

# World Journal of *Clinical Cases*

*World J Clin Cases* 2023 March 26; 11(9): 1888-2122



## Contents

Thrice Monthly Volume 11 Number 9 March 26, 2023

## REVIEW

- 1888 Endoscopic transluminal drainage and necrosectomy for infected necrotizing pancreatitis: Progress and challenges

Zeng Y, Yang J, Zhang JW

## MINIREVIEWS

- 1903 Functional role of frontal electroencephalogram alpha asymmetry in the resting state in patients with depression: A review

Xie YH, Zhang YM, Fan FF, Song XY, Liu L

- 1918 COVID-19 related liver injuries in pregnancy

Sekulovski M, Bogdanova-Petrova S, Peshevska-Sekulovska M, Velikova T, Georgiev T

- 1930 Examined lymph node count for gastric cancer patients after curative surgery

Zeng Y, Chen LC, Ye ZS, Deng JY

- 1939 Laparoscopic common bile duct exploration to treat choledocholithiasis in situs inversus patients: A technical review

Chiu BY, Chuang SH, Chuang SC, Kuo KK

- 1951 Airway ultrasound for patients anticipated to have a difficult airway: Perspective for personalized medicine

Nakazawa H, Uzawa K, Tokumine J, Lefor AK, Motoyasu A, Yorozu T

## ORIGINAL ARTICLE

## Observational Study

- 1963 Clinicopathological features and expression of regulatory mechanism of the Wnt signaling pathway in colorectal sessile serrated adenomas/polyps with different syndrome types

Qiao D, Liu XY, Zheng L, Zhang YL, Que RY, Ge BJ, Cao HY, Dai YC

## Randomized Controlled Trial

- 1974 Effects of individual shock wave therapy vs celecoxib on hip pain caused by femoral head necrosis

Zhu JY, Yan J, Xiao J, Jia HG, Liang HJ, Xing GY

## CASE REPORT

- 1985 Very low calorie ketogenic diet and common rheumatic disorders: A case report

Rondanelli M, Patelli Z, Gasparri C, Mansueto F, Ferraris C, Nichetti M, Alalwan TA, Sajoux I, Maugeri R, Perna S

- 1992 Delayed versus immediate intervention of ruptured brain arteriovenous malformations: A case report

Bintang AK, Bahar A, Akbar M, Soraya GV, Gunawan A, Hammado N, Rachman ME, Ulhaq ZS

- 2002** Children with infectious pneumonia caused by *Ralstonia insidiosa*: A case report  
*Lin SZ, Qian MJ, Wang YW, Chen QD, Wang WQ, Li JY, Yang RT, Wang XY, Mu CY, Jiang K*
- 2009** Transient ischemic attack induced by pulmonary arteriovenous fistula in a child: A case report  
*Zheng J, Wu QY, Zeng X, Zhang DF*
- 2015** Motor cortex transcranial magnetic stimulation to reduce intractable postherpetic neuralgia with poor response to other therapies: Report of two cases  
*Wang H, Hu YZ, Che XW, Yu L*
- 2021** Small bowel adenocarcinoma in neoterminal ileum in setting of stricturing Crohn's disease: A case report and review of literature  
*Karthikeyan S, Shen J, Keyashian K, Gubatan J*
- 2029** Novel combined endoscopic and laparoscopic surgery for advanced T2 gastric cancer: Two case reports  
*Dai JH, Qian F, Chen L, Xu SL, Feng XF, Wu HB, Chen Y, Peng ZH, Yu PW, Peng GY*
- 2036** Acromicric dysplasia caused by a mutation of fibrillin 1 in a family: A case report  
*Shen R, Feng JH, Yang SP*
- 2043** Ultrasound-guided intra-articular corticosteroid injection in a patient with manubriosternal joint involvement of ankylosing spondylitis: A case report  
*Choi MH, Yoon IY, Kim WJ*
- 2051** Granulomatous prostatitis after bacille Calmette-Guérin instillation resembles prostate carcinoma: A case report and review of the literature  
*Yao Y, Ji JJ, Wang HY, Sun LJ, Zhang GM*
- 2060** Unusual capitate fracture with dorsal shearing pattern and concomitant carpometacarpal dislocation with a 6-year follow-up: A case report  
*Lai CC, Fang HW, Chang CH, Pao JL, Chang CC, Chen YJ*
- 2067** Live births from *in vitro* fertilization-embryo transfer following the administration of gonadotropin-releasing hormone agonist without gonadotropins: Two case reports  
*Li M, Su P, Zhou LM*
- 2074** Spontaneous conus infarction with "snake-eye appearance" on magnetic resonance imaging: A case report and literature review  
*Zhang QY, Xu LY, Wang ML, Cao H, Ji XF*
- 2084** Transseptal approach for catheter ablation of left-sided accessory pathways in children with Marfan syndrome: A case report  
*Dong ZY, Shao W, Yuan Y, Lin L, Yu X, Cui L, Zhen Z, Gao L*
- 2091** Occipital artery bypass importance in unsuitable superficial temporal artery: Two case reports  
*Hong JH, Jung SC, Ryu HS, Kim TS, Joo SP*

