CASE REPORT
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Effectiveness of Mechanical Embolectomy for Septic Embolus in the Cerebral Artery Complicated with Infective Endocarditis

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There has been a controversy over data of thrombolytic and endovascular surgical treatment about cerebral infarction secondary to infective endocarditis. We report a woman who received early mechanical embolectomy as a treatment of acute stroke with infective endocarditis. A 35-yr-old woman was hospitalized due to right hemiparesis. Brain image showed cerebral infarction at the middle cerebral artery and echocardiography demonstrated vegetation at the mitral valve. She was successfully treated with embolectomy and parenteral antibiotics without any neurologic sequelae. This report shows that the early retrieve of septic cerebral emboli can be a helpful treatment of acute stroke associated with endocarditis.

Key Words: Mechanical Embolectomy; Acute Ischemic Stroke; Infective Endocarditis

INTRODUCTION

Neurological deficits in the setting of infective endocarditis (IE) are critical conditions. Despite considerable advances in acute stroke therapy, the most promising approach for reducing the burden of stroke and hemorrhage of a patient with ischemic stroke due to IE is not well established. The benefit of anticoagulation has never been demonstrated in patients with native valve diseases (1). Moreover, the safety and efficacy of thrombolysis in an acute ischemic stroke to secondary to IE is not well established (2). Although a few articles have reported about the use of mechanical embolectomy (3-5), the role of embolectomy is unknown. To our knowledge, this is the first reported case of successful mechanical recanalization of middle cerebral artery (MCA) occlusion by secondary to bacterial endocarditis in Korea.

CASE DESCRIPTION

A 39-yr-old woman without any underlying medical conditions including heart problems visited the emergency department with ten minutes of right hemiparesis and aphasia on April 23, 2012. Her National Institutes of Health stroke scale (NIHSS) score was 16.

On presentation, she has been often febrile for 1 month. Her pulse was regular, blood pressure was 124/67 mm Hg and temperature was 37.1°C. Laboratory tests upon admission disclosed mild normocytic anemia (hemoglobin, 11 g/dL), a normal leukocyte count (8,600/mL), and a platelet count of 193,000/μL. The serum C-reactive protein level was 3.48 mg/dL and an erythrocyte sedimentation rate was 53 mm/h. The initial electrocardiogram showed a right bundle branch block. Results of other routine laboratory tests were within normal limits. A chest film was normal.

The brain computed tomography (CT) showed no abnormal findings. The diffusion-weighted magnetic resonance (MR) images and corresponding apparent diffusion coefficient maps revealed hyperacute infarction of left insula cortex, corona radiata, centrum semiovale and posterior inferior cerebellar artery territory of right side cerebellum. The MR angiography showed left MCA proximal segment (M1) occlusion. The diffusion-perfusion mismatch was found in the mean transit time & time to peak perfusion maps. (Fig. 1, 2) She was not given an intravenous tissue plasminogen activator because of the unclear onset time of the neurological deficits. Considering the time window, diffusion-perfusion mismatch and the patient's young age, we decided to perform intra-arterial thrombolysis. The patient received urokinase 150,000 units and tirofiban (Aggrastat; Merck) 100 micrograms intra-arterially. However, there was no flow restoration of the left MCA. After the second trial of mechanical thrombectomy with retrievable stent Solitaire AB 4 × 15 mm (ev3/Covidien Vascular Therapies, Mansfield, Massachusetts, USA), the MCA was recanalized to the thromobolysis in cerebral infarction (TICI) grade 2b (6). (Fig. 3, 4) After 36-hr procedure, her right side motor power was almost fully recovered. The patient improved greatly and had only right hemifacial pal-

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sy and aphasia, which also improved gradually. A postoperative CT scan obtained 24 hr later showed no evidence of infarct or hemorrhage.

Unfortunately, we had not detected early on, but a cardiac examination revealed a regular heart beat with pansystolic murmur on apex. A transthoracic echocardiogram showed a mass like-lesion on the anterior mitral valve (1.07 × 0.59 cm) and moderate mitral regurgitation without any functional problems and the evidence of heart failure. Ceftriaxone and gentamicin treatment for IE started immediately. On the third day, *Streptococcus gordonii* was subsequently grown from the initial blood culture sets. With the patient fulfilled clinical Duke criteria for definite IE (1), she was treated with parenteral penicillin and gentamicin. The patient's NIHSS score was 7 at this time. We underwent a sequential echocardiography once a week during hospitalization. The volume of mitral regurgitation and the size of vegetation on echocardiography did not increase. After two weeks, the size of vegetation on echocardiography was decreased to about 0.7 × 0.5 cm. During the four weeks of her antibiotics course, the patient's hemiparesis and aphasia improved (NIHSS score of 3). She has had no recurrent infarction and congestive heart failure and has been recovering well at home.

