Case Reports

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Emergency thrombectomy for cerebrovascular occlusion in a patient with mirror-image dextrocardia: a case report

Wensheng Zhang, Weifang Xing, Xiaojing Zhong, Minzhen Zhu and Jinzhao He

Abstract

Cases of patients complicated with dextrocardia who suffer from acute cerebral infarction with large vessel occlusion and receive emergency thrombectomy are particularly rare and have not been widely reported. This article aimed to increase the awareness and knowledge of these cases. We report the case of a patient with mirror-image dextrocardia who suffered from cerebral infarction with large vessel occlusion and received emergency thrombectomy. A male patient in his early 60s with dextrocardia had acute cerebral infarction with posterior circulation large vessel occlusion and underwent emergency thrombectomy. During the operation, the rapid confirmation of dextrocardia and use of flexible interventional instruments helped establish a pathway for blood flow. We used an intracranial thrombectomy stent and intracranial balloon dilation catheter to restore the cerebral blood supply. The Modified Rankin Scale score was 0 at 3 months after thrombectomy, indicating a good prognosis of the patient. Acute cerebral infarction with large vessel occlusion in patients with dextrocardia is extremely rare. Emergency thrombectomy is feasible to recanalize cerebral blood flow and give patients a chance to recover.

Keywords

Emergency thrombectomy, large vessel occlusion, cerebral infarction, dextrocardia, blood flow, case report

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Introduction

Emergency embolectomy in the anterior circulation is an effective method for the treatment of acute cerebral infarction with large vessel occlusion.[1,2] The effectiveness and

Department of Neurology, Heyuan People's Hospital, Guangdong Provincial People's Hospital Heyuan Hospital, Guangdong Province, China

Corresponding author:
Wensheng Zhang, Department of Neurology, Heyuan People's Hospital, Guangdong Provincial People's Hospital Heyuan Hospital, No. 733, Wenxiang Road, Yuancheng District, Guangdong Province, China, 517000.
E-mail: 494172988@qq.com

safety of intravascular interventional therapy for acute cerebral infarction with posterior circulation large vessel occlusion have been gradually confirmed by clinical trials.[3] However, it is rare for patients with dextrocardia to have acute cerebral infarction with posterior circulation large vessel occlusion, and few patients undergo emergent thrombectomy.[4,5] We report a case of acute cerebral infarction with posterior circulation large vessel occlusion in a patient with dextrocardia and share our experience in the diagnosis and treatment of this patient.

Case report

A male patient in his early 60s complained of dizziness, speech impairments, and limb weakness after getting out of bed, and after 8 hours of experiencing symptoms, he was admitted to the Emergency Department of our hospital. The patient fell asleep at 23:00 the day before admission and reported no abnormalities before falling asleep. He had a history of hypertension, and his blood pressure was not well controlled. He denied other diseases. Neurological examination showed drowsiness, speech impairments, a shallow nasolabial fold on the right side, grade 4 limb muscle strength, instability in the bilateral finger–nose test and heel–knee–tibia test, and positive pathological signs on both sides. The National Institute of Health Stroke Scale (NIHSS) score was 7, the Glasgow Coma Scale was 13, and the Modified Rankin Scale (mRS) score was 0 before onset. A heartbeat was heard in the symmetrical right part of the left precordial area but not in the left precordial area. Considering the possibility of dextrocardia, electrocardiography (ECG) with the positions of the connecting lines in the left and right hands opposite to those for a normal person further indicated dextrocardia. Chest and abdominal X-ray examination confirmed dextrocardia (Figure 1a). The diagnosis of mirror-image dextrocardia was clear. No hemorrhage was found on brain computed tomography. Urgent brain nuclear magnetic resonance examination revealed multiple infarctions in bilateral cerebellar hemispheres (Figure 1b). Magnetic resonance angiography showed bilateral vertebral artery and basilar artery occlusion (Figure 1c).

The patient was definitively diagnosed with acute cerebral infarction caused by posterior circulation large vessel occlusion. Considering that the onset of the patient's

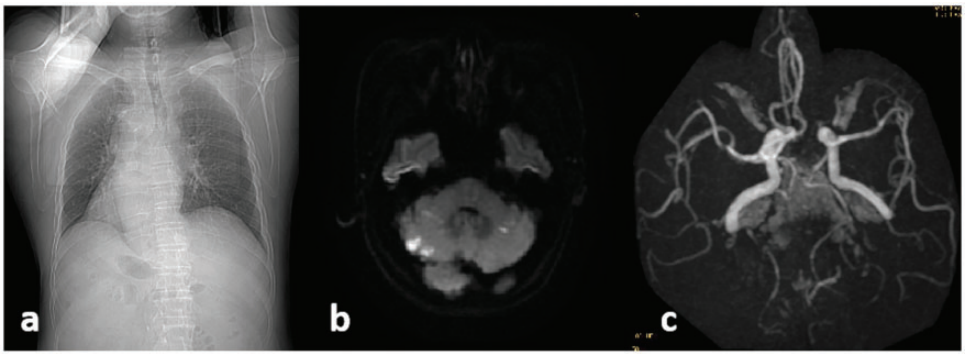

Figure 1. Imaging examinations of the male patient reported in this case. a: Chest and abdominal X-ray examination confirmed dextrocardia. b: Diffusion-weighted imaging of brain magnetic resonance indicates acute infarction of bilateral cerebellar hemispheres. c: Brain magnetic resonance angiography showed bilateral vertebral artery and basilar artery occlusion.

