

## CASE REPORT

# Successful Mechanical Thrombectomy for Subocclusive Thrombus at the Origin of Lenticulostriate Artery

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**Abstract:** Optimal treatment of patients with intracranial subocclusive thrombus remains unclear. Such a rare case successfully managed with endovascular mechanical thrombectomy is presented. A 71-year-old man experienced a sudden onset of dysarthria and motor deficits. At the time of admission his National Institutes of Health Stroke Scale (NIHSS) score was 4. DWI demonstrated incomplete infarction within the left lenticulostriate artery (LSA) territory, MRA showed partial flow defect in the distal left M1 segment and non-visualization of the LSA, and ECG revealed atrial fibrillation, thus ischemic stroke caused by cardiogenic embolism was diagnosed. Tissue plasminogen activator was administered, but symptoms progressed and NIHSS score increased up to 8. Diagnostic angiography confirmed presence of the subocclusive thrombus within the distal left M1 segment and complete occlusion of LSA at its origin. Since conservative therapy was ineffective, mechanical thrombectomy utilizing ADAPT (a direct aspiration first-pass thrombectomy) technique was performed resulting in complete recanalization of the LSA accompanied by the prompt regress of neurological symptoms. Eventually, the patient demonstrated nearly full recovery (modified Rankin Scale score 1). Thus, mechanical thrombectomy should be considered as a reasonable option in cases of acute cerebral stroke caused by subocclusive thrombus and progressive neurological deficits despite standard conservative therapy. *J. Med. Invest.* 67:372-374, August, 2020

**Keywords:** cerebral stroke, lenticulostriate artery, mechanical thrombectomy, subocclusive thrombus

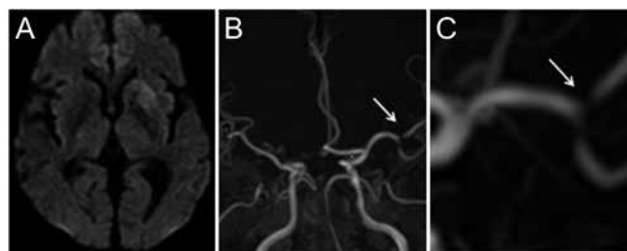
## INTRODUCTION

Subocclusive thrombi, also designated as intraluminal or non-occlusive, cause partial obstruction of the blood flow (BF) within the affected vessel and are encountered intracranially only infrequently. Their neuroradiological characteristics, which allow for discrimination from the occlusive or atherosclerotic thrombi, include eccentric location with tapering of the residual lumen, smooth and well-defined margins, and absence of the vascular wall calcifications (1-3). Although it is well recognized that presence of subocclusive thrombi is associated with increased risk of acute stroke, their optimal management remains unclear (1-5). In particular, subocclusive thrombus of the middle cerebral artery (MCA) may cause only partial obstruction of BF in the main vessel, but complete occlusion of the lenticulostriate artery (LSA) at its origin. Herein, we report such a rare case manifesting with progressive neurological deficits, in which endovascular mechanical thrombectomy has resulted in a favorable outcome. Informed consent was obtained from the patient allowing publication of his medical data and details of treatment, which was conducted in accordance with the International Code of Ethics of the World Medical Association.

## CASE REPORT

A 71-year-old man with a history of arterial hypertension ex-

perienced a sudden onset of slurred speech and was immediately transferred to the hospital. At the time of admission he presented with dysarthria and right-sided facial palsy and hemiparesis, whereas his Glasgow Coma Scale (GCS) score was 15 and the National Institutes of Health Stroke Scale (NIHSS) score was 4. Diffusion-weighted imaging (DWI) of the brain demonstrated a slightly hyperintense lesion in the left LSA territory, whereas MRA identified stenosis of the distal left M1 segment (Figure 1). There were no signs of atherosclerosis of the internal carotid arteries (ICA) or other cerebral vessels, and no other vascular stenotic lesions were noted. ECG revealed atrial fibrillation. Based on these findings left-sided incomplete cerebral infarction caused by cardiogenic embolism was diagnosed. Tissue plasminogen activator (tPA) was administered intravenously within 2 hours after the onset of symptoms. However, the condition of patient continued to deteriorate with development of severe aphasia and hemiparesis, and increase of NIHSS score up to 8. Therefore,



**Figure 1.** Imaging characteristics of the 71-year-old man with cerebral stroke at the time of admission. Diffusion-weighted imaging demonstrates slightly hyperintense lesion in the anterior limb of internal capsule, the head of caudate nucleus and putamen of the left cerebral hemisphere (A), whereas MRA without (B) and with (C) magnification shows partial flow defect within the distal left M1 segment (arrow).

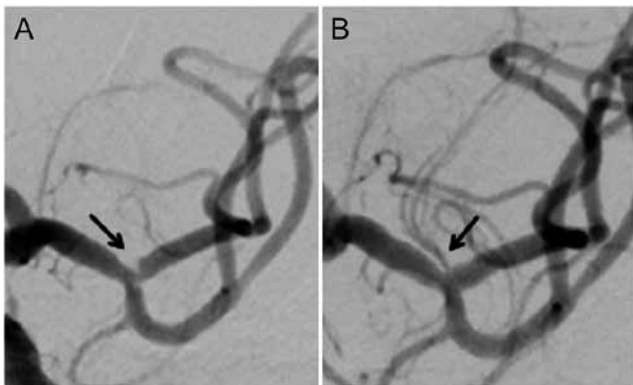
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left-sided carotid angiography was performed for clarification of diagnosis. Although there was no complete occlusion of the left MCA, the origin of the LSA from the distal M1 segment was not detected. Since conservative therapy was ineffective, the mechanical retrieval of subocclusive thrombus with the use of ADAPT (a direct aspiration first-pass thrombectomy) technique was considered.