DISCUSSION

Infectious intracranial embolic infarction constitutes a small

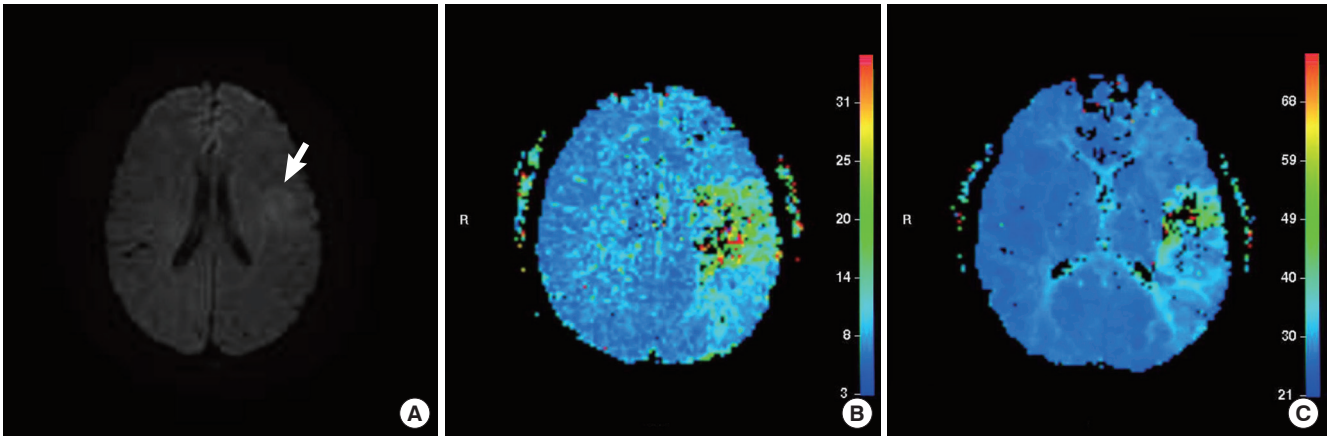

Fig. 1. The change of signal intensity of the left middle cerebral artery in brain magnetic resonance image (MRI). (**A**) MRI shows hyperintensity in diffusion-weighted image (arrow). (**B**) The image shows perfusion delay in mean transit time. (**C**) Time to peak maps of the left middle cerebral artery territory shows diffusion-perfusion mismatch.