condition was unclear, intravenous thrombolysis was not performed. The large vessel occlusion was an indication for emergency thrombectomy. After obtaining informed consent forms from the patient and his family members, emergency interventional therapy was performed. Regarding the method of anesthesia, we selected local anesthesia with midazolam and dexmedetomidine for sedation. The times to angiosuite admission and successful puncture were 90 and 107 minutes, respectively. Angiography of the aortic arch confirmed the existence of dextrocardia, and the direction of the aortic arch was opposite (Figure 2a). Angiography of the supra-aortic arch confirmed that the right vertebral artery was occluded far away from the V2 segment (Figure 2b), and the left vertebral artery only supplied the ipsilateral posterior inferior cerebellar artery (Figure 2c). The bilateral posterior communicating arteries were unobstructed, providing compensatory blood supply to the posterior circulation. No obvious abnormality was found on other cerebral angiography exams.

Because this was the first time we encountered this situation, during the operation, we discussed the particularity of the interventional treatment. Given the presence of dextrocardia and the reversal of the aortic arch, we thought that the key step in recanalizing the occluded vessels was to quickly establish a stable catheter support system, which posed no additional significant challenge during the procedure. We used flexible materials, such as a hard loach guide wire, and aimed to establish a pathway for blood flow. We retained the 5F single bend catheter in the right vertebral artery after angiography and exchanged the hard loach guide wire. After withdrawing the 5F single bend catheter, an 8F catheter was placed into the distal end of the V1 segment of the left vertebral artery along the hard loach guide wire. We used the coaxial technique to perform thrombectomy by stent retrieval in the right vertebral artery using a RECO 5.0-mm × 3.0-mm stent (Jiangsu Nico Medical Device Company, Jiangsu, China). After thrombectomy, angiography showed severe stenosis of the V4 segment of the right vertebral artery and lower segment of the basilar artery (Figure 2d). The puncture to recanalization time was 170 minutes. Considering that the stenotic vessels may be occluded again at any time, we then performed balloon dilatation of the inferior segment of the basilar artery and V4 segment of the right vertebral artery. An intracranial balloon dilator (Gateway, 3.0 mm × 15.0 mm, Shanghai Boke International Medical

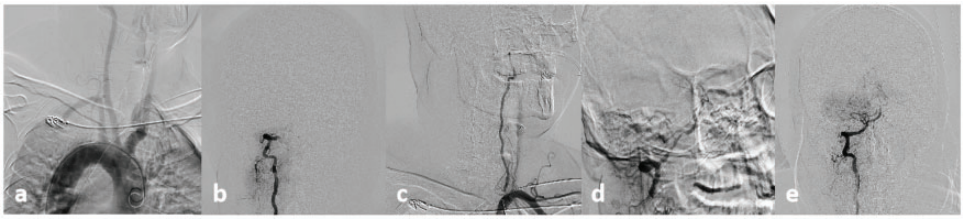

Figure 2. Angiography of anatomy and vessels. a: Aortic arch angiography confirmed that the direction of dextrocardia and the aortic arch was reversed. b: Angiography superior to the aortic arch revealed right vertebral artery occlusion. c: Left vertebral artery supplies the ipsilateral posterior inferior cerebellar artery only. d: Angiography after stent thrombectomy showed severe stenosis of the V4 segment of the right vertebral artery and inferior segment of the basilar artery. e: Cerebral blood flow of the posterior circulation after successful interventional recanalization.

Devices Co., Ltd., Shanghai, China) was used for balloon dilatation, and the atmospheric pressures selected were 8 and 10 atm in the inferior segment of the basilar artery and V4 segment of the right vertebral artery, respectively.

Angiography showed that the stenoses of the inferior segment of the basilar artery and the V4 segment of the right vertebral artery were significantly improved (Figure 2e). No thromboembolism was found in the distal end of the vessel. The NIHSS score had decreased to 1 on day 7 after thrombectomy, and the muscle strength of the right lower limb was grade 4. The mRS score was 0 at 3 months after thrombectomy, indicating a good prognosis of the patient.

The reporting of this study conformed to CARE guidelines,[6] and we obtained signed consent forms from the patient and their family for treatment and the publishing of our findings. Ethical board approval was not applicable because the treatment of our patient was consistent with medical regulations, and our study did not involve human experiments. We also de-identified all patient details.

