



Successful Intra-arterial Thrombolysis in a Patient with Perioperative Stroke after Open Heart Surgery

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To present the case of a 54-year-old male who suffered from sudden-onset motor aphasia and right-sided weakness on the 14th inpatient day after open-heart surgery for mitral valve replacement. Acute left middle cerebral artery (MCA) occlusion of the M1 segment was found on contrast computed tomographic angiogram of the head. A history of recent major surgery and old intracerebral hemorrhage excluded the patient from intravenous thrombolytic (IVT) therapy. Highly selective local intra-arterial thrombolytic (IAT) therapy was selected for its lower risk of systemic bleeding complication, since symptom onset had occurred 4 hours earlier in this patient. The occluded MCA was completely recanalized after administration of 1,250,000 units of intra-arterial urokinase. The patient's neurological function resumed quickly without early or delayed hemorrhagic complication. The highly selective local IAT may be an alternative therapy in patients with perioperative acute ischemic stroke who are not eligible for IVT therapy.

Key words: embolic occlusion, intra-arterial thrombolytic (IAT) therapy, intravenous thrombolytic (IVT) therapy, middle cerebral artery (MCA) occlusion, perioperative acute ischemic stroke

INTRODUCTION

The occurrence of stroke during the postoperative period of any surgery is a devastating complication. The time of occurrence and the composition of the occlusive lesion suggest that delayed strokes may have a different etiology or other mechanisms of action as compared with early operative stroke.¹ Postoperative stroke is usually related to underlying comorbid conditions rather than surgical or anesthetic complications.² It is estimated that stroke occurs in less than 3% of all patients who undergo general, noncardiac surgery^{3,4} but patients who undergo cardiac surgery have an increased risk of postoperative stroke. Among cardiac surgery patients, those who have had valve surgery or preexisting cerebrovascular disease usually have a higher stroke incidence rate of about 16%. Comparatively, only 6% of patients with elective coro-

nary bypass grafting experience stroke.^{4,5} The choice of treatment for acute ischemic stroke within the postoperative period is not easy decision. Intravenous thrombolysis (IVT) is contraindicated in the first 2 weeks after major surgery.⁶ Intra-arterial thrombolysis (IAT) has been suggested as an alternative therapy due to its lower dose and local delivery of thrombolytic agent with limited systemic plasminogen activator for postoperative stroke patients^{7,8,9} but the reported experience in the medical literature is still limited.

CASE REPORT

A 54-year-old male had rheumatic heart disease with severe mitral regurgitation, hypertension and spontaneous intracerebral hemorrhage (ICH) at the left occipital lobe 2 years ago that did not produce serious neurological sequela. Open-heart surgery with tissue mitral valve replacement was performed. Preoperative brain magnetic resonance imaging (MRI) demonstrated mild left occipital lobe tissue loss with gliosis. All the vessels in the neck and intracranial portion were patent without atherosclerosis. The operation was done smoothly without immediate complications. The patient took acetyl salicylic acid 100 mg daily starting on the first postoperative day to prevent thromboembolic event.

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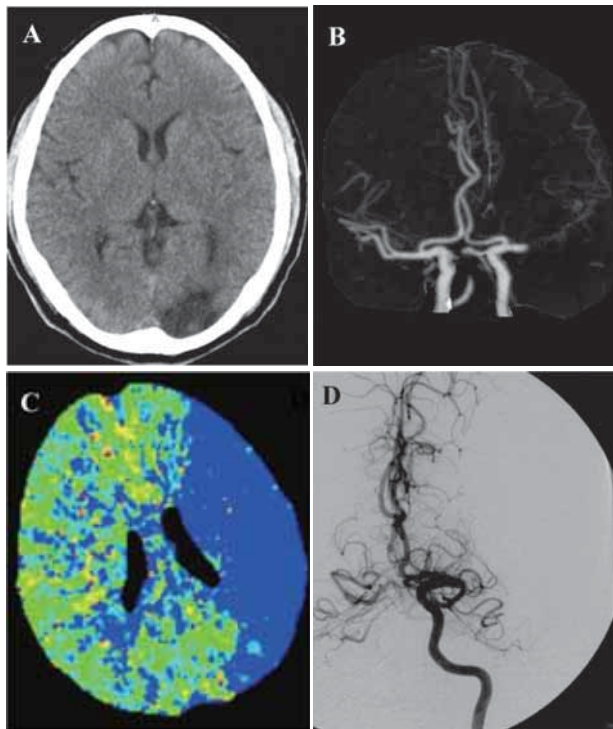


