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CASE REPORTS

Mechanical thrombectomy for acute left middle cerebral artery occlusion in a patient with mirror-image dextrocardia

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Abstract

Mirror-image dextrocardia is a physiological variant in which the heart is located in a mirror position to the right of the position of the normal human heart. Mirror-image dextrocardia combined with acute large-artery occlusive stroke is extremely rare in clinical practice. We present here a 67-year-old woman with complete blockage in her left middle cerebral artery. The patient also had a mirror-image dextrocardia. In this report, we share our experience in treating the patient using mechanical thrombectomy. During her visit to the emergency department, we performed various tests to understand the patient's anatomy. Based on the findings, we decided to approach the femoral artery. Using a combination of stent thrombectomy and intermediate catheter aspiration, we successfully restored blood flow to the patient's left middle cerebral artery.

Keywords: Case report, dextrocardia, middle cerebral artery, mechanical thrombectomy.

INTRODUCTION

Mirror-image dextrocardia is a condition where the heart is essentially a mirror image of a normal heart. The position of the atrium, ventricle, and large blood vessels is a mirrored image of a normal heart, and the relationship between the heart and large artery is similar to that of the normal heart.[1] Mirror-image dextrocardia combined with acute large-artery occlusive stroke is extremely rare. We report a case of acute occlusion of the middle cerebral artery in a patient with mirror-image dextrocardia treated with mechanical thrombectomy.

CASE REPORT

This 67-year-old woman presented to our hospital on October 10, 2022, with a sudden onset impaired consciousness and vomiting of 1 hour. The patient's had past history of hypertension. Physical examination showed: pulse rate of 72 beats/min. blood pressure 179/106 mmHg, heart rate 85 beats/min with irregularly irregular arrhythmia. She has clear consciousness but with motor aphasia. The right limb muscle strength was grade 0; the right limb was hypotonic with right positive right Babinski sign. Her National Institutes of Health Stroke Scale (NIHSS) score on admission was 9 The relevant tests were conducted in the emergency department was cranial CT showed slight hypodensity in the left frontotemporal lobe and possible infarction. The Alberta Stroke Programme Early CT Score (ASPECTS) was 9. Chest CT imaging showed the presence of mirror-image dextrocardia (Figure 1a, Figure 1b). CT angiography (CTA) showed occlusion of the left middle cerebral artery and right-sided aortic arch (Figure 1c, Figure 1d). Electrocardiogram showed rapid atrial fibrillation with premature ventricular beats, consistent with mirror-image dextrocardia.

The patient diagnosed to have occlusion of the left middle cerebral artery with cerebral infarction; atrial fibrillation; hypertensive disease; and mirror-image dextrocardia. The patient's onset was within the time window of intravenous thrombolysis and she was treated with intravenous thrombolysis followed by mechanical thrombectomy. The

