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## Importance of perioperative management for emergency carotid artery stenting within 24 h after intravenous thrombolysis for acute ischemic stroke: Case report



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## ABSTRACT

**INTRODUCTION:** We report a patient treated successfully via endovascular surgery within 24 h after intravenous thrombolysis using recombinant tissue plasminogen activator for acute cervical internal carotid artery occlusion.

**PRESENTATION OF CASE:** A 68-year-old man was admitted to our hospital. Neurological examination revealed severe left-sided motor weakness. Magnetic resonance imaging showed no cerebral infarction, but magnetic resonance angiography revealed complete occlusion of the right internal carotid artery. Systemic intravenous injection of recombinant tissue plasminogen activator was performed within 4 h after the onset. But, magnetic resonance angiography still revealed complete occlusion. Revascularization of the right cervical internal carotid artery was performed via endovascular surgery. The occluded artery was successfully recanalized using the Penumbra System<sup>®</sup> and stent placement at the origin of the internal carotid artery. Immediately after surgery, dual antiplatelet therapy (aspirin and clopidogrel) was initiated, and then cilostazol was added on the following day. Carotid ultrasonography and three-dimensional computed tomographic angiography at 14 days revealed no further obstruction to flow.

**DISCUSSION:** When trying to perform emergency carotid artery stenting within 24 h after intravenous recombinant tissue plasminogen activator administration, several issues require attention, such as the decisions regarding the type of stent and embolic protection device, the selection of antiplatelet therapy and the methods of preventing hyperperfusion syndrome.

**CONCLUSION:** Emergency carotid artery stenting for the acute internal carotid artery occlusion may be considered a safe procedure in preventing early stroke recurrence in selected patients.

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**Abbreviations:** IV, intravenous; rt-PA, recombinant tissue plasminogen activator; ICA, internal carotid artery; MCA, middle cerebral artery; HPS, hyperperfusion syndrome; CAS, carotid artery stenting; MRI, magnetic resonance imaging; MRA, magnetic resonance angiography; CCA, common carotid artery; PTA, percutaneous transluminal angioplasty; TICl, thrombolysis in cerebral infarction; SPECT, single photon emission tomography; EPD, embolic protection device.

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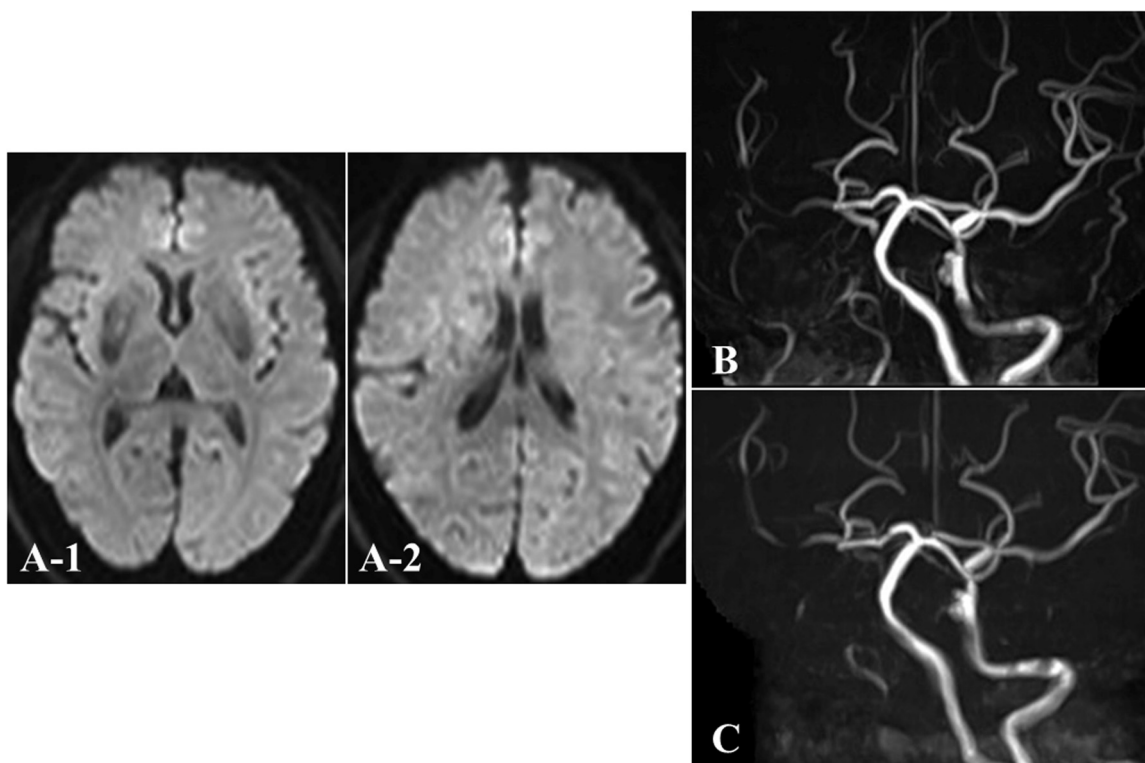
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### 1. Introduction

