Case Reports

Reversible Cerebral Vasoconstriction Syndrome

Associated with Coronary Artery Vasospasm

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Reversible cerebral vasoconstriction syndrome is a rare disorder associated with neurologic symptoms secondary to diffuse cerebral vasospasm. Cardiac involvement in this disease is exceedingly rare.

A 50-year-old woman was admitted to our hospital for evaluation of chest pain. During a 3-year period, she had been admitted multiple times because of chest pain and elevated serum cardiac enzymes. Transthoracic echocardiograms showed transient wall-motion abnormalities; however, coronary angiograms revealed no coronary artery disease. At the current admission, she had a thunderclap headache, and cerebral angiograms revealed diffuse cerebral vasoconstriction that improved after verapamil infusion, confirming the diagnosis of reversible cerebral vasoconstriction syndrome. The patient was treated successfully with oral diltiazem and had no recurrence of symptoms.

We describe what we think is the first reported case of coronary artery spasm in association with reversible cerebral vasoconstriction syndrome. Future research should be focused on identifying treatment options and defining the mechanisms by which the cerebral and coronary vasculature are affected. ***(Tex Heart Inst J 2019;46(2):139-42)***

Key words:
Cardiomyopathies/diagnosis; cerebral arterial diseases/complications/diagnostic imaging; cerebrovascular circulation/drug effects/physiology; headache disorders, primary/diagnosis/etiology; time factors; treatment outcome; vasoconstriction; vasodilator agents/therapeutic use

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Reversible cerebral vasoconstriction syndrome (RCVS) is characterized by severe thunderclap headache, with or without other neurologic symptoms, and diffuse segmental narrowing of cerebral arteries on images. Extracerebral involvement in RCVS has been reported, including narrowed renal and carotid arteries.[1-4] However, cardiac involvement is exceedingly rare; we found only 3 reported cases of RCVS with concomitant transient nonischemic cardiomyopathy.[5] We present a noteworthy case of RCVS associated with coronary artery vasospasm that caused transient wall-motion abnormalities (WMAs) on echocardiograms.

Case Report

A 50-year-old woman with a history of hypertension and diabetes mellitus was admitted to our hospital for evaluation of chest pain. During a 3-year period, she had been hospitalized multiple times because of chest pain, headaches, and elevated serum cardiac enzymes. During a previous hospitalization, her peak serum troponin level was 7.5 ng/mL, and substantial anterior WMAs were seen on a transthoracic echocardiogram (TTE). A 12-lead electrocardiogram (ECG) had revealed no acute ischemic changes. Coronary angiograms showed no evidence of coronary artery disease (Fig. 1). At the time, a localized variant of takotsubo cardiomyopathy was considered as a differential diagnosis. The patient was started on oral β-blocker therapy. During subsequent cardiac examinations, nothing notable was seen on TTE, nuclear perfusion images, or coronary angiograms, and TTE showed that the WMAs had resolved.

At the current admission, the patient's chest pain was associated with diaphoresis, nausea, and dyspnea. A complete physical examination revealed nothing of note, and a 12-lead ECG showed no acute ischemic changes. However, the patient's serum troponin I level was elevated at 3.7 ng/mL. Repeat TTE, myocardial perfusion images, and cardiac magnetic resonance images showed nothing notable. Results of urine tests for cocaine and other illicit drugs were negative.

Just before being discharged from the hospital, the patient had a severe thunderclap headache. Brain magnetic resonance images with contrast medium revealed a

hyperintense signal in the cortex and subcortical white matter, primarily in a posterior distribution. Cerebral angiograms subsequently revealed diffuse vasoconstriction (Fig. 2), which resolved after verapamil infusion (Fig. 3), consistent with a diagnosis of RCVS. Verapamil was preferred over nitrates because of the refractory headache.

Given the patient's recurrent presentations with episodic chest pain, positive serum troponin, and normal-appearing coronary angiograms in the presence of headaches secondary to RCVS, we concluded that she had concomitant coronary artery vasospasms. Our reasoning was as follows: in classic Prinzmetal angina, coronary vasospasm is sometimes seen on angiograms with a corresponding ST-segment elevation on a 12-lead ECG; however, we did not find these, perhaps because of the timing of presentation. Our patient presented with intermittent chest pain that had begun a few days earlier. We think that her initial coronary vasospasm had occurred hours before presentation, which is why no ECG changes were seen at that time. However, she did have elevated cardiac enzyme levels and WMAs on echocardiograms, suggesting a recent brief cardiac insult from coronary vasospasm that did not correspond with the exact timing of ECG and coronary angiography.

