Case Studies

Recurrent Acute Ischemic Stroke after Infective Endocarditis Caused by *Streptococcus Constellatus*: First Case Report and Analysis of the Case Series

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Acute ischemic stroke (AIS) is highly prevalent in patients with infective endocarditis (IE) and associated with high rates of death and disability. IE presenting as an acute ischemic stroke, especially recurrent concurrence of acute anterior and posterior circulation infarct, has rarely been reported. Herein, we report a case study of a 60-year-old man with a history of aortic valve replacement and was under warfarin, presented with recurrent acute ischemic stroke which was found to have no vegetation secondary to infective endocarditis caused by *Streptococcus constellatus* as the embolic source. This is the first case report of recurrent ischemic stroke secondary to IE without vegetation caused by *Streptococcus constellatus* involving concurrence of acute anterior and posterior circulation. We also then systematically analyze the cases with IE initially presenting as AIS reported in the literature to establish possible demographic, clinical, laboratory patterns, and prognostic features of these cases. **Key Words:** Acute ischemic stroke—infective endocarditis—*Streptococcus constellatus*—aortic valve replacement.

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Introduction

Infective endocarditis (IE) is a microbial infection of the endocardial surface of the heart that most commonly consists of an infective vegetation of a heart valve. Cerebral ischemic stroke is highly prevalent in patients with IE and associated with high rates of death and disability, ranging up to 73%.[1] Ischemic stroke is the most common neurological complication of IE. It occurs in approximately 25%-35% of patients with IE due to embolization from endocardial vegetations.[2] The vast majority of cerebral embolic events are located in the middle cerebral artery territory. Risk factors of IE in industrialized countries are intravenous drug use, degenerative valve disease, intracardiac devices, health care-associated infection, and hemodialysis.[3] A review of associated literature showed 7 cases of IE-related ischemic stroke involving anterior and posterior circulation infarct, and 3 case reports of prosthetic aortic-valve endocarditis-related ischemic stroke. Herein, we report a case of prosthetic-valve endocarditis caused by *Streptococcus constellatus* presented as an acute ischemic stroke involving concurrence of acute

anterior and posterior circulation. To our knowledge, this is the first reported case of recurrent ischemic stroke secondary to prosthetic aortic-valve endocarditis without vegetation caused by *S. constellatus* involving concurrence of acute anterior and posterior circulation. We analyzed the clinical characteristics of previously reported case series of IE presenting as acute ischemic stroke by reviewing the relevant associated literature.

Case Presentation

A 60-year-old right-handed man presented with fever of unknown origin and general malaise for a month. The patient's medical history was notable for rheumatic valve disease for more than 30 years with a mechanical aortic valve replacement (AVR) in 2010, and anticoagulation therapy was initiated on warfarin (International Normalized Ratio 1.5-3.0). He also had a history of hypertension for more than 30 years and was taking amlodipine; his blood pressure was easy to control (fluctuations of 140~180/90~100 mm Hg). The patient's type 2 diabetes mellitus (DM) was diagnosed for more than 20 years. It was controlled with insulin now. There was no history of relevant alcohol intake, exposure to toxins, or recent foreign travel.

He presented to his local hospital with sudden onset of dizziness and nausea, vomiting upon waking up from a nap. The maximal body temperature is 39.0°C. His brain computed tomography (CT) scan performed without contrast enhancement revealed no abnormal mass in the brain (Fig 1, A-D).

He was transferred to our neurological department (ND), the Affiliated Hospital of Chifeng University within 8.5 hours of onset. In the ND room on admission, the patient was fully oriented. His vital signs on admission were as follows: blood pressure, 137/63 mm Hg; pulse, 65 beats/min; respirations, 20 breaths/min; and temperature, 35.9°C. Physical examination was largely unremarkable, with the exception of cardiac auscultation revealed a grade II/VI systolic murmur over the apex. The second heart sound was consistent with a mechanical prosthetic valve. He was alert and able to open her eyes to voice and followed commands, was oriented to time and location. The initial neurological examination revealed significant dysmetria on right finger-to-nose testing, and lower right limb ataxia on heel-to-shin testing and gait ataxia. Laboratory parameters on admission were consistent with an acute bacterial infection with a C-reactive protein level of 115.0 mg/L and leukocytosis of 25.84×10^9/L (Table 1).

His brain CT scan on admission to our hospital performed without contrast enhancement revealed a slightly lower density with brain involving the right side cerebellar hemisphere (Fig 1 E-H, white arrows). Another head CT performed 4 days (Fig 1, I-L, white arrows) and 15 days (Fig 1, M-P, white arrows) later without contrast enhancement showed the same right side cerebellar hemisphere foci of low attenuation; most compatible with acute cerebral ischemia. The ischemic changes affected mostly the cerebellar and seemed to be consistent with posterior circulation infarct.

Further stroke workup showed an abnormal lipid profile, with a high-density lipoprotein level of 33 mg/dl and a low-density lipoprotein level of 157 mg/dl, for which the patient was started on statins. Carotid Doppler ultrasonography and neck ultrasound were normal. Given there was a hint for the diagnosis of IE-related AIS for our patient who had cardiac murmur, fever and AVR, IE-related cerebral infarction was suspected and transthoracic echocardiography (TTE) performed at day 1 showed no vegetations on the valves. Blood cultures were negative. We started, under a diagnosis of brain infarction, intravenous edaravone to minimize brain damage from cerebral infarction. He was afebrile during the hospital stay and the patient was not started on antibiotic. The patient was discharged home in stable condition without obvious dizziness and fever.

However, he developed a fever of 38.8°C about 2 days after discharge again. He was referred to Beijing Tiantan Hospital for further evaluation and treatment. Infective endocarditis with septic embolic cerebral infarction was suspected. Repeat brain CT scan was arranged, which revealed a slightly lower density with the left (Fig 1, Q-S

Table 1. *Laboratory data of our patient*

Date	6.30	7.20	8.1	8.2	8.3	8.4	8.6	8.8	8.11	8.14	8.18	8.23	8.25	8.29	9.5
WBC	10.08	17.72	25.84	15.50	13.4	10.67	10.23	9.52	11.00	8.74	7.31	7.7	15.12		12.13
NEUT%	78.1	89.1	92.6	82.8	76.4	76.1	73.8	71.9	69.2	70.4	64.9	63.9	85.7		70.7
NEUT#			23.93	12.83	10.24	8.12	7.55	6.84	7.6	6.16	4.74	4.91	12.94		8.57
CRP		140	115												
ESR													60		
BUN		16.9	17.00	15.9	13.9	13.7	14.1	14.0	13.9	10.8	11.3	7.6	14.6	15.5	
Cr		359	326	291	282	272	295	286	260	239	230	293	322	310	

Abbreviations: CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; BUN, blood urea nitrogen; Cr, creatinine; NEUT, Neutrophils; WBC, white blood cells.

WBC: $3.5\text{-}9.5\times10^9$/L;NEUT%: 40-75%; NEUT#: $1.8\text{-}6.3\times10^9$/L; BUN: 2.1-7.1 mmol/L;Cr: 20-120 μmol/L.