- 2098** Anesthetic management of a patient with preoperative R-on-T phenomenon undergoing laparoscopic-assisted sigmoid colon resection: A case report  
*Li XX, Yao YF, Tan HY*
- 2104** Pembrolizumab combined with axitinib in the treatment of skin metastasis of renal clear cell carcinoma to nasal ala: A case report  
*Dong S, Xu YC, Zhang YC, Xia JX, Mou Y*
- 2110** Successful treatment of a rare subcutaneous emphysema after a blow-out fracture surgery using needle aspiration: A case report  
*Nam HJ, Wee SY*

**LETTER TO THE EDITOR**

- 2116** Are biopsies during endoscopic ultrasonography necessary for a suspected esophageal leiomyoma? Is laparoscopy always feasible?  
*Beji H, Chtourou MF, Zribi S, Kallel Y, Bouassida M, Touinsi H*
- 2119** Vaginal microbes confounders and implications on women's health  
*Nori W, H-Hameed B*

**ABOUT COVER**

Editorial Board Member of *World Journal of Clinical Cases*, Marilia Carabotti, MD, PhD, Academic Research, Medical-Surgical Department of Clinical Sciences and Translational Medicine, University Sapienza Rome, Rome 00189, Italy. mariliacarabotti@gmail.com

**AIMS AND SCOPE**

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

**INDEXING/ABSTRACTING**

The WJCC is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Journal Citation Reports/Science Edition, Current Contents®/Clinical Medicine, PubMed, PubMed Central, Scopus, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2022 Edition of Journal Citation Reports® cites the 2021 impact factor (IF) for WJCC as 1.534; IF without journal self cites: 1.491; 5-year IF: 1.599; Journal Citation Indicator: 0.28; Ranking: 135 among 172 journals in medicine, general and internal; and Quartile category: Q4. The WJCC's CiteScore for 2021 is 1.2 and Scopus CiteScore rank 2021: General Medicine is 443/826.

**RESPONSIBLE EDITORS FOR THIS ISSUE**

Production Editor: *Ying-Yi Yuan*; Production Department Director: *Xiang Li*; Editorial Office Director: *Jin-Lei Wang*.