Discussion

One of the most effective strategies for acute cerebral infarction with anterior circulation large vessel occlusion is to evaluate whether there is a salvable ischemic penumbra within 24 hours of onset.[7] If this is the case, mechanical thrombectomy can be performed to quickly open the occluded anterior circulation vessels, which has some chance of achieving a good prognosis. In contrast to anterior circulation occlusion, emergency thrombectomy in acute cerebral infarction with posterior circulation large vessel occlusion is not highly recommended by clinical guidelines. However, it is undeniable that emergency thrombectomy in clinical practice can quickly recanalize the occluded posterior circulation large vessels, restore cerebral blood flow, save brain tissue, and give patients a certain opportunity to recover. Our patient was diagnosed with acute cerebral infarction with posterior circulation large vessel occlusion. After detailed preoperative evaluation, right vertebral artery occlusion was quickly confirmed during the operation, and severe stenoses of the V4 segment of the vertebral artery and lower segment of the basilar artery were found after thrombectomy. Following balloon dilatation, cerebral blood flow was successfully restored, which allowed the patient to recover. However, our patient also had dextrocardia. Emergency thrombectomy for acute infarction from large vessel occlusion complicated with dextrocardia has its particularity, but it may pose no additional significant challenge during the procedure. Sufficient preoperative prediction and application of a flexible guide wire, multifunctional catheter, and other materials during the operation can successfully establish the interventional treatment access using coaxial technology, indicating that dextrocardia does not necessarily delay the time of emergency embolectomy. On the basis of our clinical experience, as long as we recognize dextrocardia and understand that the key step in emergency thrombectomy for patients with dextrocardia is to quickly establish a stable catheter support system, the presence of dextrocardia will not increase the difficulty of emergency thrombectomy.

It has been reported that mirror-image dextrocardia is a real form of dextrocardia.[8] Our patient's visceral inversion was associated with mirror-image dextrocardia. This type of heart is on the right side of the chest. The position of the atrium, ventricle, and large blood vessels is a mirror image of the normal heart, and the relationship

between the heart and large artery is essentially normal. Generally, there are no clinical symptoms or hemodynamic changes.[8,9] In the present case, the pathogenesis of cerebrovascular occlusion may not have been related to dextrocardia because dextrocardia does not lead to posterior circulation cerebrovascular stenosis, and dextrocardia itself has no hemodynamic abnormalities.[8,9] Considering the history of hypertension and the angiographic results of emergency thrombectomy, we considered that the pathogenesis of this patient was vascular stenosis and occlusion caused by atherosclerosis. Whether dextrocardia causes cerebrovascular stenosis and occlusion requires the analysis of additional cases.

The successful treatment of our patient shows that when the possibility of dextrocardia is considered, the presence of dextrocardia can be quickly determined through cardiac auscultation, ECG examination, and chest and abdominal X-ray examinations for the diagnosis and treatment of patients with acute cerebral infarction with dextrocardia.[10] For patients requiring emergency thrombectomy, it is essential that comprehensive plans are made before surgery and that the time of angiography and access establishment is reduced, similar to patients with normal cardiac structures, to quickly recanalize the occluded cerebral vessels and restore the cerebral blood flow supply, giving these patients the prospect of a good recovery.

Recently, Yoshie et al. published a case report of a patient with acute cerebral infarction with left middle cerebral artery occlusion combined with dextrocardia and visceral inversion. That patient received intravascular interventional therapy and obtained a good prognosis.[11] Yoshie et al. proposed that for the diagnosis and treatment of patients with dextrocardia, an in-depth understanding of the anatomical structures makes it easier to recanalize the occluded cerebral large vessels and successfully treat the patients. Our case differed from that of Yoshie et al. First, a different vessel was occluded. In their case, it was the middle cerebral artery in the anterior circulation; in our case, it was the vertebral artery and basilar artery in the posterior circulation. Second, the pathogenesis was different. In their case, the patient had atrial fibrillation, and the pathogenesis was considered to most likely be cardiogenic embolism. The pathogenesis in our case was considered to be acute occlusion on the basis of large artery atherosclerosis. Third, the method of emergency thrombectomy differed. In their case, stent thrombectomy combined with intermediate catheter aspiration was used. In our case, stent thrombectomy and balloon dilatation were used. At present, there are few relevant literature reports on emergency thrombectomy in patients with dextrocardia combined with acute cerebral infarction due to posterior circulation cerebral large vessel occlusion. Although our case and that of Yoshie et al. were different, both patients achieved a good prognosis. We also believe that the application of flexible interventional instruments during surgery can help recanalize the occluded cerebral large vessels as soon as possible.

In summary, it is rare for patients with dextrocardia and acute cerebral infarction with large vessel occlusion to undergo emergency thrombectomy. For patients with dextrocardia and acute cerebral infarction with large vessel occlusion in the anterior circulation or posterior circulation, emergency thrombectomy can help recanalize cerebral blood flow, allowing the patients to benefit from surgery. The important points are to accurately identify and confirm the presence of dextrocardia, fully understand the particularity of the anatomical structures, and apply flexible

interventional instruments during the operation to recanalize the occluded vessels.

Declaration of conflicting interest

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ORCID iD

Wensheng Zhang https://orcid.org/0000-0001-8672-5683

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