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Case report

Successful endovascular thrombectomy 8 days after onset of acute ischemic stroke: A case report

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ABSTRACT

Endovascular thrombectomy (EVT) is the recommended option for acute ischemic stroke (AIS) patients with large vessel occlusion (LVO) that within 6 h onset of stroke. The EVT treatment time window has been extended to 24 h in carefully selected patients by DAWN trial. Recent evidences indicated that some patients presented beyond 24 h still potentially benefit from EVT treatment. Herein, we describe one case of successful delayed EVT in a 50-year-old male AIS patient with an 8-day history of left middle cerebral artery occlusion. Before surgery, CT perfusion demonstrated a marked left hypoperfusion with penumbra volume of 127 mL and ischemic core volume of 10 mL. EVT was performed with complete recanalization and significant improvement in his neurological deficits at 90-days post-surgery follow-up. In future, more randomized clinical trials are warranted to further confirm the safety, efficacy, as well as the applicable population of delayed EVT.

1. Introduction

Acute ischemic stroke (AIS) caused by anterior circulation large vessel occlusion (LVO) is a life-threatening and time-sensitive medical event that can cause permanent brain damage in affected patients. Currently, thrombolysis with tissue plasminogen activator (tPA) and endovascular thrombectomy (EVT) have been the preferred options for patients within 4.5 h and 6 h onset of stroke, respectively [1]. The EVT treatment time window has been extended up to 24 h by DAWN [2] and DEFUSE 3 [3] trials in carefully selected patients. Even so, lots of AIS patients still left untreated due to out of the conventional treatment time window. Recently, evidences have indicated that patients with favorable clinical-core or perfusion-diffusion mismatch longer than 24 h still potentially benefit from EVT treatment. Herein, we describe an AIS case with an 8-day history of left middle cerebral artery (MCA) occlusion that significantly benefited from delayed EVT treatment. To our best knowledge, this case has the longest reported time window for late EVT treatment in AIS patient with LVO.

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1.1. Case report

A 50-year-old male patient visited to a local hospital due to "right limb weakness and unable to speak after awakening from sleep" at 12, July 2019. Four days later, left acute cerebral infarction and MCA M1 occlusion were confirmed by magnetic resonance imaging (MRI) (Fig. 1A) and magnetic resonance angiography (MRA) (Fig. 1B), respectively. After treated with strategies such as antiplatelet aggregation and plaque stablilizing, the patient's condition worsened; therefore, he was transferred to our hospital at 17, July 2019. The patient admitted 1-year history of hypertension, denied diabetes mellitus, heart disease and history of major trauma and surgery.

On admission, his blood pressure was 134/89 mmHg. He was conscious but slow in reacting with incomplete motor aphasia. Right limb weakness and positive right-sided Babinski signs were observed. His water swallow test score, Glasgow Coma Scale (GCS) score, National Institutes of Health Stroke Scale (NIHSS) score and modified Rankin Score (mRS) was 4, 11, 16 and 4, respectively. Laboratory tests showed elevated concentrations of uric acid (525 μmol/L), triglyceride (1.82 mmol/L), total cholesterol (5.84 mmol/L) and creatine kinase (505 U/L).

One day after admission, non-contrast brain CT demonstrated that the patient has cerebral infarction in the left basal ganglia, centrum semiovale and insula area with an Alberta Stroke Program Early CT Score (ASPECTS) of 7. CT perfusion (CTP) demonstrated a marked left hypoperfusion with penumbra volume of 127 mL and ischemic core volume of 10 mL after data processed with syngo. via (Siemens, Erlangen, Germany) (Fig. 1C and D); CT angiography (CTA) demonstrated a left MCA M1 occlusion (Fig. 1E). Cerebral angiography demonstrated a complete left MCA M1 occlusion with a modified Thrombolysis in Cerebral Infarction (mTICI) score of 0 (Fig. 1F). Good collaterals existed with an American Society of Interventional and Therapeutic Neuroradiology/Society of Interventional Radiology (ASTIN/SIR) score of 3.

