# Transient ischemic attack induced by pulmonary arteriovenous fistula:a case report

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Cerebral ischemic stroke is attributed to paradoxical cerebral embolism (PCE). pulmonary arteriovenous fistula (PAVF) is a potential rare cause of cerebral ischemic stroke. Transient ischemic attack (TIA) induced by PAVF in children is rare, lacking typical clinical manifestations, which can not be ignored.

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**Abstract**

Cerebral ischemic stroke is attributed to paradoxical cerebral embolism(PCE). pulmonary arteriovenous fistula(PAVF) is a potential rare cause of cerebral ischemic stroke. Transient ischemic attack(TIA) induced by PAVF in children is rare, lacking typical clinical manifestations, which can not be ignored.

**KEYWORDS**

pulmonary arteriovenous fistula, transient ischemic attack, paradoxical cerebral embolism, children

## 1 INTRODUCTION

Cases of cerebral ischemic stroke induced by PAVF were mostly reported in adults, which is attributed to paradoxical cerebral embolism (PCE).[1-5] PCE was caused by the transfer of emboli from venous to artery, or from right heart system to left heart system, because of the existence of congenital or acquired arteriovenous communication. PCE is mostly induced by patent foramen ovale (PFO),[6] while PAVF is a potential rare cause. This study reported a 13-year-old boy with TIA induced by PAVF, In order that enough attentions should be drawed to the rare cause of PCE, and the missed diagnosis rate should be reduced.

## 2 CASE DESCRIPTION

A 15-year-old boy presented with recurrent onset dizziness, blurred vision in both eyes and bilateral limbs weakness for 2 years. During the attack, he could not stand and fainted onto the ground, then recovered spontaneously about 5min later, no nausea, no vomiting, no tinnitus, no hearing loss, no convulsion, and no a history of epilepsia. There were a total of 3 times of attacks with each interval of 6 months to 1 year, and the latest attack was 1 month before admitted to hospital. He was admitted to our hospital on September 02, 2020. Physical examination showed no cardiorespiratory abnormalities. The subsequent chest x-ray showed a mass shadow in the right upper lung(Figure 1A). The cardiac color ultrasound showed no obvious abnormalities, and no patent foramen ovale was seen. Brain magnetic resonance imaging (MRI) and cerebral arteries magnetic resonance angiography (MRA) showed no obvious abnormalities. The contrast-enhanced transcranial doppler (c-TCD) revealed a positive result with a large right-to-left shunt. The cardiovascular CT angiography (CTA) showed the right upper pulmonary artery expanded with a diameter of 7.4mm, its branching vessels thickened and twisted into an abnormal vascular nest, then directly refluxed into the right upper pulmonary posterior vein, finaly merged into the right upper pulmonary vein(Figure 1B,1C, and1D). Blood routine test, blood gas analysis and coagulation test were normal. TIA induced by PAVF was considered. The patient underwent embolization therapy of PAVF under general anesthesia on the third day of hospitalization. Intraoperative angiography showed a PAVF originated from the right upper pulmonary branch artery (Figure 2A and 2B), which could not be revealed after embolization by a vascular plug (Figure 2C and 2D). At 1 year and 2 year postoperative follow-up, the patient remains clinical stable, no any symptom of dizziness, blurred vision or poor lower limbs movement.

## 3 DISCUSSION

At present, it is believed that the risk factors for cerebral ischemic stroke in patients with PAVF are: (1) feeding artery diameter $> 3$ mm; (2) existence of multiple PAVFs.[7] Whether patients with PAVF present with clinical manifestations depends on the right-to-left shunt quantity. There are intrapulmonary and extrapulmonary manifestations in patients with pulmonary arteriovenous fistula. The intrapulmonary manifestations are as follows: dyspnea after the activity, dizziness, easy to fatigue, etc.[8-10] Physical examination may reveal cyanosis, clubbing fingers(toes), and chest continous murmur, etc. Some patients may only present with abnormal arterial blood gas analysis.The extrapulmonary manifestations are as follows: migraine, TIA, ischemic stroke, brain abscess, epilepsy, etc. [8-10]

Espejo-Herrero et al [1] reported a patient with TIA presenting with a short-term (30 min) right limb paralysis, and subsequent pulmonary arteriography showing a PAVF. Pulmonary DSA is the gold standard for the diagnosis of PAVF, which can observe the fistula size, feeding artery, draining vein and other conditions.[8] However, DSA is an invasive examination. As a non-invasive examination, CTA can not only show the lesions (even the mild lesions) and the responsible blood vessels of PVAFs, but also accurately judge the peripheral and complex PVAFs, which is more suitable for the diagnosis of PAVF. [8] At present, c-TCD has been widely used for right-to-left shunt screening, which can dynamically observe the emboli entering into the intracranial arteries and the changes of cerebral blood flow in real time.[11,12] In our report of this case, c-TCD revealed a positive result with a big right-to-left shunt, which was in line with the diagnosis of PAVF.

Most of the PAVFs will gradually enlarge and rarely atrophy spontaneously, which may cause serious complications. The mortality rate of untreated patients with PAVF was as high as 50%, which can be reduced to 3% after treatment. At present, it is advocated that active treatments should be adopted for patients with symptomatic or asymptomatic PAVFs, if their lesions diameter exceed 3mm. The PAVF treatments mainly include surgery and interventional embolization, which can improve the symptoms of hypoxia and prevent the occurrence of central nervous system complications. [8,9] Todo et al[13] reported a patient with recurrent ischemic stroke induced by PAVF with a feeding artery diameter of 1.80 mm, who was successfully prevented from the recurrence of embolic events after embolic treatment. In our report, this case was treated with interventional embolization of PAVF in our hospital, and there was no recurrent seizure of TIA symptoms for 2 years, which further confirmed that the recurrent TIA symptoms were associated with PAVF.

In conclusion, although pulmonary arteriovenous fistula is a rare cause of abnormal embolism, it can not be ignored as the main extracardiac shunt pathway. Most patients with PAVF have atypical clinical presenta-

tions, and even present with cerebral ischemic stroke or TIA as the only clinical symptom. Therefore, for the patients with cryptogenic stroke , especially for the children with cryptogenic stroke, the corresponding examinations should be conducted to judge whether they may suffer from PAVF, then active treatments and follow-up should be offered.

## CONFLICT OF INTEREST

There are no conflicts of interest to declare.

## DATA AVAILABILITY STATEMENT

None.

## ETHICAL APPROVAL

None.

## CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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