



Case Report

Staged strategy using a transcarotid approach for acute tandem occlusions with left common carotid artery origin steno-occlusive lesion

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Received : 08 June 2021

Accepted : 21 June 2021

Published : 19 July 2021

DOI

10.25259/SNI_572_2021

Quick Response Code:



ABSTRACT

Background: Endovascular treatment for acute tandem occlusion (ATO) of the combination of an ipsilateral extracranial internal carotid artery (ICA) steno-occlusive lesion with concurrent intracranial artery occlusion is challenging. Whether extracranial lesions, especially in cases of the left common carotid artery (LCCA) origin steno-occlusive lesions, should be treated after recanalization of an occluded intracranial artery by mechanical thrombectomy simultaneously in the same session has not been established. We report two cases of successful ATO with LCCA origin steno-occlusive lesions treated by staged retrograde transcarotid LCCA stenting followed emergent mechanical thrombectomy in two sessions because of the tortuous aortic arch.

Case Description: A 61-year-old man with left ICA occlusion and an 82-year-old woman with left middle cerebral artery occlusion underwent emergent mechanical thrombectomy for ATO with LCCA origin steno-occlusive lesions. We achieved recanalization of large vessels, but severe stenosis of LCCAs remained. Because of the tortuous aortic arch, we decided to treat LCCA origin steno-occlusive lesions with staged stenting in the other session followed emergent mechanical thrombectomy. Postoperative courses were uneventful, and their symptoms improved. We performed stenting using a transcarotid approach through CCA cut down for LCCA steno-occlusive lesions without any complications.

Conclusion: The staged strategy leaving LCCA origin stenosis seems to offer a better strategy than the simultaneous strategy for ATO with LCCA origin steno-occlusive lesions. A retrograde transcarotid approach through CCA cut down is recommended for LCCA stenting.

Keywords: Acute tandem occlusion, Left common carotid artery origin steno-occlusive lesions, Retrograde transcarotid approach, Staged strategy

INTRODUCTION

In acute ischemic stroke (AIS) with large vessel occlusion (LVO), recanalization results in good clinical outcomes.^[4] In AIS due to LVO in the anterior circulation, 15–20% of cases involve tandem occlusion of the combination of an ipsilateral extracranial internal carotid artery (ICA) steno-occlusive lesion and concurrent intracranial artery occlusion.^[2] Endovascular treatment for acute tandem occlusion (ATO) of a combination of steno-occlusive lesion of the ipsilateral extracranial artery with concurrent intracranial artery occlusion is challenging. ATO with a steno-occlusive

lesion of the origin of the left common carotid artery (LCCA) is rare but must be considered a cause of ischemic stroke. Several reports have suggested the combination of acute stenting of the extracranial ICA with antithrombotic agents and intracranial mechanical thrombectomy to treat ATO.^[6] Conversely, others prefer to perform only balloon dilatation for the extracranial lesion.^[5,8] Whether extracranial lesions, especially in cases of LCCA origin lesions, should be treated after recanalization of an occluded intracranial artery by mechanical thrombectomy simultaneously in the same session has not been established. Here, we report two cases of successful ATO with LCCA origin steno-occlusive lesions treated by staged retrograde trans-carotid LCCA stenting following emergent mechanical thrombectomy because of the tortuous aortic arch.

CASE PRESENTATION

Case 1

A 61-year-old man with a history of hypertension presented with right hemiparesis and total aphasia within 1 h after symptom onset. National Institutes of Health Stroke Scale (NIHSS) score was 19. Magnetic resonance imaging (MRI) showed acute and subacute infarctions in the left frontal lobe with an Alberta stroke program early computed tomography score (ASPECTS) of 7 on diffusion-weighted imaging (DWI) [Figure 1a]. Magnetic resonance angiography (MRA) showed occlusion of the left ICA to the left middle cerebral artery (MCA) [Figure 1b]. Computed tomography angiography revealed occlusion of the LCCA origin [Figure 1c]. We diagnosed AIS with atherosclerosis-related LVO. We decided to perform endovascular treatment alone. A 9-Fr balloon-guided catheter (OPTIMO; Tokai Medical Products, Aichi, Japan) was positioned at the proximal end of the LCCA origin through the right femoral artery under local anesthesia. Angiography of the LCCA revealed severe stenosis of the LCCA and thrombus [Figure 2a]. First, the occlusive lesion was easily but carefully crossed with a 6-Fr JB2 catheter (Medikit, Tokyo, Japan) over a Radifocus 0.035”