By combining the appearance (Fig. 2A) and angiogram characteristics (Fig. 2B–D) of occluded vessels, his occlusion was identified as embolism-related occlusion (EMB-O) and the Solitaire FR/Stent With Intermediate Catheter Assisting (SWIM) technique using a 4 × 20 mm RECO stent retriever (Minitech Medical, Jiangsu, China) pass through a Catalyst 6 intermediate catheter (Stryker Neurovascular, CA, USA) was employed [4]. A hard thrombus was extracted from M1 occlusion (Fig. 2E) and a small escaped thrombus was extracted from the superior trunk of M2 segment (Figure not shown). Repeat angiography demonstrated a complete MCA territory reperfusion with an mTICI score of 3 (Fig. 2F); Tirofiban (6mL/h) were then intravenously pumped for 24 h. Following the procedure, his NIHSS was 16. Repeat brain CT didn't find any signs of intracranial hemorrhage. Aspirin (100mg) and clopidogrel (75mg) were then orally administrated 6 h before withdraw of tirofiban. The symptoms of the patient were gradually improved. 10 days later, he was transferred back to a local hospital for further treatment. At discharge, his NIHSS was 9 and mRS was 4. These two scores decreased to 5 and 3 at 30-days post-surgery follow-up, and to 3 and 2 at 90-days post-surgery follow-up, respectively.

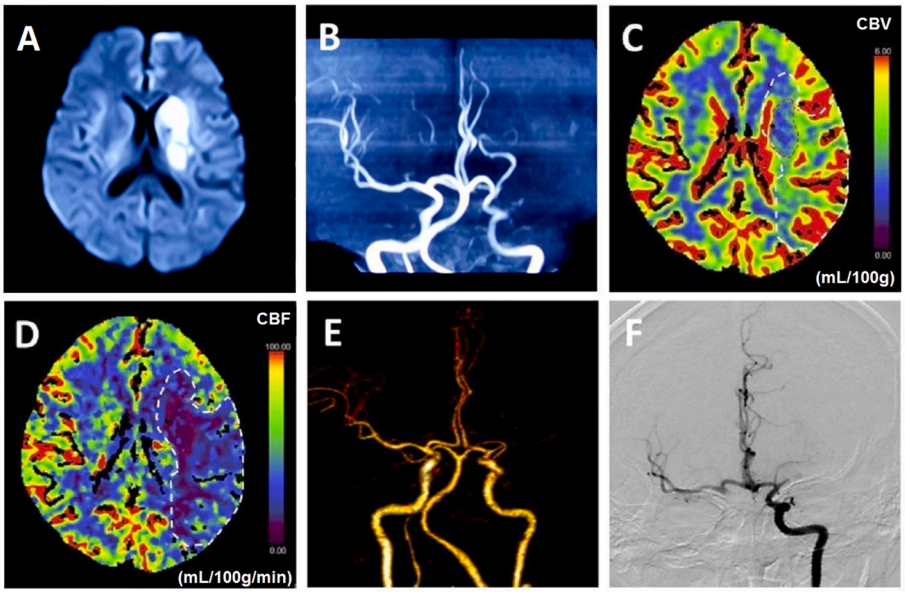

Fig. 1. (A) Diffusion-weighted MRI shows left acute cerebral infarction involving the basal ganglia and corona radiata; (B) MRA shows a left MCA M1 occlusion; (C) Preoperative CTP-CBV image demonstrates left acute cerebral infarction involving the corona radiata; white dashed circle represents ischemic core area of CBV<1.2mL/100mL; (D) Preoperative CTP-CBF image displays a large area of penumbra in the left hemisphere; red dashed circle represents penumbra area of CBF<27mL/100g/min; (E) CT angiogram demonstrates a left MCA M1 occlusion; (F) Preoperative angiogram demonstrates a left MCA M1 occlusion. MRI, magnetic resonance imaging; MRA, magnetic resonance angiography; CTP, CT perfusion; CBV, cerebral blood volume; CBF, cerebral blood flow; MCA, middle cerebral artery.