**NAME OF JOURNAL**

*World Journal of Clinical Cases*

**ISSN**

ISSN 2307-8960 (online)

**LAUNCH DATE**

April 16, 2013

**FREQUENCY**

Thrice Monthly

**EDITORS-IN-CHIEF**

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

**EDITORIAL BOARD MEMBERS**

<https://www.wjnet.com/2307-8960/editorialboard.htm>

**PUBLICATION DATE**

March 26, 2023

**COPYRIGHT**

© 2023 Baishideng Publishing Group Inc

**INSTRUCTIONS TO AUTHORS**

<https://www.wjnet.com/bpg/gerinfo/204>

**GUIDELINES FOR ETHICS DOCUMENTS**

<https://www.wjnet.com/bpg/GerInfo/287>

**GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH**

<https://www.wjnet.com/bpg/gerinfo/240>

**PUBLICATION ETHICS**

<https://www.wjnet.com/bpg/GerInfo/288>

**PUBLICATION MISCONDUCT**

<https://www.wjnet.com/bpg/gerinfo/208>

**ARTICLE PROCESSING CHARGE**

<https://www.wjnet.com/bpg/gerinfo/242>

**STEPS FOR SUBMITTING MANUSCRIPTS**

<https://www.wjnet.com/bpg/GerInfo/239>

**ONLINE SUBMISSION**

<https://www.f6publishing.com>

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

Jun Zheng, Qi-Yue Wu, Xia Zeng, Du-Fei Zhang

**Specialty type:** Medicine, research and experimental

**Provenance and peer review:** Unsolicited article; Externally peer reviewed.

**Peer-review model:** Single blind

**Peer-review report's scientific quality classification**

Grade A (Excellent): 0  
Grade B (Very good): B, B  
Grade C (Good): 0  
Grade D (Fair): 0  
Grade E (Poor): 0

**P-Reviewer:** Khouzam RN, United States; Suwanto D, Indonesia

**Received:** November 12, 2022

**Peer-review started:** November 12, 2022

**First decision:** January 30, 2023

**Revised:** February 1, 2023

**Accepted:** March 3, 2023

**Article in press:** March 3, 2023

**Published online:** March 26, 2023



**Jun Zheng, Qi-Yue Wu, Xia Zeng, Du-Fei Zhang,** Department of Pediatrics, Hainan Women and Children's Medical Center, Haikou 570000, Hainan Province, China

**Corresponding author:** Du-Fei Zhang, MBBS, Chief Physician, Director, Department of Pediatrics, Hainan Women and Children's Medical Center, No. 17 Changbin Road, Xiuying District, Haikou 570000, Hainan Province, China. [freezdfei@163.com](mailto:freezdfei@163.com)

## Abstract

### BACKGROUND

Cerebral ischemic stroke is attributed to paradoxical cerebral embolism. Pulmonary arteriovenous fistula (PAVF) is a rare potential cause of cerebral ischemic stroke, and cerebral ischemic stroke induced by PAVF in children is rare.

### CASE SUMMARY

We report a case of right PAVF that presented as a transient ischemic attack (TIA) in a 13-year-old boy. The patient underwent embolization therapy and remained clinically stable for 2 years after treatment.

### CONCLUSION

TIA induced by PAVF in children is rare, lacks typical clinical manifestations, and should not be ignored.

**Key Words:** Pulmonary arteriovenous fistula; Transient ischemic attack; Paradoxical cerebral embolism; Children; Case report

©The Author(s) 2023. Published by Baishideng Publishing Group Inc. All rights reserved.

**Core Tip:** Pulmonary arteriovenous fistula (PAVF) is a rare potential cause of cerebral ischemic stroke. Children with PAVF have atypical clinical presentations, and even present with cerebral ischemic stroke or transient ischemic attack as the only clinical finding. If a PAVF is suspected, we recommend that appropriate examinations should be performed for early detection, and then active treatment and follow-up should be offered.