Fig. 1 Computer tomography of head (CT) prior to thrombolysis is shown. Emergent non-contrast head CT (A) 1 hour after symptom onset only demonstrated left occipital lobe tissue loss with gliosis. Brain CTA (B) revealed an occlusion of the left MCA at pre-bifurcation M1 segment and distal MCA branches remained opacified upon contrast agent. Mean transit time (MTT) (C) of the left MCA territory is markedly decreased as compared to the contralateral side. Left ICA angiogram (D) revealed an abrupt interruption at pre-bifurcation M1 segment of left MCA.

On the 14th postoperative day in the hospital, the patient presented with sudden onset of slurred speech and right-sided weakness during usual daily activities. His blood pressure was 108/68 mmHg, irregular heart rate of 88/min, and respiratory rate of 18/min. The total score of National Institutes of Health Stroke Scale (NIHSS) was 13. Blood biochemistry and platelet count were all within normal limits.

Emergent non-contrast brain CT scan did not reveal an active lesion (Fig. 1A). However, contrast brain CTA disclosed acute occlusion of the left MCA at the M1 segment (Fig. 1B). The patient was found to have two exclusion criteria, an old ICH and recent major operation within 2 weeks. Therefore, emergent acute IV thrombolytic therapy could not be initiated even though it was within

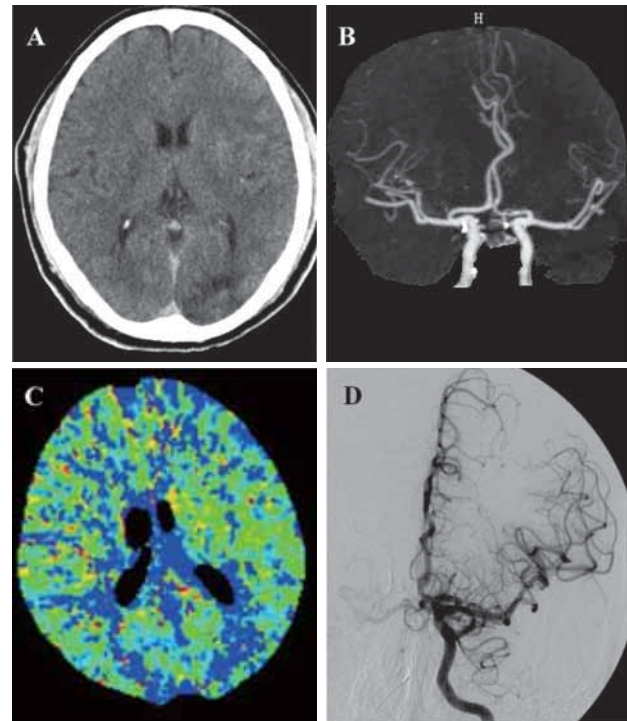


Fig. 2 Follow up brain CT after IAT (A) showed minimal contrast enhancement in the left frontal gyrus, but no hemorrhagic transformation in the cerebral cortex as compared with the pre-thrombolytic scan. Brain CTA (B) showed a complete recanalization of left MCA and a slight increase of MTT (C) at left MCA indicates post-stroke luxury perfusion. Left ICA angiogram (D) demonstrated complete recanalization of left MCA after administration of urokinase 1,250,000 units.

a 3 hours time frame. Subsequently, the highly selective local IA thrombolytic therapy was performed under general anesthesia through a right transfemoral approach after 4 hours from stroke onset. The left internal carotid artery angiogram showed an abrupt interruption at the pre-bifurcation M1 segment of the left MCA (Fig. 1D) by a thromboembolus. After combining gentle microcatheter manipulation and slow administration of 1,250,000 units urokinase, the occluded left MCA was completely recanalized (Fig. 2B, 2D). No immediate bleeding complication was found in the follow-up non-contrast CT scans of the head (Fig. 2A). The anticoagulant, nadroparin calcium (Sanofi-Aventis, Bridgewater, NJ) 3800 IU once daily, was started 24 hours after recanalization for the prevention of embolic recurrence. One week after recanalization, the patient's NIHSS score was recorded as 1. The patient's Barthel Index score was 100, and the modified

Rankin scale registered a score of 1.