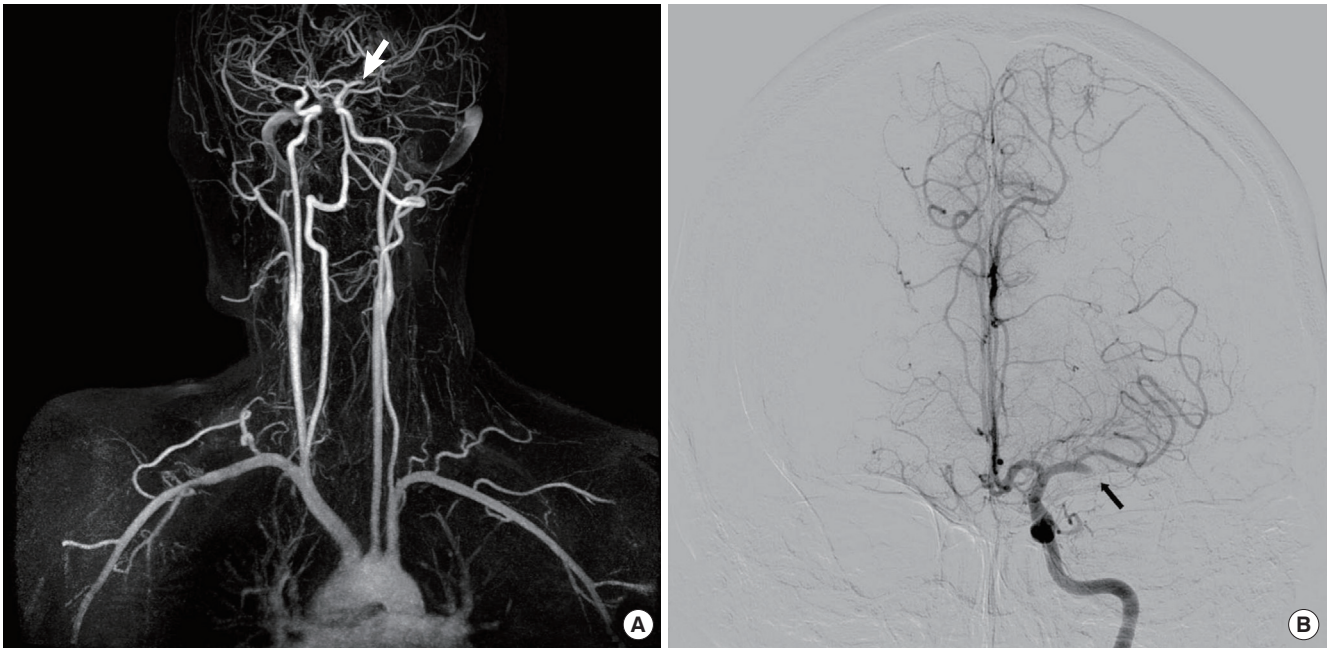

Fig. 2. Angiographic findings of cerebral flow. (**A**) Magnetic resonance angiography shows stopping of left middle cerebral artery (arrow). (**B**) Left internal cerebral artery angiography reveals abrupt cessation of left proximal middle cerebral flow (arrow).

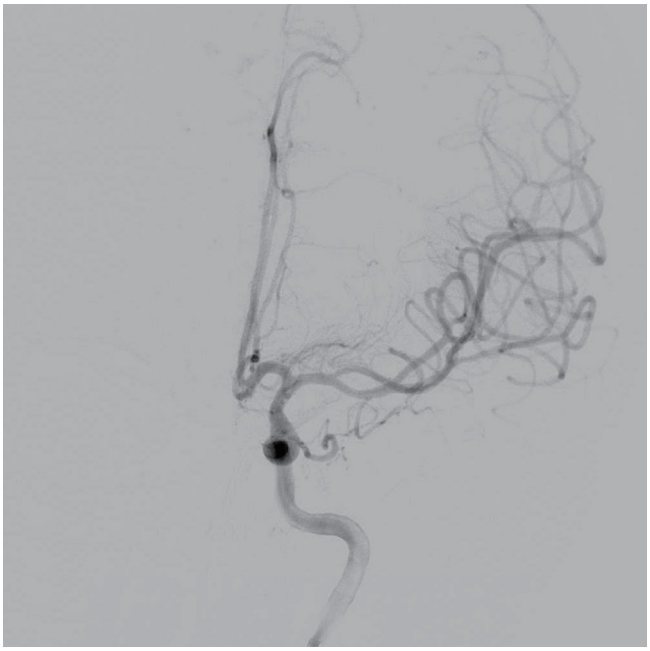

Fig. 3. Left internal cerebral artery angiography shows recanalization of middle cerebral artery after mechanical intra-arterial embolectomy.

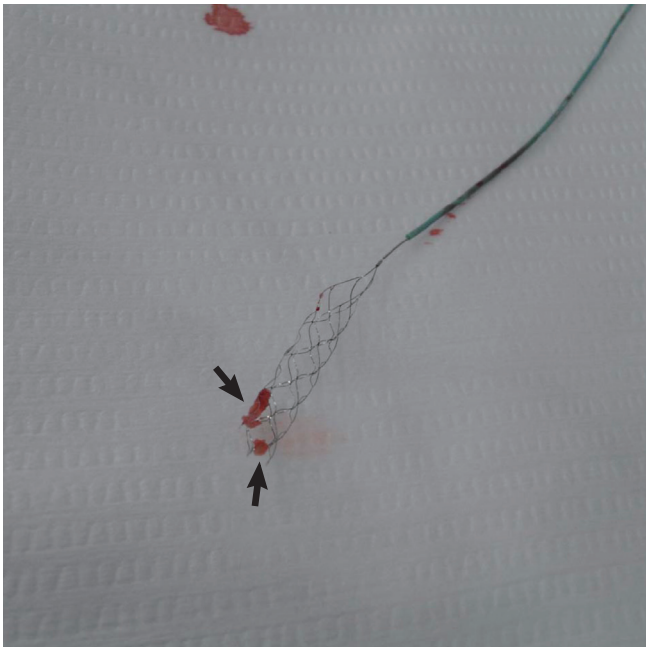

Fig. 4. Retrievable solitaire stent and captured emboli are shown (arrows).

