# Delayed Endovascular Thrombectomy in a Patient Suffering from Stroke in Progression after Intravenous Thrombolytic Therapy

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#### Abstract

- *Purpose:* Significant improvement of stroke symptoms may occur in acute stroke patients due to large artery occlusion (LAO) treated with intravenous thrombolysis (IVT). Directly proceeding with endovascular thrombectomy (EVT) would be a clinical dilemma.
- *Case Report:* A 55-year-old male suddenly suffered from global aphasia and right side hemiplegia at work. Left proximal middle cerebral artery (MCA) occlusion was shown on CT angiography. After IVT, NIHSS significantly improved from 11 to 4 points. EVT was withheld due to rapidly improving symptoms and low NIHSS scores. However, stroke in progression occurred 7 hours after onset with NIHSS scores increasing from 4 to 13 points. A follow-up brain CT scan showed an Alberta Stroke Program Early CT score of 9 and no hemorrhage. Successful recanalization of the left MCA by EVT was performed at 10.5 hours after onset. The patient was discharged with a NIHSS score of 3 and his modified Rankin Scale score was 0 at 3 months.
- *Conclusion:* In LAO patients, directly proceeding EVT following IVT may not be hesitated. In addition, while LAO patients with incomplete IV-tPA treatment responses result in transient improvement of neurological symptoms but later reversed, EVT may be a potential rescue therapy in carefully selected patients.
- *Keywords:* Delayed endovascular thrombectomy, large artery occlusion, rapid improving symptoms, stroke in evolution.

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## **INTRODUCTION**

Intravenous thrombolysis (IVT) followed by endovascular thrombectomy (EVT) is recommended for

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treating acute ischemic stroke (AIS) resulting from large artery occlusion (LAO) because EVT may show better efficacy in recanalizing LAO than IV t-PA<sup>(1, 2)</sup>. However, a clinical dilemma may exist if LAO patients show rapid and significant improvement after IVT, which may

Correspondence to: Pi-Shan Sung; No.138, Sheng Li Road, Tainan, Taiwan 704, R.O.C. Email: pishansung@gmail.com indicate successful recanalization of occluded vessels after IVT. Should clinicians directly perform EVT immediately after tPA administration? Here we present a patient with AIS patient resulting from LAO who showed rapidly and significantly improved symptoms after IVT; however, stroke symptoms were deteriorated later. EVT was then successfully performed 10.5 hours after symptom onset and led to favorable clinical improvement.

### **CASE REPORT**

A 55-year-old male with uncontrolled hypertension presented with difficulty communicating, and weakness of right limbs at work. The symptoms started 1 hour before arriving at the emergency room. The initial National Institute of Health Stroke Scale (NIHSS) score was 11 points, but spontaneously improved to 8 points after intravenous hydration. An initial brain computed tomography (CT) scan showed unremarkable findings. Systemic thrombolytic therapy with tPA (0.9mg/Kg, total 59 mg) was performed 116 minutes after stroke onset. CT angiography (CTA) and CT perfusion (CTP) performed during tPA administration showed proximal left middle cerebral artery (MCA) occlusion (Fig. 1A) and hypoperfusion in nearly the entire territory supplied by the left MCA with a small ischemic core (Fig. 1B, C).

Although CTA showed left MCA M1 occlusion, the patient's neurological deficit significantly improved to a NIHSS score of 4 points after IVT, showing only mildly impaired in fluency and minor right side weakness was left. Further EVT was not performed due to presumed vascular recanalization after IVT. However, the patient suffered from sudden onset of dull response, global aphasia, and right limbs hemiplegia again with an NIHSS score of 13 points 5 hours after IVT (7 hours after stroke onset). A repeated brain CT scan revealed no hemorrhage and the Alberta Stroke Program Early CT Score (ASPECTS) of 9. After excluding tPA-induced symptomatic hemorrhage, re-stenosis of the left MCA or compromised collateral circulation was suspected. We performed endovascular treatment with thrombectomy devices (Navien<sup>™</sup> Intracranial Support Catheter and



Fig. 1. CTA shows left M1 occlusion indicated by a solid arrow (A). The CTP image consisted of cerebral blood volume (CBV) (B) and mean transit time (MTT) (C). Increased MTT at the left MCA territory with preserved CBV indicated a large penumbra, but a small ischemic core. After EVT, successful revascularization was noted after the thrombus was aspirated using a Navien<sup>™</sup> Intracranial Support Catheter and REVIVETM SE thrombectomy device at the left MCA M1 segment (dashed arrow). The TICI grade was 3/3 (D). Follow-up MRI performed on day 5 showed scattered lesions in the left MCA territory (E and F) on Diffusion-weighted imaging.

REVIVETM SE thrombectomy device) and recanalization at the left MCA M1 segment occurred 10.5 hours after symptom onset (8.5 hours after IVT and 3.5 hours after deterioration were noted), achieving a Thrombolysis in Cerebral Infarction (TICI) grade of 3/3 (Fig. 1D). The patient's neurological deficit gradually improved after receiving EVT. Follow-up magnetic resonance imaging (MRI) on day 5 showed scattered lesions in the left MCA territory (Fig.1E, F). The patient's NIHSS scores at discharge was 3 points. A Modified Rankin scale score was 0 points at 3 months after stroke.