guidewire (Terumo, Tokyo, Japan). Second, the OPTIMO was advanced over the JB2 catheter and the Radifocus in the ICA, and angiography of the ICA revealed left ICA terminus occlusion [Figure 2b]. Third, we performed thrombectomy using a Penumbra ACE68 (Penumbra, California, USA). Reperfusion of the left MCA territory was confirmed by contralateral ICA flow through the anterior communicating artery with left ICA flow stagnation [Figure 2c]. Finally, the OPTIMO was withdrawn from the ICA with continuous aspiration to aspirate the thrombus in the LCCA. As a result, recanalization of the LCCA was achieved without emboli in any new territories [Figure 2d]. The postoperative course was uneventful, and all symptoms improved. He underwent LCCA stenting using a transcarotid artery approach through CCA cut down with a small transverse neck incision 61 days after onset because of the tortuous aortic arch. He was maintained on dual antiplatelet therapy with aspirin and clopidogrel before the procedure. With a small transverse neck incision to expose the LCCA under general anesthesia, we cut down the LCCA trunk and inserted a 4-Fr sheath, followed by transposition of the 6-Fr guiding sheath (Asahi Fubuki Dilator kit; Asahi Intecc Co., Aichi, Japan), followed by systemic heparinization. First, a guiding sheath was positioned distal to the LCCA origin, and the CCA was clamped distally to the sheath insertion point as distal protection. Second, the LCCA origin steno-occlusive lesion was carefully pierced using a 0.014-inch micro guidewire (Transcend; Stryker, Kalamazoo, MI) and we performed predilatation balloon angioplasty followed by double-layer micromesh stent (CASPER Rx; Terumo, Tokyo, Japan) placement under breath-hold to prevent misalignment. Finally, post-dilatation balloon angioplasty was performed after stent placement. Angiography from the LCCA demonstrated successful revascularization of the LCCA [Figure 2e]. Postoperative computed tomography angiography revealed revascularization of the LCCA origin by successful stenting [Figure 2f]. He was discharged on day 99 from the onset with a modified Rankin Scale (mRS) score of 2.

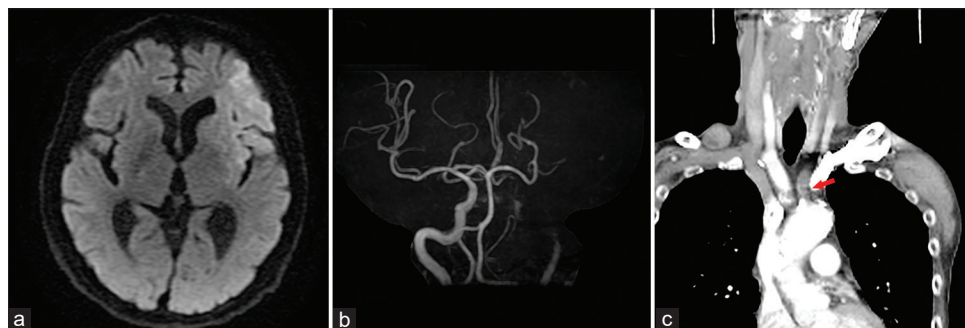


Figure 1: (a) Magnetic resonance imaging shows acute infarction in the left frontal lobe with an Alberta stroke program early computed tomography score of 7 on diffusion-weighted imaging. (b) Magnetic resonance angiography shows occlusion of the left internal carotid artery. (c) Computed tomography angiography reveals occlusion of the left common carotid artery origin without aortic dissection.

Case 2

An 82-year-old woman with a history of dyslipidemia, chronic heart failure, and cardiac arrhythmias presented with right hemiparesis and motor aphasia 2.5 h after symptom onset. NIHSS was 11. MRI/MRA showed acute infarction with a DWI-ASPECTS of 8 and occlusion of the left MCA [Figure 3a and b]. We diagnosed AIS with LVO caused by cardiogenic embolus and decided to perform endovascular treatment with intravenous thrombolysis. However, angiography of the LCCA revealed severe stenosis at the origin [Figure 3c]. We diagnosed ATO with the LCCA origin stenosis finally and performed thrombectomy. We achieved recanalization of the MCA, but severe stenosis of the LCCA remained [Figure 3d and e]. Due to training and rehabilitation, her symptoms were improved. Because of the tortuous aortic arch, she underwent LCCA stenting using a trans-carotid approach with an mRS score of 1 on day 167 from onset [Figure 3f].

