

Case Report

Paradoxical Embolism in a Girl with Atrial Septal Defect After Paroxysmal Supraventricular Tachycardia Ablation

Xiang Chen, MD, Zhijun Zhu, MD, and Danning Wu, MD

Paradoxical embolism is a kind of important pathogenesis of cardiocerebrovascular diseases. In our case, radiofrequency current catheter ablation was accomplished successfully in a 15-year-old girl who had been experiencing supraventricular tachycardia for 6 months. She presented with abrupt onset of left hemiplegia and loss of consciousness on the first postoperative day. An urgent cerebral computed tomography showed a hyperdense right middle cerebral artery. Transthoracic echocardiogram examination revealed an atrial septal defect (ASD), with the diameter measuring 39 mm. The case highly suggests that the issue of ASD should be resolved by either closed or prompt anticoagulant therapy, especially for patients who are planned to receive catheter manipulation. **Key Words:** Cerebral infarction—embolism—complication—radiofrequency ablation.

© 2017 Published by Elsevier Inc. on behalf of National Stroke Association.

Case

A 15-year-old girl who had been experiencing recurrent palpitation for 6 months was admitted to our cardiac department. Electrocardiogram (ECG) during palpitation showed a narrow QRS tachycardia (Fig 1, A), and resting ECG was normal. She was healthy without medication history and had no history of stroke, transient ischemic attack, and atrial fibrillation (AF) before. On physical examination, her first heart sound was normal, whereas the second heart sound was widely split and fixed. Moreover, a systolic murmur was heard in the pulmonary area. Laboratory investigations were within normal limits. Transthoracic echocardiogram examination revealed right heart

enlargement because of a secundum-type atrial septal defect (ASD), with the diameter measuring 39 mm (Fig 1, B), whereas left ventricular systolic function, as well as systolic pulmonary artery pressure, was still normal. Based on the recurrent attacks of palpitation, the onset of ECG changes, physical examination, and transthoracic echocardiogram results, a diagnosis of narrow QRS complex tachycardia coexisting with ASD was established. Then, the electrophysiological study was performed, and typical slow-fast atrioventricular nodal re-entrant tachycardia was induced. Ablation of the slow pathway was accomplished successfully and the tachycardia could no longer be induced with standard pacing maneuvers. The patient remained asymptomatic without any anti-arrhythmic therapy, and only aspirin 100 mg/d was given subsequently after the procedure, which lasted about 80 minutes.

However, she presented with abrupt onset of left hemiplegia and loss of consciousness on the first postoperative day (National Institutes of Health Stroke Scale: 14). An urgent cerebral computed tomography (CT) (Fig 1, C) showed a hyperdense right middle cerebral artery (MCA) and early signs of infarction in its territory. Given the thrombolysis time window, the patient was submitted to an intravenous infusion of recombinant tissue plasminogen activator (rt-PA) .9 mg/kg (total dose: 45 mg).

From the Cardiovascular Department, No 117 Hospital of Chinese People's Liberation Army, Hangzhou, Zhejiang.

Received March 14, 2017; revision received May 22, 2017; accepted May 28, 2017.

Address correspondence to Danning Wu, MD, Cardiovascular Therapeutic Centre, No 117 Hospital of the Chinese People's Liberation Army, No 14, Linying Road, Hangzhou, Zhejiang 310013, China. E-mail: wdn20150901@sina.com.

1052-3057/\$ - see front matter

© 2017 Published by Elsevier Inc. on behalf of National Stroke Association.

