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Case Report

# Successful treatment of cerebral emboli with tissue plasminogen activator in a patient with takotsubo cardiomyopathy: A case report

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ABSTRACT

Takotsubo cardiomyopathy is a cardiac syndrome characterized by reversible left ventricular wall motion abnormalities. It mimics the acute coronary syndrome; however, significant obstructive coronary artery disease is absent. The prognosis is relatively favorable in many cases, but complications may occur during the acute stage. Herein, we present a case of takotsubo cardiomyopathy in a 76-year-old woman. Three days after admission for persistent chest pains, the patient suddenly developed right hemiplegia, right homonymous hemianopsia, and aphasia. By diffusion-weighted magnetic resonance imaging and magnetic resonance angiography, we diagnosed acute-phase cerebral infarction caused by abrupt occlusion of the left middle cerebral artery by a thrombus, and treated it with intravenously administered tissue plasminogen activator. Three hours afterward, the patient's condition improved considerably. She was discharged 15 days after admission without any neurological sequelae. Thus, we show that takotsubo cardiomyopathy complicated by cerebral emboli can be successfully treated using tissue plasminogen activator.

<Learning objective: Serious complications sometimes occur during the acute stage of takotsubo cardiomyopathy. Cerebral thromboembolisms are relatively common complications of takotsubo cardiomyopathy that require careful observation during acute phase, and anticoagulant therapy needs to be considered. In case of cerebral emboli, rapid treatment by tissue plasminogen activator infusion may lead to a favorable prognosis.>



## Introduction

Takotsubo cardiomyopathy, also called 'stress cardiomyopathy', is a cardiac syndrome characterized by reversible left ventricular wall motion abnormalities and the absence of significant obstructive coronary artery disease, although the symptoms and electrocardiogram changes are similar to those of the acute coronary syndrome [1]. The prognosis is relatively favorable in many cases, but sometimes complications such as cardiogenic shock, congestive heart failure, ventricular tachycardia, and sudden death are observed, especially during the acute stage of the cardiomyopathy [2–4]. Furthermore, thromboembolic phenomena such as apical thrombus formation and cerebral emboli have been reported [5]. Herein, we present a case of takotsubo cardiomyopathy complicated by cerebral emboli, which we successfully treated with tissue plasminogen activator (t-PA).

## Case report

A 76-year-old woman visited the emergency department complaining of persistent chest pain. She had taken nitroglycerin after attending the funeral of a relative, which had been particularly stressful for her. She had a medical history of hypertension.

On admission, her mental status was alert, blood pressure was 92/68 mmHg, body temperature was 36.3 °C, respiratory rate was 24 $min^{-1}$, peripheral capillary oxygen saturation was 92% (room air), and heart rate was 102 beats/min with a regular rhythm. A II/VI systolic murmur was heard along the left parasternal border, and fine crackles were audible at bilateral lower lung fields. Electrocardiography showed ST segment elevation in the II, III, $aV_F$, and $V_{2-5}$ leads. Laboratory tests revealed an increase in the white blood cell count (12,800 $mm^{-3}$) with mild thrombocytosis

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($47 \times 10^4$ mm$^{-3}$) and positive heart-type fatty acid binding protein with normal levels of creatine kinase (204 IU/L). Cardiac troponin T level was slightly elevated to 2.16 ng/mL. Levels of serum C-reactive protein (1.25 mg/dL) and D-dimer (1.38 mg/l) were mildly elevated. Brain natriuretic peptide was elevated to 328 pg/mL. Echocardiography demonstrated akinesis of the left ventricular apex with augmented contraction of the basal area, leading to a suspicion of acute coronary syndrome or takotsubo cardiomyopathy. Echocardiography showed no left ventricular thrombus. Emergency coronary angiography was performed to ascertain the cause of the apical asynergy. Coronary angiography showed no significant epicardial coronary stenosis (Fig. 1A and B), while left ventriculography showed apical ballooning with basal hyperkinesis (Fig. 1C and D). Based on these angiographic findings, the patient was diagnosed with takotsubo cardiomyopathy.

Three days after admission, at 11:35 am, the patient suddenly developed right hemiplegia, right homonymous hemianopsia, and aphasia. A head computed tomography scan showed no signs of early ischemia and no evidence of cerebral hemorrhage (Fig. 2A). Echocardiography showed severe apical hypokinesis with no thrombus. The National Institutes of Health Stroke Scale (NIHSS) score was 18 points. Diffusion-weighted magnetic resonance (MR) imaging showed high intensity in the left temporal lobe (Fig. 3) and MR angiography revealed proximal occlusion of the left middle cerebral artery (MCA; Fig. 2C), which was consistent with thrombotic embolism. We diagnosed acute-phase cerebral infarction on the basis of the abrupt occlusion of the left MCA by the thrombus, and intravenously administered 16 million international units of t-PA in total at 1:05 pm. Three hours after t-PA infusion, the patient could reply to questions, and the right hemiplegia improved (muscle maneuver test score 3/5, NIHSS score 8). On the next day, i.e. the fourth day after admission, the patient could answer almost clearly, and the right hemiplegia almost disappeared (NIHSS score 1). Electrocardiography or telemetry during hospitalization demonstrated no evidence of atrial fibrillation. Follow-up echocardiography at 7 and 12 days after admission showed complete resolution of the wall motion abnormality.