DISCUSSION

We have presented two cases of successful ATO with LCCA origin steno-occlusive lesions treated under a staged strategy. LCCA origin occlusive lesions are generally atherosclerotic, but Takayasu arteritis or radiation arteritis and aortic dissection should also be considered.^[5] ATO with an LCCA origin steno-occlusive lesion is rare,^[5,8] but must

be considered as one cause of AIS with LVO. ATO with an LCCA origin steno-occlusive lesion accounted for 2 of 78 cases (2.7%) of endovascular treatment for AIS with LVO in the left anterior circulation in our registry from April 2016 to December 2020. When using a simultaneous strategy, insufficient preprocedural antiplatelet therapy, anatomical limitations such as a tortuous type II or III aortic arch, severe agitation, and loss of airway reflexes can make LCCA stenting difficult, because most endovascular treatment is performed via the femoral artery in an emergency situation with conscious sedation and local anesthesia. In addition, the lack of preoperative evaluation to prevent cerebral reperfusion hemorrhage and reach a diagnosis might result in misery outcome, because left carotid artery stenting is independently associated with cerebral hyperperfusion.^[3] Further, in patients with Takayasu arteritis, biological inflammation after revascularization increases the risk of arterial complications.^[7] Alternatively, using a staged strategy, sufficient preprocedural antiplatelet therapy, preoperative evaluation of cerebral reperfusion hemorrhage, avoidance of operational procedures under the administration of intravenous thrombolysis, and accurate diagnosis prevent neurological complications and facilitate safe LCCA stenting. Because postoperative LCCA origin steno-occlusive lesion remained recanalized, we performed staged LCCA stenting in the present two cases.

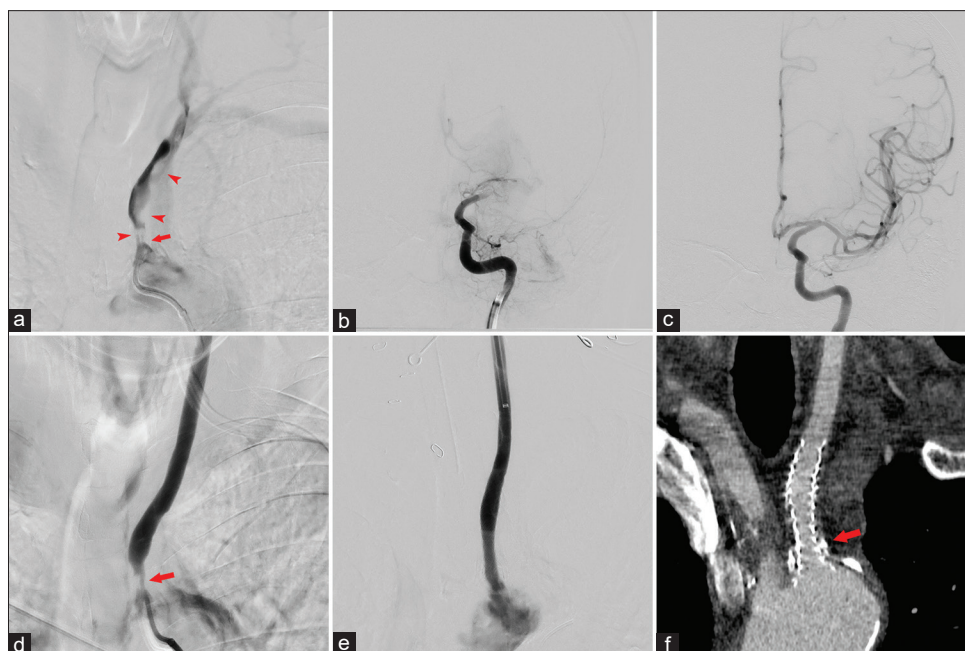


Figure 2: (a) Angiography of the left common carotid artery (LCCA) demonstrates severe stenosis visualization of the LCCA (red arrow) and thrombus (red arrowhead). (b) Angiography of the internal carotid artery (ICA) reveals occlusion of the left ICA terminus with ICA flow stagnation. (c) Reperfusion of the left middle cerebral artery territory is confirmed. (d) Angiography of the LCCA confirms patency of the LCCA origin (red arrow) at the end of endovascular treatment. (e) We placed a double-layered micromesh stent under breath-hold to prevent misalignment. Angiography confirms successful revascularization of the LCCA. (f) Postoperative computed tomography angiography reveals revascularization of the LCCA origin (red arrow) by successful stenting.