**Citation:** Zheng J, Wu QY, Zeng X, Zhang DF. Transient ischemic attack induced by pulmonary arteriovenous fistula in a child: A case report. *World J Clin Cases* 2023; 11(9): 2009-2014

**URL:** <https://www.wjgnet.com/2307-8960/full/v11/i9/2009.htm>

**DOI:** <https://dx.doi.org/10.12998/wjcc.v11.i9.2009>

## INTRODUCTION

Cases of cerebral ischemic stroke induced by pulmonary arteriovenous fistula (PAVF) are mostly reported in adults, and are largely attributed to paradoxical cerebral embolism (PCE)[1-5]. Due to congenital or acquired arteriovenous communications, PCE can be caused by emboli transferring from a vein to an artery, or transferring from the right heart system to the left heart system. PCE is most commonly induced *via* a patent foramen ovale (PFO)[6], and PAVF is a rare potential cause. Cerebral ischemic stroke induced by PAVF in children is rare. We report the case of a 13-year-old boy with a transient ischemic attack (TIA) induced *via* PAVF. We aim to bring attention to this rare cause of PCE with the goal of decreasing the rate of missed diagnosis.

## CASE PRESENTATION

### Chief complaints

A 13-year-old boy was admitted to our hospital on September 2, 2020 due to intermittent dizziness for 2 d.

### History of present illness

The patient presented with intermittent dizziness and bilateral limb weakness for 2 d. During the attack, he fainted and then recovered spontaneously approximately 5 min later. He had no dyspnea, nausea, vomiting, tinnitus, hearing loss, or convulsions.

### History of past illness

The patient had a no previous medical history.

### Personal and family history

The patient had no relevant personal or family history.

### Physical examination

Physical examination showed no neurological or cardiorespiratory abnormalities. His vital signs were stable.

### Laboratory examinations

The results of laboratory examinations were normal.

### Imaging examinations

Subsequent chest x-ray showed a mass shadow in the right upper lung (Figure 1). Cardiac color ultrasound showed no obvious abnormalities and no PFO was seen. Cardiovascular computed tomography (CT) angiography (CTA) showed that the right upper pulmonary artery (diameter 7.4 mm) had expanded. Its branching vessels were thickened and twisted into an abnormal vascular nest with direct reflux into the right upper pulmonary posterior vein, and the artery finally merged into the right upper pulmonary vein (Figure 2). Brain magnetic resonance imaging and cerebral artery magnetic resonance angiography showed no obvious abnormalities (Figure 3). Contrast-enhanced transcranial Doppler (c-TCD) ultrasound was remarkable for a large right-to-left shunt (RLS) (Figure 4).

## FINAL DIAGNOSIS

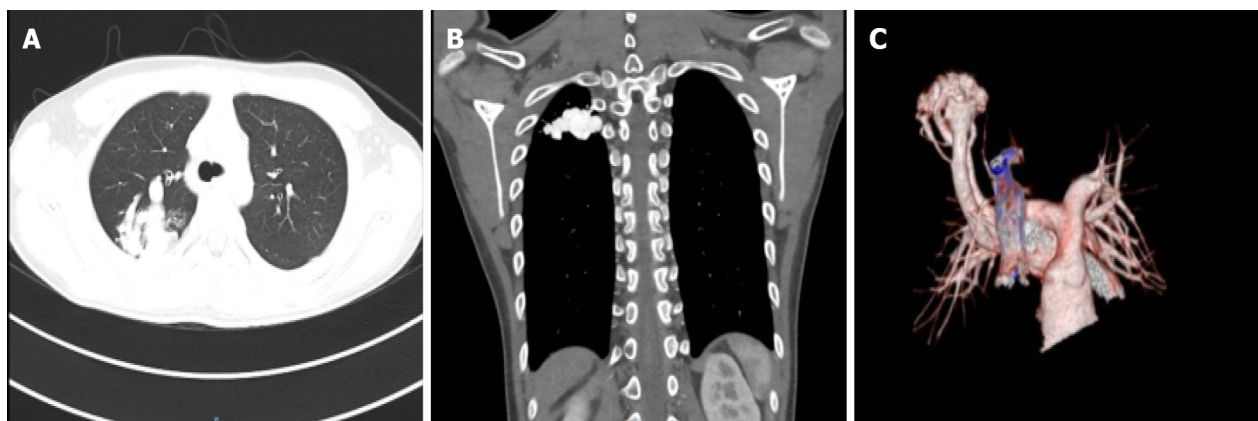
The patient was diagnosed with TIA and PAVF. TIA induced *via* PAVF was considered.