DISCUSSION

Local IAT therapy proved successful in a patient with acute left MCA infarction on the 14th hospital day following the open-heart surgery with tissue mitral valve replacement. The patient was a high risk for perioperative stroke because of previous cerebrovascular disease. Additional risk factors included valve surgery and postoperative atrial fibrillation (AF). Preoperative assessment included neck and head MR study. A careful operative procedure were undertaken to prevent perioperative stroke recurrence. Antiplatelet was started on the first postoperative day. Because previous studies¹⁰ have shown that early initiation of antiplatelet therapy (aspirin) after cardiac surgery reduces the incidence of postoperative stroke without increasing the odds of bleeding complications.^{10,11} However, these methods still failed to prevent the unfortunate stroke event in our patient.

During the onset of acute stroke, an MRI was contraindicated as auxiliary diagnosis due to the existing electrolyte guide wire that was embedded into the epicardium for the prevention of cardiac arrhythmia. CTA is a good alternative for diagnosis and can be quickly determined whether a large vessel occlusion exists. CTA disclosed not only an acute embolic occlusion in the left MCA, but also showed significant abnormalities of both the mean transit time and cerebral blood volume in the left MCA regions upon comparison with the right side (Fig.1C,2C).

Previous radiological or postmortem studies have shown that most late perioperative strokes are usually ischemic and embolic.^{5,12} These strokes are often attributed to postoperative arrhythmia, myocardial infarction, or coagulopathy.¹³ Upon evaluation of the overall success rate of arterial recanalization after acute thrombolysis, the composition of the occlusion, the number and size of thrombi, and the distribution of the vessel must be considered. The fresh fibrin-rich emboli occlusions will be more amenable to lysis, whereas calcific and atheroembolic particles are not easily lysed.⁵

From the findings of emergent contrast CTA of the head, the patient was highly suspect for an in-hospital perioperative acute embolic stroke with left MCA total occlusion. The patient may have suffered from a fresh embolic infarction because of the occurrence of postoperative AF. Embolic occlusion of the MCA is one of the most clinically severe types of stroke. This event usually is associated with severe, acute neurologic deficit

at onset, extensive brain infarction, and poor neurologic outcome. Early recanalization of an occluded MCA is associated with a favorable clinical outcome. According to the previous reports¹⁴, acute IVT or IAT within 3 hours after the onset of stroke symptoms may be beneficial for patients with acute embolic MCA infarction.

In a comparison of the benefit/risk ratio of IVT or IAT in our patient, IVT could have an increased the hemorrhage risk because of a past history of ICH two years prior and recent surgery within 2 weeks. These events violate the recommendations of the American Heart Association for the early management of adults with ischemic stroke.⁶ IVT has a higher dose and systemic delivery of thrombolytic agent with a wider effect of systemic plasminogen activator for postoperative stroke patients as compared with the properties and outcomes of IAT.^{7,8,9} Previous reports indicated that IV thrombolytic therapy is better for recanalization of smaller distal emboli as opposed to large intracranial vessel occlusions that can be successfully lysed with local IAT.^{7,8,9} The PROACT II⁶ and our previous study¹⁷ also showed that IAT within 6 hours after onset of symptoms has a higher recanalization rate that was beneficial in patients with MCA occlusion. Intra-arterial thrombolysis is a treatment option for patients who have major stroke of <6 hours' duration due to occlusions of the MCA and who are not otherwise candidates for intravenous rtPA and have contraindications to use of intravenous thrombolysis, such as recent surgery. In our patient Intravenous thrombolysis (IVT) is contraindicated to have two exclusion criteria, an old ICH and recent major operation within 2 weeks. Local intra-arterial thrombolytic (IAT) therapy was selected for its lower risk of systemic bleeding complication, since symptom onset had occurred 4 hours earlier in this patient. Recently, Mattle et al¹⁸ also demonstrated that IAT was more beneficial than IVT in stroke patients who present with hyperdense middle cerebral artery sign on CT, even though IAT was started later. To date, a few case series have proved that the use of IAT within 6 hours after the onset of a perioperative stroke is relatively safe and does not increase the complication of symptomatic hemorrhage.^{2,4} In more difficult circumstances, the additional use of snares, suction devices, or mechanical disrupters might be helpful to increase the recanalization rate of IAT.

In conclusion, this case indicates that IAT is a promising alternative treatment option for cases with acute thromboembolic stroke with left MCA occlusion, even after a recent major surgery and having a history of intracerebral hemorrhage.

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