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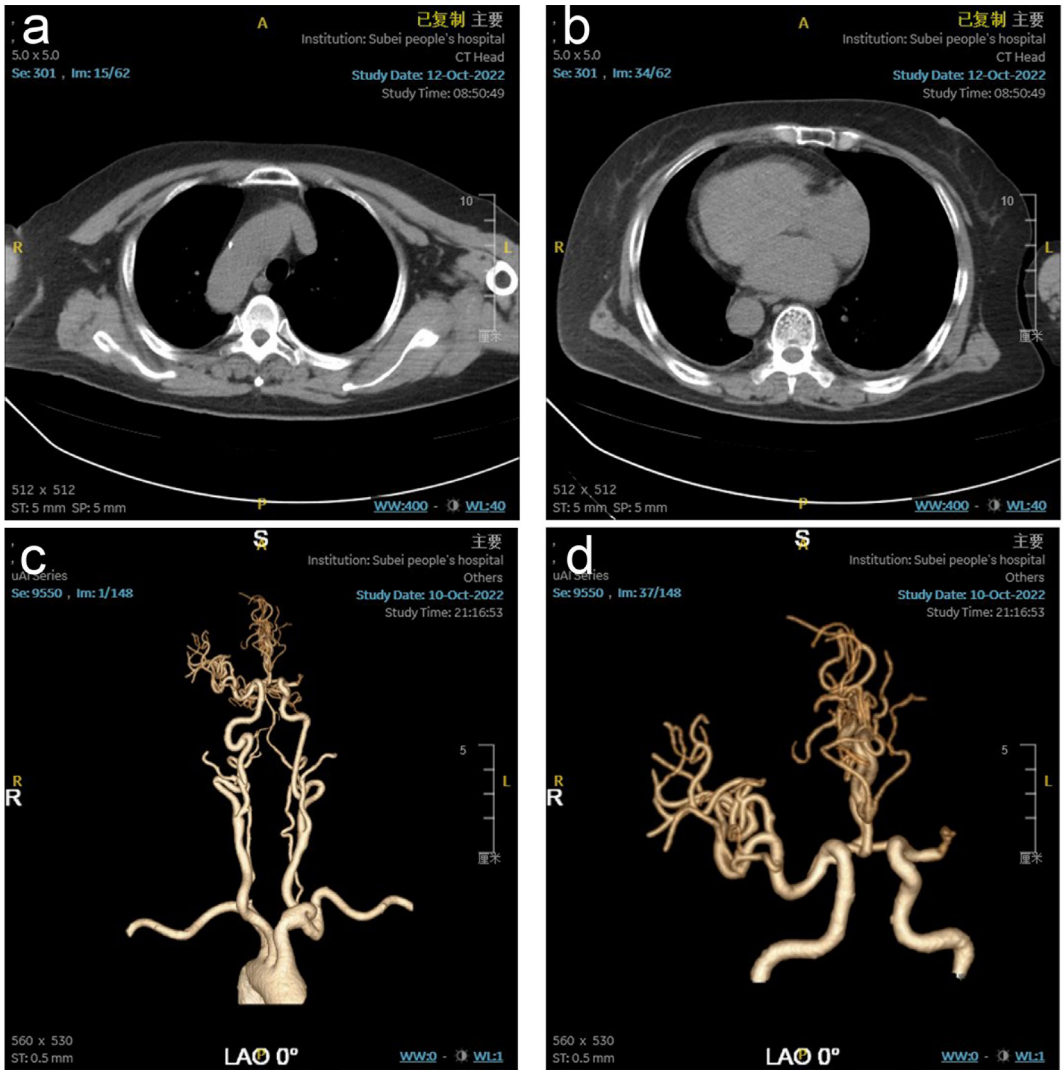

Figure 1. Relevant investigations were completed after admission: **a**. Chest CT imaging showing the right aortic arch. **b**. Chest CT imaging showing mirror image changes in the mediastinum with a bias to the right. **c**. Head and carotid CTA showing right aortic arch and left middle cerebral artery occlusion. **d**. Left middle cerebral artery occlusion.

emergency physician administered recombinant tissue plasminogen activator (rt-PA) 63 mg (0.9 mg/kg) For the thrombectomy, the coaxial technique was used to deliver an 8F guiding catheter to the distal distraction of the extracranial segment of the left internal carotid artery, and a 5 MAX ACE catheter was used to deliver the aspiration catheter to the cavernous sinus segment of the left internal carotid artery in cooperation with the microcatheter micro guide wire. The microcatheter was delivered to the M2 segment of the left middle cerebral artery, and a 4×20-mm RECON thrombectomy stent was used twice for the repeated removal of the embolus as well as the removal of a small embolus (mTICI grade 3). Postoperatively, the patient was given support for blood pressure control, ventricular rate control, and dehydration to lower the cranial pressure. The postoperative cranial CT imaging was repeated 24 hours after surgery, showing slight high-density shadows in the left lateral ventricle, basal ganglia, and temporal lobe, suggestive of contrast retention and infarction with hemorrhage. At 48 hours postoperatively, the high-density shadow on the cranial CT imaging was smaller, and the patient was thought to have post-infarction hemorrhagic transformation. At the 30-day postoperative follow-up, the NIHSS score was 6 (right upper limb muscle strength 4 points, right lower limb muscle strength 2 points), with

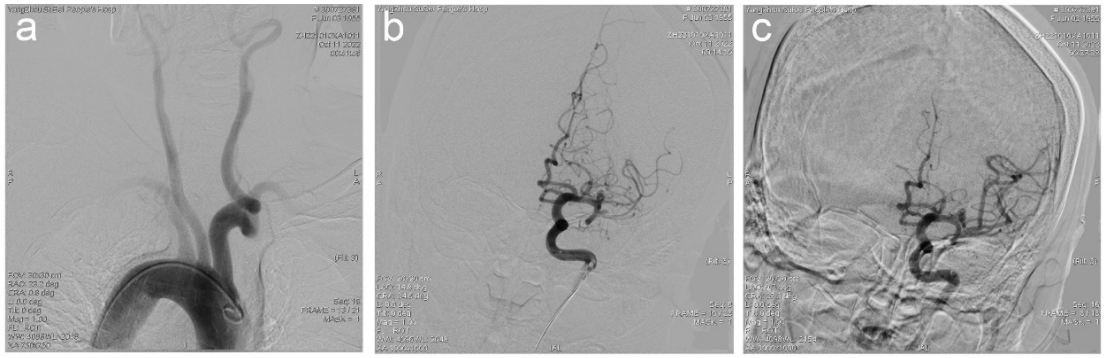

Figure 2. Cerebral angiography: **a.** Right aortic arch, **b.** Left middle cerebral artery occlusion, **c.** Repeat angiography shows restoration of blood flow in the left middle cerebral artery.

no hemorrhagic transformation on cranial MRI, and anticoagulation therapy with rivaroxaban was added.