Coronary vasospasm provocation is not routinely performed at our hospital and, therefore, was not attempted. We changed the patient's therapy from β-blockers to oral diltiazem, which targets both coronary and cerebral

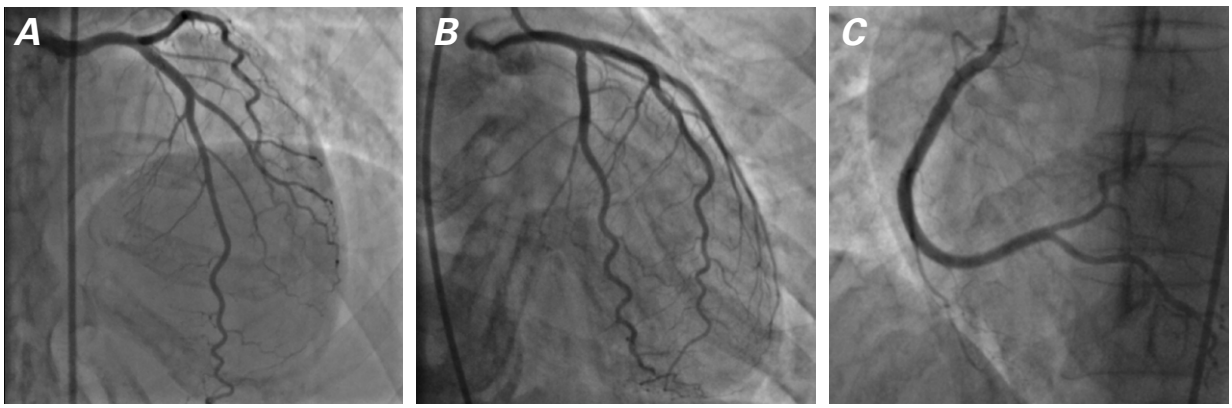

Fig. 1 *Selective angiograms of the left main coronary artery reveal no substantial coronary artery disease in the anteroposterior* ***A****) cranial or* ***B****) caudal view.* ***C****) No substantial right coronary artery disease is seen (anteroposterior cranial view).*

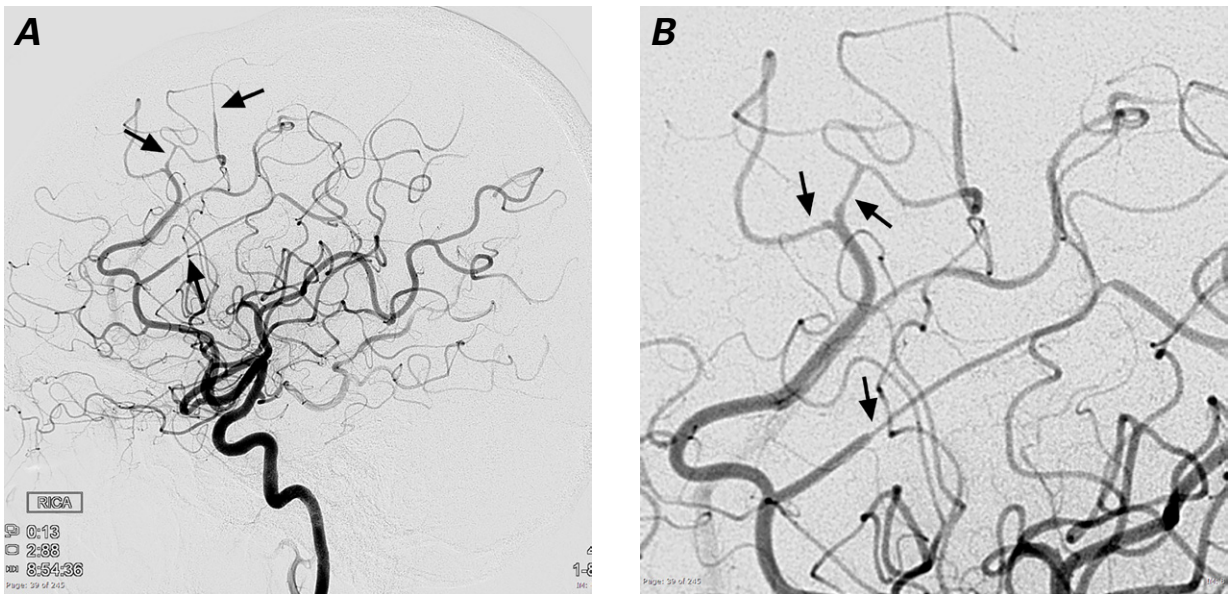

Fig. 2 ***A****) Cerebral angiogram shows vasoconstriction (arrows) in the cerebral circulation;* ***B****) an area of notable vasoconstriction (zoomed view).*