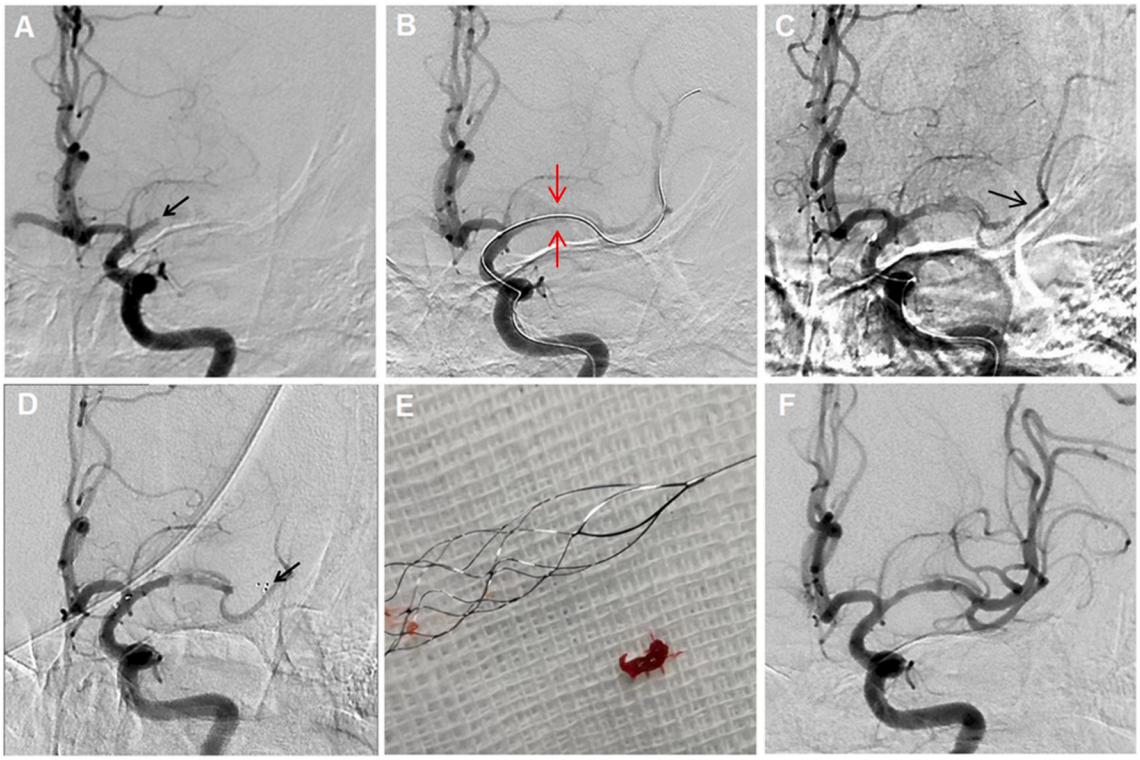

Fig. 2. (A) Non-jet-like appearance on preoperative angiogram (black arrow); (B) When keeping microwire, angiogram shows a filling defect at the M1 occlusion with little blood pass through from the two sides of microwire (red arrow); (C) After retrieved microwire, angiogram shows a filling defect at the M1 occlusion with little blood pass through and a filling defect at the superior trunk of M2 segment (black arrow) which suggesting a escaped thrombus; (D) After opened the stent retriever, angiogram shows a filling defect at the M1 occlusion and total occlusion of the superior trunk of M2 segment. Black arrow indicates the end of stent retriever; (E) A hard thrombus with size of 2 × 4 mm was extracted from the M1 occlusion; (F) Postoperative angiogram demonstrates complete MCA territory reperfusion. No dissection or plaque was found in the M1 occlusion. MCA, middle cerebral artery.