DISCUSSION

Dextrocardia is a congenital heart malformation caused by the transposition of the heart during embryonic development. The condition is extremely rare and is usually divided into three types, namely, mirror-image dextrocardia, right-rotated heart, and right shift of the heart. The diagnosis can be determined rapidly by cardiac auscultation, electrocardiography, and chest CT imaging.[2,3] In this case, the electrocardiogram, chest CT imaging, and echocardiogram after admission were all consistent with the diagnosis of mirror-image dextrocardia. In addition, the electrocardiogram of the patient suggested ventricular rate rapid atrial fibrillation, and it has been reported that patients with right-sided hearts are more prone to arrhythmias, especially atrial fibrillation/atrial flutter, which is thought to be related to genetic factors and hemodynamic and circulatory load changes.[4-7] The cerebral infarct TOAST classification was thought to be cardiogenic embolic.

Our case is similar to Yoshie *et al*. but differs in that we employed bridging thrombolysis with mechanical thrombectomy, successfully carried out recanalization with stent thrombectomy combined with intermediate catheter aspiration, and used different interventional devices for mechanical thrombectomy.[8] In contrast, the case reported by Zhang *et al*. involved occlusion of a basilar artery of atherosclerotic type. They concluded that the right heart did not cause posterior circulation occlusion by affecting hemodynamics change.[9] In their case, stenting stent combined with balloon dilation was used to successfully re-open the vessel.

Mechanical thrombectomy is currently the preferred treatment option for large-artery occlusive stroke.[10] However, mechanical thrombectomy in these cases has not yet been standardized because of the rarity of patients with a right-sided heart combined with large-artery vascular occlusion stroke. Compared with the conventional mechanical thrombectomy technique, the aorta of a patient with a mirror-image dextrocardia is a mirror image of the normal left heart in the reverse position, so the optimal working angle and catheter operation during mechanical thrombectomy are different from those used in the conventional operation, making the procedure more difficult and requiring a higher level of operator skill.[8,11]

We learn from this case that: 1. In patients with acute middle cerebral artery occlusion combined with mirror-image dextrocardia, it is particularly important to complete the preliminary tests of computed tomography with CT angiography, chest CT scan, and electrocardiogram on admission. These tests can help to identify the anatomical structure of the patient as early as possible, facilitate the clinician in making quick judgments, and assist in assessing the difficulty of thrombectomy and establishing a path for subsequent treatment to shorten the recanalization time. 2. In this case, the right femoral artery puncture approach was chosen instead of the radial artery approach, mainly because the radial artery has a smaller diameter than the femoral artery, resulting in the radial artery puncture approach being limited to a 6F arterial sheath, which restricts some of the choices for thrombectomy instrumentation. Furthermore, in this patient with a mirror-image dextrocardia, the left common carotid artery and the aortic arch were at an acute angle, making it difficult to establish an embolization path. If the femoral

artery puncture route fails, it is recommended to consider switching from a femoral artery puncture to a radial artery puncture route or a direct puncture of the carotid artery. 3.The aortic arch of this case was in the reverse direction from that of ordinary patients, and the vessels were tortuous, which may result in failure of the extraction catheter to directly reach the occluded vessel due to anatomical variations. Therefore, it is recommended to use a stent thrombectomy combined with intermediate catheter aspiration to open the vessel, minimize the frequency of thrombectomy, and shorten the recanalization time.

In summary, mirror-image dextrocardia combined with acute large-artery occlusive stroke is very rare in clinical practice. The clinical intervention for these patients focuses on the early identification and diagnosis of the right-sided heart through relevant imaging examinations such as electrocardiogram and chest CT imaging after admission to the hospital, as well as the development of an individualized mechanical thrombectomy plan as soon as possible according to the special anatomical structure to shorten the recanalization time and thus improve the prognosis of these patients.

DISCLOSURE

Ethics: Consent for publication obtained from patient for publication.

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Conflict of interest: None

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