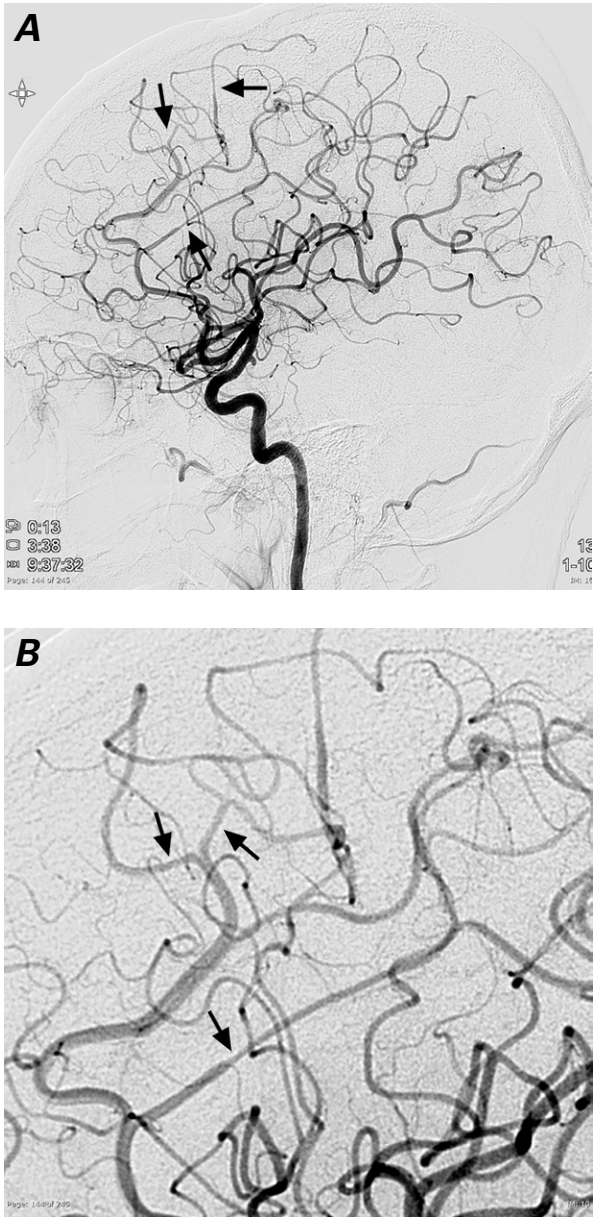

Fig. 3 ***A****) After verapamil infusion, cerebral angiogram shows improved vascular caliber (arrows) in the cerebral circulation;* ***B****) zoomed view.*

vasospasm. She was regularly monitored in the clinic after her discharge from the hospital, and she remained free of symptoms at her 9-month follow-up visit.

Discussion

We think that this is the first report of coronary artery vasospasm in association with RCVS. A rare neurovascular disorder, RCVS is characterized by diffuse vasospasm of the cerebral arterial system, preceded by thunderclap headaches with or without other neurologic symptoms.[6,7] Evidence suggesting systemic vascular involvement in RCVS is sparse.

Extracranial vascular involvement in RCVS has been described in several case reports,[3,5,6,8] and RCVS has been associated with dissection of the internal and external carotid arteries.[1,2,4,5] In a 20-patient cohort study,[2] cervical artery dissection was seen in 12% of patients with RCVS, and RCVS was diagnosed in 7% of all patients with cervical artery dissection. Renal artery narrowing in patients with RCVS has been reported.[1,3] Cardiac involvement in RCVS is exceedingly rare. In a review of the extracerebral manifestations of RCVS in 68 patients,[5] 18 patients underwent TTE during the ictal stage of RCVS, to evaluate the origin of stroke. Three of the 18 (17%) had evidence of WMA. All 3 were women with no history of coronary artery disease or congestive heart failure, and 2 were postpartum. Of note, coronary angiograms and prior TTE were not available for these patients. On follow-up echocardiograms, the WMA had resolved completely in 2 of the 3 patients (one postpartum).[5] These findings are similar to those seen in our patient. Finally, both takotsubo and peripartum cardiomyopathy have been associated with RCVS.[9,10]

The pathogenesis of RCVS is not well understood, but it may be associated with impaired cerebral endothelial function. Endothelial dysfunction leading to increased vascular tone is typically limited to the cerebral vasculature in RCVS; however, we think that endothelial dysfunction may extend to the extracranial vasculature in some cases.[11]

According to available data, calcium channel blockers are the therapeutic mainstay in RCVS.[5-8] After the diagnosis of RCVS, our patient was switched from propranolol to a calcium channel blocker (diltiazem) to treat the coronary and cerebral arterial vasospasms. Her symptoms completely resolved, and she was doing well on follow-up visits. More research is needed to study systemic vascular involvement in RCVS and its treatment with diltiazem.

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