#### Thrombectomy

An 8 Fr Launcher (Medtronic; Minneapolis, MN, USA) was inserted into the left ICA and a Penumbra 4MAX Reperfusion Catheter (Penumbra, Alameda, CA, USA) was placed into the distal left M1 segment over a coaxially inserted PX SLIM Delivery Microcatheter (Penumbra) and CHIKAI 14 microguidewire (Asahi Intecc; Nagoya, Aichi, Japan). Then, a Solitaire™ FR (6 × 20 mm) clot retrieval device (Covidien Neurovascular; Irvine, CA, USA) was deployed into the MCA to the blocked origin of LSA. Approximately 10 minutes thereafter, Penumbra 4MAX Reperfusion Catheter was connected to the Penumbra aspiration system. Pressure was maintained on the housing of the 4MAX and continuous aspiration was applied while slight pulling the Solitaire™ FR device back. The post-intervention angiogram revealed complete recanalization of the previously occluded LSA (Figure 2).



**Figure 2.** Left internal carotid angiograms before (A) and after (B) mechanical thrombectomy, which resulted in full resolution of the pre-existent partial flow defect within the distal M1 segment and complete recanalization of the previously occluded lenticulostriate artery (arrow).

#### Postoperative Course

On the first postoperative day, the condition of patient improved significantly, and only mild aphasia and right-sided hemiparesis were demonstrated, whereas his NIHSS score was 3. Anticoagulant therapy was started to prevent re-embolization. Subsequent rehabilitation resulted in remarkable regression of the aphasia and hemiparesis, and in 2 months the patient achieved complete independence in the activities of daily living and did not show any obvious cognitive dysfunction (modified Rankin Scale score 1).

#### DISCUSSION

Usually, between 2 and 12 LSA arise from the MCA, and origins of the most proximal and distal arteries are located at a mean distances of 4.35 and 13.49 mm from the carotid bifurcation (6). Herein, we present a patient with subocclusive

thrombus of the MCA resulting in full occlusion of the LSA and development of ischemic stroke, successfully treated by means of endovascular mechanical thrombectomy. To the best of our knowledge, this is the first report of such a rare case.

The optimal treatment of cerebral infarction is largely determined by its cause. The diagnosis of subocclusive thrombus of the left MCA in our patient with sudden onset of the clinical symptoms was mainly based on DWI demonstrating incomplete infarction within the left LSA territory, MRA and carotid angiography showing partial BF defect within the distal left M1 segment and non-visualization of the LSA caused by thrombus with smooth and well-defined margins, and ECG indicating atrial fibrillation, thus cardiogenic embolism was suspected. Of note, advanced neuroimaging may provide additional clues to the pathophysiological cause of the intracranial arterial occlusion. In particular, high-resolution MRI may help to differentiate atherosclerosis, dissection and vasculitis, especially if mismatch between basi-parallel anatomical scanning (BPAS) and MRA is demonstrated (7, 8). Finally, the thrombus itself, if collected, may pinpoint the cause of disease. Sgreccia *et al.* (9) have speculated that cardioembolic clots are red in color, in difference with white ones indicating atypical etiology (for example, infective endocarditis).

Several studies investigated the efficacy of anticoagulation with and without antiplatelet therapy in cases of subocclusive thrombus (1-4). In their series, Mokin *et al.* (2) reported a favorable outcome in 75% of patients treated with intravenous heparin. However, intravenous administration of tPA in our patient was not effective, and did not prevent progression of the neurological symptoms. Therefore, it was decided to perform mechanical thrombectomy. Such procedure with the use of aspiration catheter and stent retriever is routinely applied nowadays in cases of ischemic stroke caused by large vessel occlusion and has demonstrated high safety and efficacy profiles. Its application in patients with nonocclusive intracranial thrombus usually results in good functional outcome, although the risk of clinical deterioration and persistent focal neurological deficits may reach 17% (1). It emphasizes importance of the meticulous surgical technique and appropriate choice of the endovascular devices.

In our patient thrombus retrieval was achieved by Solitaire™ FR with the use of Penumbra 4MAX Reperfusion Catheter as aspiration system. It was considered that in a case of incomplete MCA occlusion such surgical strategy would result in more secure capture of the clot in comparison to utilization of a Reperfusion Catheter alone. As has been noted previously, combined use of the aforementioned devices may be highly effective in BF restoration while prevents inadvertent distal embolization (10, 11). Indeed, positioning the 4MAX Reperfusion Catheter at the clot allowed for a quick, smooth initiation of the continuous direct aspiration during thrombus retrieval, and also allowed for immediate re-access after each pass with the Solitaire™ FR.

Endovascular surgery has resulted in complete recanalization of LSA, which was accompanied by prompt regress of aphasia and motor deficits. Postoperative course was uneventful and the patient demonstrated nearly full recovery, which indicates the appropriateness of the selected treatment strategy. Thus, mechanical thrombectomy should be considered as a reasonable option in cases of acute cerebral stroke caused by subocclusive thrombus manifesting with progressive neurological deficits despite administration of the standard conservative therapy.

**CONFLICT OF INTEREST DISCLOSURE**

The authors have no personal or institutional interests in drugs, materials, or devices described in this paper.

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