DOI: 10.12998/wjcc.v11.i9.2009 Copyright ©The Author(s) 2023.

**Figure 1 Chest x-ray.** A mass shadow in the right upper lung (red arrow).



DOI: 10.12998/wjcc.v11.i9.2009 Copyright ©The Author(s) 2023.

**Figure 2 Cardiovascular computed tomography angiography.** A and B: Representative images showing the abnormal vascular nest in the right upper lung; C: Expansion of the right upper pulmonary artery with thickened and twisted branching vessels to form an abnormal vascular nest with direct reflux into the right upper pulmonary posterior vein. The artery finally merged into the right upper pulmonary vein.

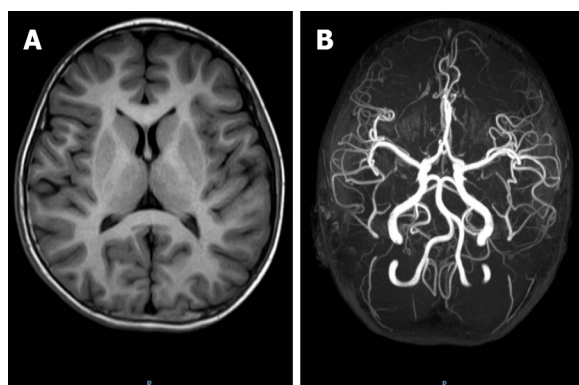
## TREATMENT

The patient underwent embolization therapy of the PAVF under general anesthesia on the day 3 of hospitalization. Intraoperative angiography showed that the PAVF originated from the right upper pulmonary branch artery (Figure 5A and B), which was no longer detected after embolization with a vascular plug (Figure 5C and D).

## OUTCOME AND FOLLOW-UP

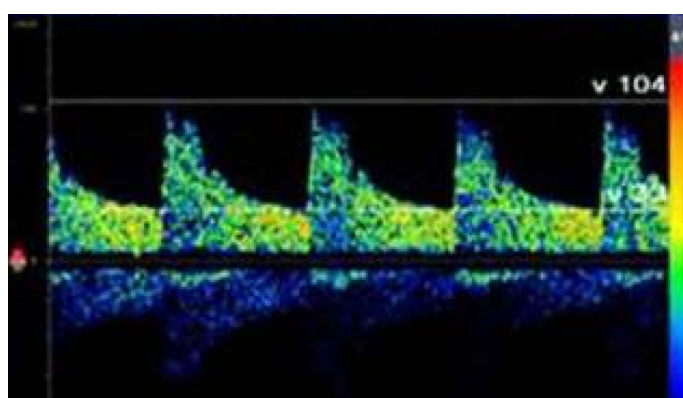
At the 10 mo postoperative follow-up, a chest x-ray showed that the position of the vascular plug was stable (Figure 6A), and a CT scan showed that the PAVF had markedly shrunk (Figure 6B). At the 1 year and 2 years postoperative follow-up points, the patient remained clinically stable without symptoms of dizziness, limb weakness, or fainting.





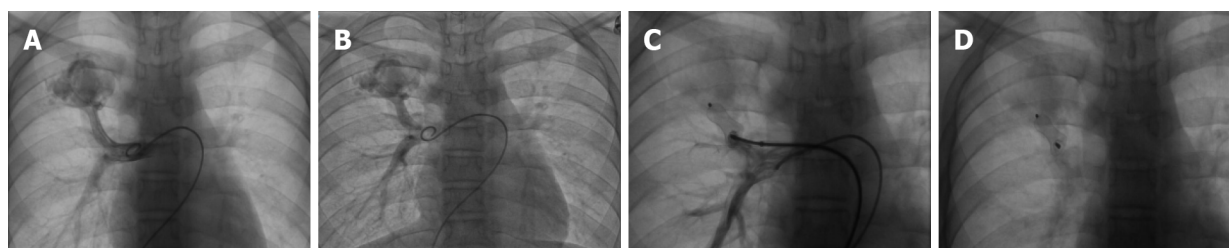
DOI: 10.12998/wjcc.v11.i9.2009 Copyright ©The Author(s) 2023.