Computed tomography at the time of discharge revealed a low-density area in the left temporal lobe (Fig. 2B), and MR angiography demonstrated complete dissolution of the MCA thrombus (Fig. 2D). The patient was discharged 15 days after admission without any neurological sequelae. As post-medication, we prescribed 50 mg of oral clopidogrel per day.

## Discussion

In the absence of significant comorbid complications, the prognosis of takotsubo cardiomyopathy is generally favorable, and left ventricular asynergy is usually resolved within several weeks. However, the disease can be associated with serious complications such as ventricular tachycardia, congestive heart failure, cardiogenic shock with severe left ventricular pressure gradient [3], cardiac rapture [4], and cerebral emboli through the formation of thrombi in the left ventricular cavity [5,6]. Despite the fact that left ventricular dysfunction in takotsubo cardiomyopathy is a transient phenomenon, it favors the formation of a thrombus through catecholamine-induced platelet activation and blood stagnation around the hypo/akinetic apical region [7]. In addition, embolic events were observed more frequently than in the acute coronary syndrome because the normalization of left ventricular contraction may promote the discharge of emboli from an apical thrombus [8]. To date, the true incidence and clinical significance of a left ventricular thrombus and related embolic outcomes in patients with takotsubo cardiomyopathy have not been fully established.

The incidence of left ventricular thrombi in takotsubo cardiomyopathy varies according to researchers. Haghi and colleagues reported that a left ventricular thrombus occurred in 8% of takotsubo cardiomyopathy cases in a single center [5]. In

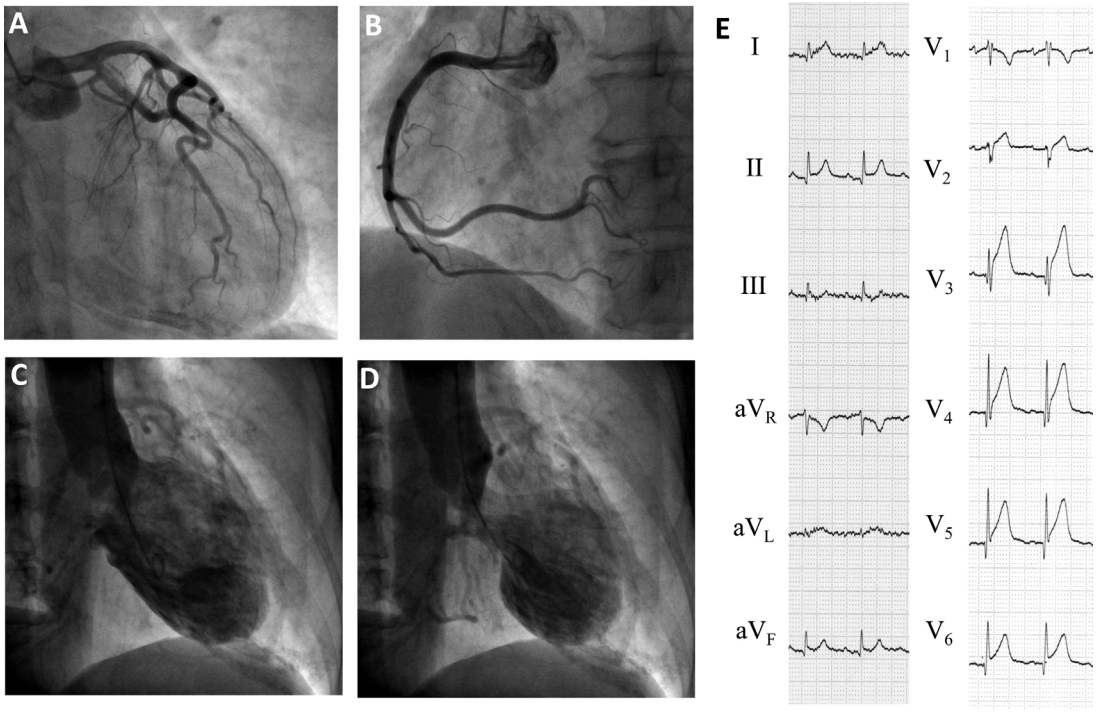


**Fig. 1.** Emergency cine angiography and ECG. Emergency coronary angiogram images (A: left coronary artery, B: right coronary artery). There was no significant stenosis in coronary artery. Left ventriculography images (C: end-diastole, D: end-systole) showing typical "takotsubo" configuration. Electrocardiogram on admission (E).