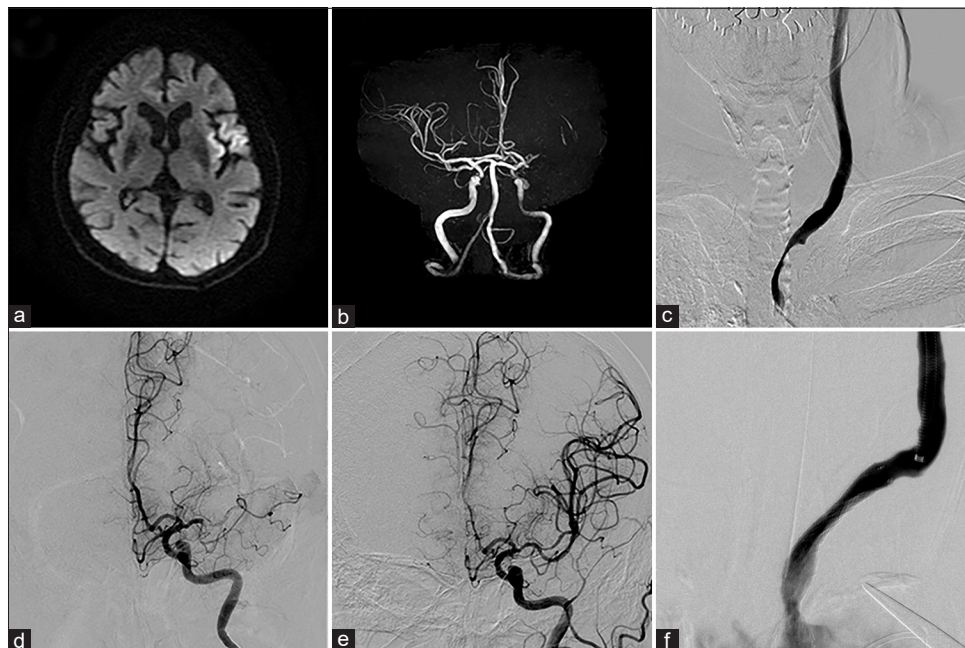


Figure 3: (a) Magnetic resonance imaging (MRI) shows acute infarction in the left frontal lobe with an Alberta stroke program early computed tomography score of 8 on diffusion-weighted imaging. Magnetic resonance angiography (MRA) shows occlusion of the left middle cerebral artery (MCA). (b) MRI shows acute infarction in the left frontal lobe with an Alberta Stroke Program Early Computed Tomography score of 8 on diffusion-weighted imaging. MRA shows occlusion of the left MCA. (c) Angiography of the left common carotid artery (LCCA) demonstrates severe stenosis of the LCCA origin. (d) Angiography of the internal carotid artery reveals left MCA occlusion. (e) Reperfusion of the left MCA territory is confirmed. (f) Angiography confirms successful revascularization of the LCCA by successful stenting.

During LCCA stenting using a trans-femoral approach, anatomical limitations and the lack of guiding catheter support make stenting difficult. Aortic arch manipulation represents the greatest risk for microembolization in carotid artery stenting.^[1] Because of the technical success rate and periprocedural mortality and stroke, the 2017 European Society for Vascular Surgery Clinical Practice Guidelines recommends that stenting using a transcarotid approach through CCA cut-down be considered for the treatment for LCCA steno-occlusive lesions.^[5] In addition, with the transcarotid approach through CCA cut down under general anesthesia, stability of the guiding catheter, and control of both spontaneous breathing and agitation, LCCA stenting can be performed safely despite any anatomical limitations. We thus performed LCCA stenting using a retrograde transcarotid approach through CCA cut down in the present cases. However, the transcarotid approach carries a risk of hematoma at the neck incision, which may lead to airway obstruction because of the preprocedural antiplatelet therapy. Here, we reported two cases of successful endovascular treatment of ATO with LCCA origin steno-occlusive lesions and staged strategy using a transcarotid approach for LCCA origin steno-occlusive lesions because of the tortuous aortic arch. Because of the small sample size for this report, further prospective and randomized trials are needed to clarify whether this strategy offers a better treatment option than a simultaneous strategy.

CONCLUSION

We must consider LCCA origin steno-occlusive lesions as one cause of AIS with LVO. The staged strategy leaving LCCA origin stenosis seems to offer a better strategy than the simultaneous strategy for ATO with LCCA origin steno-occlusive lesions. A retrograde trans-carotid approach via CCA cut down was recommended for LCCA stenting.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Maeoka R, Nakagawa I, Ohnishi H, Ohnishi H. Staged strategy using a trans-carotid approach for acute tandem occlusions with left common carotid artery origin steno-occlusive lesion. *Surg Neurol Int* 2021;12:364.