#### DISCUSSION

EVT has gradually demonstrated its clinical benefit for selected conditions of AIS, particularly in LAO patients<sup>(3)</sup>, but IVT with tPA remains the first-line therapy for eligible patients. Current guidelines in the Unites States suggest that a waiting period between IVT and EVT is not necessarily needed<sup>(3,4)</sup>. However, in our case, after IVT, the patient showed rapid and significant improvement in his neurological deficits, indicating the possibility of recanalization. In addition, there are insufficient data for EVT in patients with NIHSS scores < 6<sup>(3)</sup>. Further randomized trials in LAO patients with lower NIHSS scores or rapidly improving symptoms may be needed to determine the net clinical risk and benefit of EVT.

Stroke in progression remains a challenging problem in clinical practice. In our case, deterioration of stroke symptoms occurred 5 hours after systemic thrombolytic treatment. Re-occlusion of original recanalizing vessels, compromised collateral flow, or intracranial hemorrhage may be considered in this situation. Immediate brain imaging is strongly recommended to provide additional clues regarding the etiology of a stroke in progression. By assessing an ASPECTS scores of 9, indicating a small ischemic core at the time of follow-up, this fulfilled the current recommendation of a minimal scores of ASPECTS of  $\ge 6$  for EVT<sup>(3)</sup>. Hence, endovascular treatment may become a potentially type of rescue therapy in our case even though the timing of groin puncture and revascularization was relatively delayed (8.5 and 10.5 hours after symptom onset, respectively).

A recent meta-analysis suggested that EVT should be initiated as soon as possible within the first 7 hours after symptom onset<sup>(5)</sup>. However, several studies, including DAWN and DEFUSE 3 trial, have discussed the benefit of delayed EVT within 6-24 hours after symptom onset<sup>(6-10)</sup>. Patients in these studies were selected using MRI or CTP imaging. Favorable clinical outcome was still observed in patients with successful recanalization, but delayed EVT may increase the risk of intracerebral haemorrhage (0% - 6.4% in early EVT within 4.5 - 6 hours vs. 8.86% in delayed EVT within 6-12 hours)<sup>(8,11)</sup>. Therefore, case selection should be carefully performed.

In conclusion, in LAO patients with favorable therapeutic responses to IVT treatment, directly proceeding to EVT after IVT may become a challenging clinical decision. On the other hand, stroke in progression may occur in LAO patients due to compromised collateral flow or re-occlusion of re-vascularized vessels. While LAO patient with incomplete IV-tPA treatment response resulting in transient improvement of neurological symptoms but later reversed, EVT may be a potential therapeutic choice if a small ischemic core is demonstrated at the time of stroke in progression. However, generalizability from our single case experience is uncertain. Further large trials or more case experiences may be needed to determine the net clinical risk and benefit of delayed EVT in this type of situation. This case experience also strengthened the importance of not delaying EVT after IVT only for observing the treatment response of IVT in LAO patients, except recanalization being confirmed.

Conflict of interest: None declared.

#### REFERENCE

- Meyers PM, Schumacher HC, Connolly ES, Jr., Heyer EJ, Gray WA, Higashida RT. Current status of endovascular stroke treatment. Circulation. 2011; 123(22):2591-601.
- Rodrigues FB, Neves JB, Caldeira D, Ferro JM, Ferreira JJ, Costa J. Endovascular treatment versus medical care alone for ischaemic stroke: systematic review and meta-analysis. Bmj. 2016;353:i1754.
- Powers WJ, Derdeyn CP, Biller J, Coffey CS, Hoh BL, Jauch EC, et al. 2015 AHA/ASA Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding

Endovascular Treatment A Guideline for Healthcare Professionals From the American Heart Association/ American Stroke Association. Stroke; a journal of cerebral circulation. 2015:STR. 000000000000074.

- Furie KL, Jayaraman MV. 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke. Stroke. 2018;49(3):509-10.
- Saver JL, Goyal M, van der Lugt A, Menon BK, Majoie CB, Dippel DW, et al. Time to Treatment With Endovascular Thrombectomy and Outcomes From Ischemic Stroke: A Meta-analysis. Jama. 2016; 316(12):1279-88.
- Goyal M, Demchuk AM, Menon BK, Eesa M, Rempel JL, Thornton J, et al. Randomized assessment of rapid endovascular treatment of ischemic stroke. The New England journal of medicine. 2015;372(11):1019-30.
- Janjua N, El-Gengaihy A, Pile-Spellman J, Qureshi AI. Late endovascular revascularization in acute ischemic stroke based on clinical-diffusion mismatch. AJNR American journal of neuroradiology. 2009;30(5):1024-

7.

- Jovin TG, Liebeskind DS, Gupta R, Rymer M, Rai A, Zaidat OO, et al. Imaging-based endovascular therapy for acute ischemic stroke due to proximal intracranial anterior circulation occlusion treated beyond 8 hours from time last seen well: retrospective multicenter analysis of 237 consecutive patients. Stroke; a journal of cerebral circulation. 2011;42(8):2206-11.
- Albers GW, Marks MP, Kemp S, Christensen S, Tsai JP, Ortega-Gutierrez S, et al. Thrombectomy for Stroke at 6 to 16 Hours with Selection by Perfusion Imaging. N Engl J Med. 2018;378(8):708-18.
- Nogueira RG, Jadhav AP, Haussen DC, Bonafe A, Budzik RF, Bhuva P, et al. Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct. N Engl J Med. 2018;378(1):11-21.
- Saver JL, Goyal M, Bonafe A, Diener HC, Levy EI, Pereira VM, et al. Stent-retriever thrombectomy after intravenous t-PA vs. t-PA alone in stroke. The New England journal of medicine. 2015;372(24):2285-95.