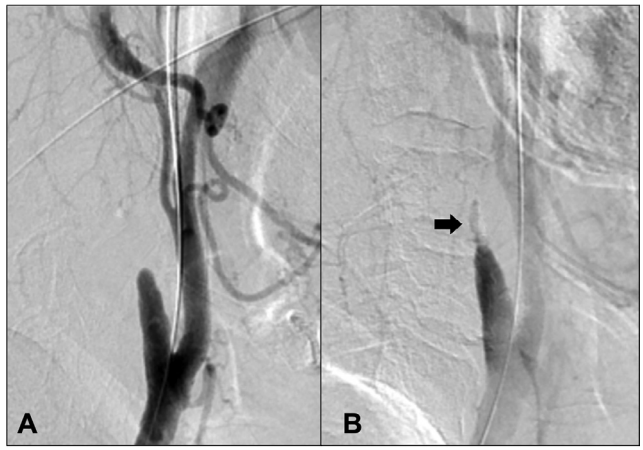

Fig. 2 – Intraoperative angiographic images. (A) The internal carotid artery was completely occluded. (B) As a result of the aspiration technique, the distal portion of the occlusion was slightly visible (arrow).

The aspiration catheter was removed, but no definite thrombus was noted; however, angiography showed inflow of contrast material into the vessel, which indicated distal widening; the micro-guidewire was then advanced slowly (Fig. 2B). After advancing approximately 7 cm, the wire again became stuck, and angiography revealed that the occluded segment had extended to the distal part of the vessel (Fig. 3A). We had great difficulty in advancing the wire further distally but were eventually able to reach the intact part of the ICA (Fig. 3B).

A SpiderFX embolic protection device (Medtronic) was deployed, and we performed gentle percutaneous transluminal angioplasty at the site of occlusion to guide the stent distally (Fig. 3C). The longest stent available in our hospital (WallStent Self-Expanding 8 mm × 29 mm × 135 cm; Boston Scientific, Santa Clara, CA) was implanted, but stenosis remained in the distal portion of the ICA. Percutaneous transluminal angioplasty was performed again, but the stenosis did not improve, and we implanted another stent (WallStent Self-Expanding 8 mm × 21 mm × 135 cm). Eventually we were able to achieve good re-expansion of the ICA and to restore intracranial perfusion (Fig. 3D).

Outcome

The patient's right-sided paralysis diminished soon after the procedure, but the aphasia remained. On magnetic resonance imaging, the ICA was well delineated, but a well-defined infarction was identified in the frontal lobe (Fig. 4). Rehabilitation was continued for the patient. However, he died 5 months following surgery, due to worsening chronic renal failure.

Discussion

We learned 2 important clinical facts: first, an aspiration catheter could be useful for advancing a wire into the true

Fig. 3 – Intraoperative angiographic images. All images are lateral views. Contrast-enhanced view of the distally advanced microcatheter (arrow). It is confirmed that the distal normal portion of the artery has not yet been reached. (A) The microcatheter (arrow) was distally advanced further, and it was confirmed that it reached the distal normal portion of this artery. (B) After an embolic protection device (arrow) was deployed, gentle percutaneous transluminal angioplasty was performed. (C) The internal carotid artery subsequently showed good recanalization.

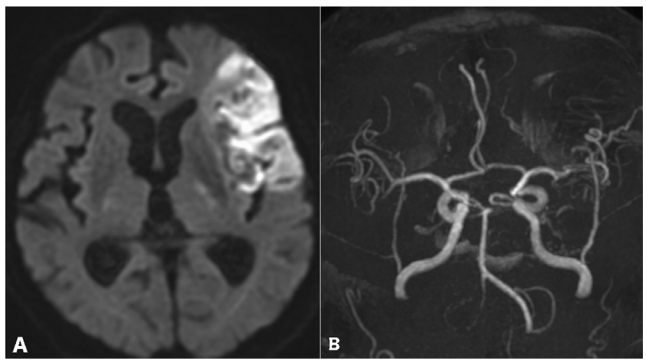

Fig. 4 – Postoperative images. Diffusion-weighted imaging (A) showed a well-defined infarct. On magnetic resonance angiography (B), the left internal carotid artery was well delineated.

lumen, and second, an ICA occlusion after CEA could extend distally.

ICA occlusion after CEA can sometimes be caused by ICA dissection. Because of the high risk of perforation in case of ICA dissection, the wire must certainly be guided into the true lumen. In cases of stenosis or almost complete occlusion, this maneuver is relatively easy, but in the case of complete occlusion, it is often difficult. According to Chen et al., in cases of chronic total occlusion of the cervical ICA, the success of guidewire insertion depends on the anatomy of the stump of the lesion [6]. They reported success rates of 76.1% with a tapered stump, 18.8% with a nontapered stump, and 5.1% with no stump; thus, a tapered stump best enables passage through the occlusion. Although our patient had an acute occlusion within 24 hours after CEA, the shape of the occlusion site corresponded to that of a nontapered stump; thus, safe passage of the wire was not easy. At first, in fact, the wire could not be advanced into either the true or false lumen.

Various ways of advancing the wire into the true lumen in difficult cases have been reported [7–9]. However, most cases have involved cardiovascular intervention, and the methods are not directly applicable to cases of occlusion after CEA. Iatrogenic arterial dissection during or after CEA is a rare complication; it is reportedly caused by the ballooning of the arterial shunt or temporary clipping of the ICA [1–3].

Acute occlusion following arterial dissection is thought to be caused by thrombus adhesion to the flap at the dissection site. Therefore, we tried to remove the thrombus by using an aspiration catheter. As a result, an inflow of contrast medium appeared distally in the ICA on angiography, which indicated that the wire could be advanced to that site. The probability that aspiration could damage the wall of the ICA is low, and this procedure is worth trying if the wire cannot be advanced smoothly.

ICA dissection may extend distally. It is difficult to determine whether this case presents a thrombotic occlusion or an occlusion due to dissection. Although it is difficult to judge the length of the lesion preoperatively, the possibility of distal extension should be considered. Some authors have suggested that the rate of success of recanalization can decrease with longer lesions [10–12]. Anzuini et al. stated that reoperation is often effective in cases of thrombosis after CEA, but difficult in cases of dissection because many such lesions extend distally [1].

In our patient, the lesion was approximately 7 cm long, and it was very difficult to pass the wire through the lesion. Prolonged attempts to pass through the lesion may also lead to complications. Myrcha and Gloviczki noted that if the lesion cannot be traversed within 30 minutes, the procedure must be halted [11]. Surgeons should be prepared for other methods, such as bypass surgery, in case recanalization fails.

In cases of acute occlusion after CEA, it is important to account for the possibility of dissection, which is often difficult for recanalization.

Conclusion

In endovascular treatment of acute occlusions resulting from ICA dissection, the wire must certainly be advanced into the true lumen. When advancing the wire is difficult, the aspiration procedure may help advance the wire into the true lumen safely. In addition, the dissection can extend distally, and this possibility should also be considered. Surgeons should be prepared for other methods if recanalization fails.

Patient consent

We obtained the consent from the family members of the patient for publication of this case report.

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