**Figure 3 Brain magnetic resonance imaging and cerebral magnetic resonance angiography.** A: Magnetic resonance imaging showed no obvious abnormalities; B: Magnetic resonance angiography showed no obvious abnormalities.



DOI: 10.12998/wjcc.v11.i9.2009 Copyright ©The Author(s) 2023.

**Figure 4 Contrast-enhanced transcranial Doppler ultrasound.** Significant embolus signals appeared in the middle cerebral artery within 10 s after Valsalva maneuver.

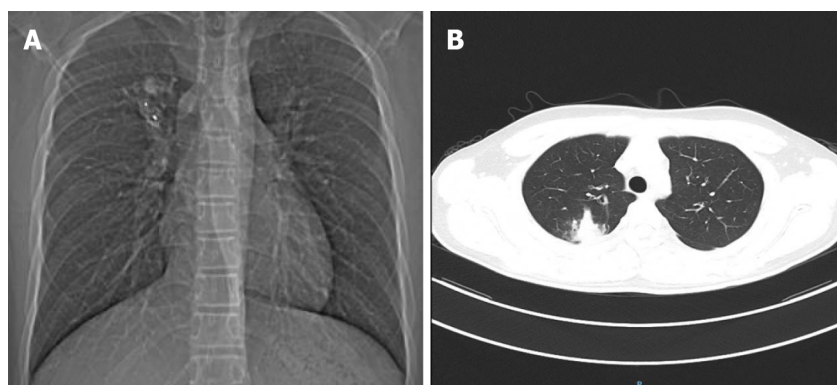


DOI: 10.12998/wjcc.v11.i9.2009 Copyright ©The Author(s) 2023.

**Figure 5 Angiography and embolization treatment.** A and B: Representative angiography images showing a pulmonary arteriovenous fistula (PAVF) originating from the right upper pulmonary branch artery; C and D: Representative images showing the PAVF was no longer detected after embolization with a vascular plug.

## DISCUSSION

The presence of a RLS, which can result in paradoxical brain embolism, is an important etiology of ischemic stroke especially in young adults. PFO and PAVF are the most important causes of RLS. TCD ultrasound is currently reported to be a noninvasive and useful method for detecting RLS. The gold standard for detecting RLS is contrast-enhanced transesophageal echocardiography. It is recommended that these examinations be carried out immediately after onset of stroke[7]. A previous report showed that the prevalence of PAVF is 0.026% [8], and TIA is a clinical manifestation of PAVF in up to 20% of cases [1]. At present, it is believed that the risk factors for cerebral ischemic stroke in patients with PAVF are as follows: (1) Feeding artery diameter > 3 mm; and (2) existence of multiple PAV malformations [9]. Whether patients with PAVF present with clinical manifestations depends on the level of the RLS. There



DOI: 10.12998/wjcc.v11.i9.2009 Copyright ©The Author(s) 2023.

**Figure 6 Postoperative follow-up imaging.** A: Chest x-ray showed that the position of the vascular plug was stable; B: Computed tomography showed that the pulmonary arteriovenous fistula markedly shrank after embolization therapy.

are intrapulmonary and extrapulmonary manifestations in patients with PAVF. The intrapulmonary manifestations include dyspnea after activity, dizziness, easy fatigability, and others[10-12]. Physical examination may reveal cyanosis, clubbing of fingers or toes, or continuous chest murmur. Some patients may only present with abnormal arterial blood gas analysis. The extrapulmonary manifestations include migraine, TIA, ischemic stroke, brain abscess, epilepsy, and others[10-12].