Generally, in patients with acute ischemic strokes, intravenous (IV) thrombolysis with recombinant tissue plasminogen activator (rt-PA) is employed to recanalize thrombosed intracranial vessels (such as the internal carotid artery (ICA) and the middle cerebral artery (MCA) and its branches) within 4.5 h [1–3]. In addition, various reports have been published that a combination of IV thrombolysis and early carotid revascularization via endovascular technique might be a more effective secondary stroke prevention strategy. On the other hand, during the first 24 h after IV rt-PA administration, the risk of intracranial hemorrhage associated with early reperfusion might be increased because of hyperperfusion

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**Fig. 1.** Magnetic resonance imaging (MRI) and MR angiography (MRA) findings. (A, B) MRI/diffusion-weighted imaging (DWI) at the time of initial presentation shows no acute cerebral infarction, but MRA reveals complete occlusion of the right internal carotid artery (ICA). (C) After intravenous injection of recombinant tissue plasminogen activator (rt-PA), cervical MRA demonstrates that the right ICA is still occluded.

syndrome (HPS) and the use of anticoagulant drugs or antiplatelet agents [3–7]. Here, we present a case of acute ICA occlusion treated successfully by use of the Penumbra System® and carotid artery stenting (CAS) within 24 h after IV thrombolysis using rt-PA.

## 2. Case report

A 68-year-old man with a history of hypertension, hyperlipidemia and diabetes mellitus was admitted to our hospital. Neurological examination on admission revealed disturbance of consciousness and severe left-sided motor weakness (16 on the National Institutes of Health Stroke Scale). Blood biochemistry findings revealed no evidence of inflammation or coagulation system abnormalities. Electrocardiography indicated a sinus rhythm at 70 beats/min. Diffusion-weighted magnetic resonance imaging (MRI) showed no acute cerebral infarction (Fig. 1A), but magnetic resonance angiography (MRA) revealed occlusion of the right ICA (Fig. 1B). We made a diagnosis of acute cerebral ischemia, then a systemic IV injection of rt-PA was performed 4 h after onset. However, neurological symptoms did not improve for 1 h. In addition, repeated MRA (Fig. 1C) and cerebral angiography still revealed complete occlusion of the right cervical ICA at its origin (Fig. 2A). As collateral blood flow from the contralateral anterior and posterior circulation was poor, revascularization of the right cervical ICA was performed using an endovascular technique.

We performed all procedures under local anesthesia. An OPTIMO balloon-tipped guiding catheter (Tokai Medical Products, Kasugai, Japan) was inserted into the right femoral artery and advanced until the tip reached the right common carotid artery (CCA). After blockage of the proximal blood flow in the right CCA, an Excelsior SL-10® Microcatheter (Stryker Neurovascular, Fremont, CA, USA) was inserted to the right ICA segment distal to the occlusion area. Imaging study performed from the

Excelsior SL-10® Microcatheter demonstrated obvious floating clot in the cervical right ICA (Fig. 2B and C). Transluminal balloon angioplasty was performed with a 3.0-mm Gateway® Monorail™ percutaneous transluminal angioplasty (PTA) Balloon Catheter (Stryker Neurovascular) for the occluded area within the ICA (Fig. 3A) and a Penumbra aspiration catheter 5MAX™ ACE (Penumbra, Alameda, CA, USA) was passed distal to the position. Then, we performed a direct aspiration of the floating clot using this Penumbra aspiration catheter (Fig. 3B). After recanalization of the right ICA, a GuardWire® Temporary Occlusion & Aspiration System (Medtronic, Minneapolis, MN, USA) was passed through the stenotic portion into the distal right ICA. Transluminal balloon angioplasty was performed with a 3.5-mm Sterling PTA balloon catheter (Boston Scientific, Natick, MA, USA). Next, a 10 × 24-mm Carotid Wallstent Monorail® (Boston Scientific) was deployed (Fig. 3C), and post-dilatation was performed using a 4.5-mm Sterling PTA balloon catheter (Boston Scientific). Subsequent angiography confirmed successful recanalization of the right ICA (thrombolysis in cerebral infarction (TICI) grade 3) at 7 h post-onset (Fig. 3D).

Immediately after these procedures, we started treatment with dual-agent antiplatelet therapy (aspirin 100 mg/day and clopidogrel 75 mg/day) and cilostazol 200 mg/day was added on the following day. The patient was restless with neurological abnormalities, and <sup>123</sup>I IMP-single photon emission tomography (SPECT) (Fig. 4A) and INVOS-3100 revealed hyperperfusion in the territory of the right ICA. Strict control of blood pressure under dexmedetomidine anesthesia allowed effective prevention of HPS. Carotid ultrasonography and three-dimensional computed tomographic angiography at 14 days (Fig. 4B and C) revealed no further obstruction to flow, and the patient was discharged 3 weeks after surgery with mild left motor weakness.

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