Table 1. Successful mechanical embolectomy of acute cerebral infarction due to infective endocarditis

Cases	Age	Sex	Underlying heart condition	Affected valve	*Time interval	Initial NIHSS Score	Infarction site	Organism	IE suspected	Outcomes
Ref. 3	78	Woman	MVP	AV	< 1 hr	16	MCA, Rt.	Viridians streptococcus	Preembolectomy	Cured
Ref. 4	33	Male	Rheumatic MS	MV	< 1 hr	14	MCA, Lt.	Alpha hemolytic streptococcus	Preembolectomy	Cured
Present	39	Woman	No	MV	4 hr	18	MCA, Lt.	*Streptococcus gordonii*	Postembolectomy	Cured

*Time interval; Time to procedure from the onset of neurologic symptoms. IE, infective endocarditis; M, male; F, female; NIHSS, National Institute of Health Stroke Scale; MCA, middle cerebral artery; Rt; right; Lt; left; MS, mitral stenosis; MVP, mitral valve prolapse; AV, aortic valve; MV, mitral valve.

group of all intracranial infarctions, but is an important cause of neurologic complications in patients with IE. The incidence of stroke in patients with IE is about 10% (7). Many studies have endeavored to detect appropriate strategy to reduce the neurologic complications of IE. However, standard cares are not well established for the treatment or prevention of acute ischemic stroke caused by IE. Despite advances in antimicrobial and surgical therapy, IE remains one of infectious emergency diseases that can lead to rapid severe complications and death.

The most effective strategy for prevention of a stroke is prompt initiation of appropriate antibiotics therapy (8). Typically patients with intracranial hemorrhage were not offered cardiac surgery and anticoagulants would not be initiated for patients with IE with the goal of reducing the risk of stroke. The stroke in IE could be improved by early identification of lesions amenable to an endovascular procedure. Our patient presents several risk factors of mortality from IE, a neurological complication, large vegetation, and a need for surgery. Although some studies have demonstrated a survival benefit with surgery, she was treated only with medical treatment combined with mechanical embolic removal.

Table 1 showed three cases of successful embolectomy for a stroke with IE. Embolectomies in previous two cases were done within one hour after initiation of neurologic symptoms. However, in our case, the procedure was done 4 hr after the onset of neurologic symptoms. We successfully retrieved the septic embolus and the patient experienced functional improvement within hours. Three cases are IE caused by streptococcus. *S. gordonii* is a member of the viridans group, freshly isolated strains from oral cavities (9), and is among the bacteria most frequently identified as an etiologic agent of subacute endocarditis (10). *Staphylococcus aureus* is the most common strain which makes neurologic critical complications; infarction and hemorrhage, secondary to IE. We need more data about mechanical embolectomy treatment for acute cerebral stroke with IE due to *S. aureus*, which results in poor outcome.

Among cases of IE, up to 65% of embolic events involve the central nervous system, and the distribution of middle cerebral artery is commonly involved (8). When MCA stroke occurred, full neurological recovery was achieved in only 50% after proper valvular heart surgery. This was significantly lower when compared with patients with ischemic events affecting other parts of

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the brain (11). Three cases were also involved with MCA. However, they were cured with mechanical embolectomy without valvular heart surgery. Some experts recommend delaying surgery for 2 to 3 weeks for IE complicated by stroke (12, 13). Recent studies indicate that early surgery can be accomplished with a similar risk or better outcome in patients with native valve endocartitis (11, 14). Nevertheless, operators in our hospital wanted to delay valvular surgery because early operation will fail mechanical valve to attach the myocardium, during inflammatory reactions. And, cardiologists did not agree early valvular surgery because mitral regurgitation volume was not severe and aggravated. In this situation, mechanical embolectomy will be a useful procedure for prevention from aggravating and early recovery of neurologic symptoms and critical valvular surgery.

In conclusion, mechanical embolectomy in cases of stroke due to infective endocarditis manifesting with major neurologic deficits is a subject of controversy and needs additional clinical experience and evaluation in a randomized trials. Nevertheless, the benefit of this intervention introduced in these cases, can be one of the options for patients to whom thrombolysis or anticoagulation is unsuccessful or is contraindicated.

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