Espejo-Herrero *et al*[1] reported a patient with TIA presenting with a short-term (30 min) right limb paralysis, with subsequent pulmonary arteriography showing a PAVF. Pulmonary digital subtraction angiography (DSA) is the gold standard for the diagnosis of PAVF, which can determine fistula size, feeding artery, draining vein, and other conditions[10]. However, DSA is an invasive examination. As a noninvasive procedure, CTA can not only show the lesions (even mild lesions) and the blood vessels involved in PAVF, but can also accurately judge peripheral and complex PAVF anatomy, which is more helpful in diagnosis[10]. At present, c-TCD is widely used for RLS screening, which can observe the dynamics of emboli entering the intracranial arteries and the changes of cerebral blood flow in real time [13]. In our case, c-TCD ultrasound revealed a large RLS, which was in line with the diagnosis of PAVF.

Most PAVFs will gradually enlarge and rarely shrink spontaneously, which may cause serious complications. The mortality rate in untreated patients with PAVF is as high as 50%, which can be reduced to 3% after treatment. It is currently recommended that active treatment should be pursued in patients with symptomatic or asymptomatic PAVF if the lesion diameter exceeds 3 mm. PAVF treatments mainly include surgery and interventional embolization, both of which can improve the symptoms of hypoxia and prevent the occurrence of central nervous system complications[10,11]. Todo *et al*[14] reported a patient with recurrent ischemic stroke caused by PAVF with a feeding artery diameter of 1.80 mm, and embolic events were successfully prevented after fistula embolization. Our patient was treated with interventional embolization of PAVF in our hospital. The patient had no recurrent seizure or TIA symptoms for 2 years, further suggesting that recurrent TIA symptoms are indeed associated with PAVF.

## CONCLUSION

Although PAVF is a rare cause of abnormal embolism, it should not be ignored. Most patients with PAVF have atypical clinical presentations, and can even present with cerebral ischemic stroke or TIA as the only clinical finding. Therefore, in patients with cryptogenic stroke, especially children, appropriate examinations should be performed to determine whether a PAVF may be present. If a PAVF is discovered, active treatment and follow-up should be pursued.

## FOOTNOTES

**Author contributions:** Zheng J and Zhang DF drafted the manuscript; Wu QY and Zeng X collected the clinical data; Zheng J and Zhang DF revised the manuscript for intellectual content; All authors read and approved the final manuscript.

**Supported by** Scientific Research Project of Hainan Provincial Health Industry, China, No. 20A200081; and Clinical Medical Center Project of Hainan Province, China, No. QWYH202175.

**Informed consent statement:** Written informed consent was obtained from the patient for publication of this case

report.