<http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2017.05.035>

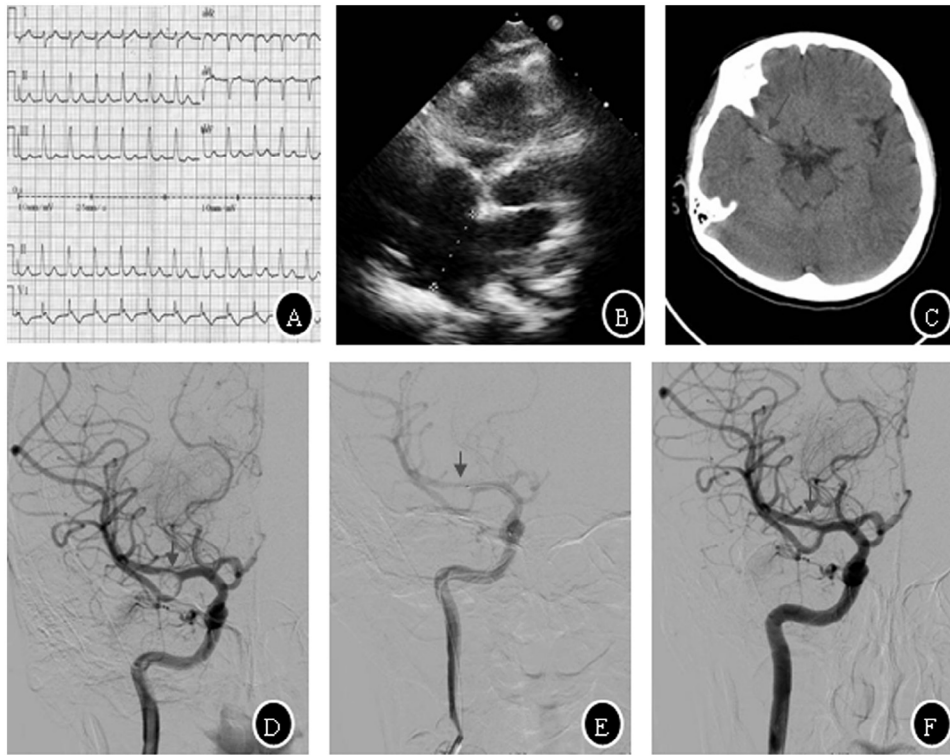


Figure 1. (A) ECG feature of a narrow QRS tachycardia during palpitation. (B) TTE demonstrated a large secundum ASD. (C) CT showed a hyperdense right middle cerebral artery (black arrow). (D) Emergent cerebral angiography showed obvious stenosis at the right MCA bifurcation with thrombosis (black arrow). (E) Intra-arterial thrombolysis via an Echelon microcatheter (black arrow). (F) Restoration of TIMI 3 flow in the right MCA after intra-arterial thrombolysis (black arrow). Abbreviations: ASD, atrial septal defect; CT, computed tomography; ECG, electrocardiogram; MCA, middle cerebral artery; TIMI, thrombolysis in myocardial infarction; TTE, transthoracic echocardiogram.

During the infusion of rt-PA, she showed an improvement in her neurological deficit (National Institutes of Health Stroke Scale: 7 on completing the infusion). Emergent cerebral angiography was taken 2 hours after the onset of the stroke, which showed obvious stenosis at the right MCA bifurcation with thrombus (Fig 1, D). Then, she was treated with intra-arterial thrombolysis (IAT) using an Echelon microcatheter (Fig 1, E). Rt-PA at a dose of 10 mg was infused directly into the proximal end of the thrombus, and final angiography revealed thrombolysis in cerebral infarction 3 flow without residual thrombus of the right MCA (Fig 1, F).

Repeated CT of the brain showed no abnormality 1 hour after IAT. A brain magnetic resonance imaging was also performed in the meantime, finding no signs of infarction or hemorrhage. A Doppler sonogram of lower extremity venous was normal (without embolic sources). The next day after the thrombolysis, neurological examination revealed normal consciousness and improved left-sided muscle strength. No abnormality was demonstrated on the repeated cerebral CT scans. Then, low molecular weight heparin and warfarin were prescribed to prevent further thrombotic events. One week after IAT, the patient was discharged without symptoms and underwent surgical repair of ASD 3 months later. There was no recurrence of stroke event in subsequent 3-month follow-up.

Discussion

Stroke is one of the most common causes of death and major causes of disability worldwide. In children who underwent thrombolytic treatment, the main cause of stroke included cardiac and paradox embolism, iatrogenic stroke, and stroke of unknown etiology. Given the medical history of our patient, it is thought paroxysmal supraventricular tachycardia (PSVT) or ASD should contribute to this embolic event.

It has been reported that there is an independent association between diagnoses of PSVT and subsequent ischemic stroke in a large and demographically diverse sample of patients.¹ In a single center, it was found in 14% of patients with unexplained stroke that PSVT was inducible during esophageal electrophysiologic study.² Another study showed a prevalence of 2.8% of ischemic stroke or transient ischemic attack among a population having PSVT. However, only age and previous history of AF were found to be predictors of stroke.³ Unlike PSVT in older patients, which may reflect underlying atrial disease that predisposes to stroke, PSVT in younger patients usually seems benign. Meanwhile, the ablation procedure of the slow pathway for atrioventricular nodal re-entrant tachycardia itself is of little probability to cause cerebral embolism. However, it may be different when coexisting with ASD.

Thrombolysis, although not indicated for patients younger than 18 years of age, is currently being administered to children.⁴ In this case, the effect of thrombolysis is very obvious, and there is no alteplase-related hemorrhage.

In our patient, aspirin 100 mg qd was given regularly after the ablation, but this failed to prevent ischemic stroke, which highly suggests that the issue of ASD should be resolved by either closed or prompt anticoagulant therapy, especially for patients who are planned to receive catheter manipulation. Acute ischemic stroke because of ASD or PSVT ablation is uncommon for young patients without AF; although the association between stroke and ASD or PSVT has previously been reported in the literature, to the best of our knowledge, this is the first case of acute ischemic stroke with secundum ASD after PSVT ablation.

Conclusion

This case highlights that the use of antithrombotic therapy in PSVT ablation should be undertaken with great attention in the patient who has abnormal arteriovenous

communications like ASD, because of increased risk of thrombosis. It is thought that the anticoagulation therapy may be safer than the single antiplatelet treatment during the perioperative period of PSVT ablation especially for patients with high risk of thrombosis.

References

1. Kamel H, Elkind MS, Bhave PD, et al. Paroxysmal supraventricular tachycardia and the risk of ischemic stroke. *Stroke* 2013;44:1550-1554.
2. Brembilla-Perrot B, Blangy H. Prevalence of inducible paroxysmal supraventricular tachycardia during esophageal electrophysiologic study in patients with unexplained stroke. *Int J Cardiol* 2006;109:344-350.
3. Brembilla-Perrot B, Delobelle J. Prevalence of stroke among patients with paroxysmal supraventricular tachycardia. *Pacing Clin Electrophysiol* 2013;36:180-186.
4. Amlie-Lefond C, deVeber G, Chan AK, et al. Use of alteplase in childhood arterial ischaemic stroke: a multicentre, observational, cohort study. *Lancet Neurol* 2009;8:530-536.