Angioplasty and Stenting of Totally Occluded Common Carotid Artery at the Chronic Stage

—Case Report—

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Abstract

A 64-year-old man with chronic occlusion of common carotid artery (CCA) underwent successful recanalization with angioplasty and stenting. Patients with symptomatic CCA occlusion with hemodynamic impairment are at increased risk of subsequent stroke. Percutaneous transluminal angioplasty and stenting could be an option for chronic occluded CCA with hemodynamic impairment.

Key words: common carotid artery, percutaneous transluminal angioplasty, stent, chronic stage

Introduction

Percutaneous transluminal angioplasty (PTA) and stenting are a new therapeutic approach for totally occluded internal carotid artery (ICA).^{4,5)} Surgical revascularization with extracranial-intracranial bypass is effective in improving hemodynamic impairment. However, surgical reconstruction is not straightforward for total occlusion of the common carotid artery (CCA), and the effectiveness remains unclear. We successfully treated a patient with symptomatic CCA occlusion in the chronic stage by the endovascular approach, which suggests that PTA and stenting are an option for occluded CCA with hemodynamic compromise in the chronic stage.

Case Report

A 64-year-old man was treated for right hemiparesis and mild aphasia 2 months before admission, and was not at risk for vascular event. Brain diffusion-weighted magnetic resonance (MR) imaging showed a high-intensity area in the left corona radiata (Fig. 1A). Cerebral angiography revealed occlusions of the bilateral CCAs (Figs. 1B and 2A) and right vertebral artery (Fig. 1B). However, the distal proximal section of the left CCA (Fig. 1C) and left carotid bifurcation were unobstructed (Fig. 2B). Single photon emission computed tomography (SPECT) with iodine-123 N-isopropyl-p-iodoamphetamine (dual table autoradiographic method) demonstrated severe cerebral hypoperfusion and reduced vasoreactivity (-1.1%) in the left middle cerebral artery and anterior cerebral artery (Fig. 3A). Therefore, endovascular recanalization of the occluded CCA was performed using a proximal embolic protection system 8 weeks after the ischemic event.

Fig. 1 A: Diffusion-weighted magnetic resonance image on admission showing a high-intensity area on the left basal ganglia, indicating newly-developed cerebral infarction. B, C: Angiograms from the right innominate artery on admission demonstrating occlusion of the right common carotid artery and right vertebral artery. The carotid bifurcation (arrow) was opacified via the deep cervical artery.

The patient was premedicated with clopidogrel (75 mg/day) and aspirin (100 mg/day) for 14 days. The endovascular procedure was performed with local anesthesia and intravenous sedative. 9 Fr and 5 Fr short sheaths were inserted into the right and left femoral arteries, respectively. An activated clotting time of more than 250 seconds was maintained by intravenous administration of heparin. A 9 Fr guiding catheter with an occlusion balloon (Patlive; Clinical Supply, Tokyo) was placed in the proximal portion of the CCA and the balloon was inflated for cerebral protection. A 0.035 inch guide wire and a 4 F angi catheter (Glidecath; Terumo, Tokyo) were passed

Fig. 2 A: Left carotid angiogram on admission showing that the left common carotid artery (CCA) was totally occluded, but the origin of the CCA was open. B: Left vertebral angiogram on admission showing that the left carotid bifurcation (arrow) was retrogradely opacified via the anastomosis between the vertebral artery and the occipital artery. The carotid bifurcation was not occluded.

Fig. 3 A: Split-dose single photon emission computed tomography (SPECT) scans at rest on admission showing decreased cerebral blood flow in the territories of the left middle cerebral artery (MCA) and the left anterior cerebral artery (ACA) (upper), and after Diamox challenge showing decreased cerebral vasoreactivity (CVR) in the territories of the left MCA and the left ACA (lower). B: SPECT scans after the procedure showing improved cerebral blood flow (upper) and CVR (lower).

Fig. 4 A: Intraoperative fluorogram showing penetration of the percutaneous transluminal angioplasty (PTA) guide wire through the occluded lesion. B: Angiogram obtained after PTA of the occluded common carotid artery (CCA) showing wall irregularity of the recanalized CCA. C: Angiogram after stent placement showing antegrade flow in the fully-recanalized CCA.

Fig. 5 A: Three-dimensional computed tomography (3D-CT) angiogram obtained 9 months after the procedure showing restenosis in the stent. B: Angiogram before repeat percutaneous transluminal angioplasty (PTA) showing in-stent restenosis. C: Angiogram obtained after repeated PTA showing complete dilation of the in-stent stenosis. D: 3D-CT angiogram obtained 3 months after the second procedure showing no in-stent restenosis.

across the occluded lesion, and the ICA was occluded with an occlusion balloon (Fig. 4A). Then, the occluded portion of the CCA was dilated with a 3.5 by 40 mm PTA balloon (Savvy; Cordis Neurovascular, Inc., Miami Lakes, Fla., U.S.A.) (Fig. 4B), and two self-expanding stents (10 by 40 mm and 10 by 20 mm, Precise; Johnson and Johnson, Inc., New Brunswick, N.J., U.S.A.) were introduced and postdilated with a 4.5 by 40 mm PTA balloon (Savvy). After blood aspiration and balloon deflation, recanalization and antegrade flow of the CCA were confirmed (Fig. 4C). To avoid hyperperfusion after stenting, staged angioplasty with an undersized balloon was attempted, but failed be-

cause of insufficient dilation.⁶⁾ SPECT was performed immediately following stenting, and no hyperperfusion was revealed. However, blood pressure was strictly controlled both during and after the procedure.

The patient showed no neurological changes after the procedure, but MR imaging showed a small high intensity spot on the left thalamus. SPECT showed marked improvement of cerebral hypoperfusion and vasoreactivity (Fig. 3B). The patient continued to be free from symptoms and recanalization of the CCA was confirmed using three-dimensional computed tomography (3D-CT) angiography at 1 and 3 months following the procedure. However, in-stent restenosis of the CCA was identified by 3D-CT angiography 9 months after the procedure (Fig. 5A, B). PTA was performed using the distal protection method (Fig. 5C) and no restenosis was observed 3 months after the second procedure (Fig. 5D).

Discussion

The present case demonstrates that endovascular recanalization of chronic CCA occlusion can result in hemodynamic improvement. Therapeutic indication was extremely important in the application of this novel approach. The annual rate of ipsilateral stroke is 5.5% in patients with symptomatic occlusion of the ICA,¹⁾ but this rate might vary in patients with CCA occlusion due to the effects of residual blood flow from the external carotid artery to the ICA. The natural course of CCA occlusion is unknown, so the therapeutic indications should be determined by comparison of procedural risks and estimated risks under medical treatment on a case-by-case basis.

Selection of treatment options is also important. Surgical treatments for occluded CCA are well known, and consist of bypass surgery with a vessel graft³⁾ or long segment endarterectomy.²⁾ Compared to these surgical approaches, the endovascular approach seems less invasive. Therefore, the endovascular approach could be appropriate for patients with other medical risks, such as our patient with

multiple occlusions of the supra-aortic arteries. However, procedural risks, such as embolic stroke or the risk of hyperperfusion after the procedure, are unknown. Since this therapy is applied to patients with hemodynamic compromise, blood pressure control is important to avoid hyperperfusion after the procedure. Further clinical experience is necessary to gauge the safety and efficacy of this endovascular approach.

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