2. Discussion

Up to date, no randomized clinical trial (RCT) has been performed to study the application of EVT in AIS patients with LVO that presented beyond 24 h; however, in real life practice, some case or case series that lead to favorable functional outcomes have been reported. Gunawardena et al. first described one case of EVT in an AIS patient 90 h after stroke onset. The patient presented with small left posterior insular and Sylvian infarcts. CTP showed a large mismatch. After EVT treatment, a complete recanalization with mTICI of 3 was achieved. At 6 weeks, the patient was independent with daily life activities with a mRS of 1 [5]. Conan et al. reported one case of EVT application in an AIS patient 37.5 h after symptom onset. Except for his NIHSS score, the patient, with a MCA occlusion and an infarct volume of 5.4 cm^2, fits the selection criteria for both the DAWN and DEFUSE-3 trial. After EVT treatment, complete reperfusion to the right MCA was noticed and his mRS was 1 at 6 months following thrombectomy [6]. Another case of successful EVT 6 days after stroke onset was reported by Aguilar-Salinas et al. In that case, the patient has MCA M1 occlusion, good collaterals and sizeable penumbra. After procedure, clinical improvement without any complications or hemorrhagic transformation was noticed. At 30-day follow-up, her NIHSS was 0 and mRS was 1 [7]. In addition to these case reports, a case series by retrospectively reviewed patients who presented beyond 24 h but otherwise meeting the DAWN criteria was reported by Desai et al. EVT in those 21 patients led to comparable outcomes to patients in the DAWN trial intervention arm [8]. In our case, the patient has a left MCA M1 occlusion, NIHSS of 16, penumbra volume of 127 mL and ischemic core volume of 10 mL. Except for his treatment time window was far beyond 24h, he simultaneously meets the DEFUSE 3 and the DAWN criteria. Taken together, these evidences consolidate the view that some AIS patients presented with good clinical-core or perfusion-diffusion mismatch beyond 24 h can benefit from delayed EVT treatment.

Identification of the occlusion etiology before endovascular treatment is of great significance because EVT has been shown to be suitable for EMB-O not for intracranial atherosclerotic stenosis occlusion (ICAS-O) [9]. In this case, balloon angioplasty was initially planned because the patient was presented beyond 24 h with good clinical-core mismatch and collaterals and be misregarded as ICAS-O; however, after combining the “non-jet-like appearance” of the occluded vessel [9] and the angiogram characteristics that different with the reported microcatheter “First-Pass Effect” observed in ICAS-O [10], his occlusion was identified as EMB-O and EVT was finally performed with complete recanalization and significant improvement in his neurological deficits.

Currently, antiplatelet drugs management is an unsolved issue in EVT treatment. Although, there is no high-level evidence to guide

the clinical use of antiplatelet therapy in EVT treatment, growing evidence indicate patients receiving EVT may benefit from dual antiplatelet or Tirofiban treatment. In a practical guide to EVT, the dual antiplatelet treatment including aspirin and clopidogrel was suggested if a stent was deployed during EVT [11]. Recently, many studies demonstrated that Tirofiban, as one of glycoprotein IIb/IIIa antagonists, has a more promising role in EVT treatment. For instance, Yang et al. demonstrated that, compared with EVT alone, EVT combined with intravenous tirofiban is associated with high recanalization rate and good outcome [12]. Several meta-analysis studies also indicated that tirofiban combined with endovascular therapy (including EVT) seems to be safe and potentially effective in treating AIS [13–15]. However, in another meta-analysis study, Zhang et al. found that tirofiban combined with EVT increased risk of fatal intracranial hemorrhage (ICH) [16]. In China, tirofiban is recommended as an adjunct to EVT by the Chinese Neurointerventionist Society [17]. Therefore, in this case, Tirofiban was intravenously pumped after EVT, followed by dual antiplatelet treatment. After EVT, tirofiban and dual antiplatelet treatment, the patient recovered well and no signs of ICH were observed.

3. Conclusion

In selected cases, some AIS-LVO patients presented with good clinical-core or perfusion-diffusion mismatch beyond 24 h can benefit from delayed EVT treatment. In future, RCTs are warranted to further confirm the safety, efficacy, as well as the applicable population of delayed EVT.

3.1. Institutional review board statement

Ethical review and approval were waived for this study due to the data has been analyzed in a retrospective manner.

3.2. Informed consent statement

Written informed consent was obtained from the participant for the publication of this case report (including all data and images).

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