**Conflict-of-interest statement:** All the authors report having no relevant conflicts of interest for this article.

**CARE Checklist (2016) statement:** The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

**Open-Access:** This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

**Country/Territory of origin:** China

**ORCID number:** Du-Fei Zhang [0000-0003-4611-1825](https://orcid.org/0000-0003-4611-1825).

**S-Editor:** Fan JR

**L-Editor:** Filipodia

**P-Editor:** Fan JR

## REFERENCES

- 1 **Espejo-Herrero JJ**, Bravo-Rodríguez F, Triviño-Tarradas F, Ysamat-Marfá R, Zurera-Tendero LJ, Canis-López M. [Transient ischemic attack as the presenting symptom of a pulmonary arteriovenous fistula]. *Rev Neurol* 2005; **40**: 163-165 [PMID: [15750902](#)]
- 2 **Roshanali F**, Mandegar MH, Oraii S. Traumatic pulmonary arteriovenous fistula may be misdiagnosed with residual shunt after patent foramen ovale closure. *BMJ Case Rep* 2012; **2012** [PMID: [23001101](#) DOI: [10.1136/bcr-2012-006802](#)]
- 3 **Wozniak L**, Mielczarek M, Sabiniewicz R. Paradoxical brain embolism in a young man: is it only a patent foramen ovale? *Neurol Neurochir Pol* 2015; **49**: 61-64 [PMID: [25666776](#) DOI: [10.1016/j.pjnns.2014.12.003](#)]
- 4 **Tomelleri G**, Bovi P, Carletti M, Mazzucco S, Bazzoli E, Casilli F, Onorato E, Moretto G. Paradoxical brain embolism in a young man with isolated pulmonary arteriovenous fistula. *Neurol Sci* 2008; **29**: 169-171 [PMID: [18612765](#) DOI: [10.1007/s10072-008-0930-5](#)]
- 5 **Cortes M**, Mayeda GS, Liu MW. Recurrent minor strokes/TIA with a right to left shunt. *BMJ Case Rep* 2018; **2018** [PMID: [29991544](#) DOI: [10.1136/bcr-2018-224862](#)]
- 6 **Vindiš D**, Hutrya M, Šaňák D, Král M, Čecháková E, Littnerová S, Adam T, Přechek J, Hudec Š, Ječmenová M, Táborský M. Patent Foramen Ovale and the Risk of Cerebral Infarcts in Acute Pulmonary Embolism-A Prospective Observational Study. *J Stroke Cerebrovasc Dis* 2018; **27**: 357-364 [PMID: [29031497](#) DOI: [10.1016/j.jstrokecerebrovasdis.2017.09.004](#)]
- 7 **Matsuoka H**. [Paradoxical brain embolism]. *Rinsho Shinkeigaku* 2005; **45**: 849-851 [PMID: [16447743](#)]
- 8 **Ma X**, Li LL, Yu D, Jie B, Jiang S. Management of pulmonary arteriovenous malformations involves additional factors aside from the diameter of feeding arteries: a 3-year case-case retrospective analysis. *Respir Res* 2022; **23**: 107 [PMID: [35501913](#) DOI: [10.1186/s12931-022-02030-9](#)]
- 9 **Holzer RJ**, Cua CL. Pulmonary Arteriovenous Malformations and Risk of Stroke. *Cardiol Clin* 2016; **34**: 241-246 [PMID: [27150172](#) DOI: [10.1016/j.ccl.2016.01.001](#)]
- 10 **Tellapuri S**, Park HS, Kalva SP. Pulmonary arteriovenous malformations. *Int J Cardiovasc Imaging* 2019; **35**: 1421-1428 [PMID: [30386957](#) DOI: [10.1007/s10554-018-1479-x](#)]
- 11 **Majumdar S**, McWilliams JP. Approach to Pulmonary Arteriovenous Malformations: A Comprehensive Update. *J Clin Med* 2020; **9** [PMID: [32575535](#) DOI: [10.3390/jcm9061927](#)]
- 12 **Kramdhari H**, Valakkada J, Ayyappan A. Diagnosis and endovascular management of pulmonary arteriovenous malformations. *Br J Radiol* 2021; **94**: 20200695 [PMID: [34038182](#) DOI: [10.1259/bjr.20200695](#)]
- 13 **Wessler BS**, Kent DM, Thaler DE, Ruthazer R, Lutz JS, Serena J. The RoPE Score and Right-to-Left Shunt Severity by Transcranial Doppler in the CODICIA Study. *Cerebrovasc Dis* 2015; **40**: 52-58 [PMID: [26184495](#) DOI: [10.1159/000430998](#)]
- 14 **Todo K**, Moriwaki H, Higashi M, Kimura K, Naritomi H. A small pulmonary arteriovenous malformation as a cause of recurrent brain embolism. *AJNR Am J Neuroradiol* 2004; **25**: 428-430 [PMID: [15037468](#)]



Published by **Baishideng Publishing Group Inc**  
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

**Telephone:** +1-925-3991568

**E-mail:** [bpgoffice@wjgnet.com](mailto:bpgoffice@wjgnet.com)

**Help Desk:** <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

