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Case report

Paradoxical brain embolism in a young man: Is it only a patent foramen ovale?

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ABSTRACT

Paradoxical embolism is considered the major cause of cerebral ischemic events in young patients. The most common cause of paradoxical embolism, which has been widely described, is right-to-left shunting (RLS) at cardiac level through a patent foramen ovale (PFO). Rarely paradoxical embolism can also be caused by RLS at pulmonary level due to pulmonary arteriovenous fistula (PAVF). Herein, we present a case of a young man, who experienced transient ischemic attack (TIA) due to paradoxical embolism, in whom both abovementioned abnormalities coexisted. This coincidence is very rare (noted in only 1% of patients with cryptogenic stroke or TIA), but it highlights the importance of searching for extracardiac RLS in patients with cryptogenic stroke, even if a PFO has been detected.

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1. Introduction

The incidence of ischemic stroke is strongly correlated with increasing age. Consequently stroke in children and young adults is a relatively rare condition and the etiology and risk factors are different from those of older patients. Paradoxical embolism associated with intracardiac shunting through a patent foramen ovale (PFO) is considered the major cause of cerebral ischemic events in young patients. An often unrecognized cause of paradoxical embolism is intrapulmonary right-to-left shunting through a pulmonary arteriovenous fistula (PAVF).

Herein, we present a case of a young man, who experienced transient ischemic attack (TIA) due to paradoxical embolism,

in whom both abovementioned abnormalities coexisted. This coincidence is very rare (noted in only 1% of patients with cryptogenic stroke or TIA), but it highlights the importance of searching for extracardiac RLS in patients with cryptogenic stroke, even if a PFO has been detected.

2. Case report

A 15-year-old man, with no previous medical history, experienced two episodes of transient ischemic attacks (TIA) within a year, which manifested in sudden dysarthria and paresis of the right upper and lower limb. He was admitted to the Department of Neurology where his general and neurological examination was normal. Brain magnetic resonance imaging (MRI) revealed

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multifocal cerebral infarctions. There was no history of atherosclerosis risk factors such as smoking, diabetes or hyperlipidemia and family history was unremarkable. His complete coagulation work-up (including Protein S and C levels, anticardiolipin antibodies, antithrombin, Factor V Leiden, Prothrombin gene mutation) and carotid ultrasound did not reveal any abnormalities. Therefore, paradoxical embolism was suspected. Doppler ultrasound did not reveal any potential source of embolism in deep veins of the lower limbs as well as in the iliac veins. However, transcranial Doppler (TCD) showed right-to-left shunting after saline contrast infusion. The patient was referred to the Department of Cardiology. On admission, he had normal physical examination, the oxygen saturation measured by pulse oximeter was 97%. Holter ecg monitoring did not reveal any arrhythmia. Transesophageal echocardiogram (TEE) showed a small shunt from the left to the right atrium across the PFO and right-to-left shunting (RLS) with microbubbles after saline contrast infusion and Valsalva maneuver. The patient was qualified for a transcatheter closure of the patent foramen ovale (PFO). A chest radiography performed prior to the procedure demonstrated a round shadow measuring 21 mm × 25 mm, located in the upper part of the left lung (Fig. 1). Contrast enhanced chest computed tomography (CT) showed a polycyclic mass of uniform density, measuring 20 mm × 14 mm and surrounded by feeding vessels located in the central part of the upper lobe of the left lung. The image suggested vascular malformation. There was no thrombus within the PAVF and no evidence of pulmonary embolism. Under general anesthesia we performed a selective left pulmonary arterial angiography, which revealed an arteriovenous fistula in the upper lobe of left lung (Fig. 2). The diameter of the vessel supplying the malformation was 7 mm. Occlusion of the malformation was performed successfully by embolization using Amplatzer Vascular Plug 10 mm device (Fig. 3). At the same time PFO closure was performed with Occlutech Figulla

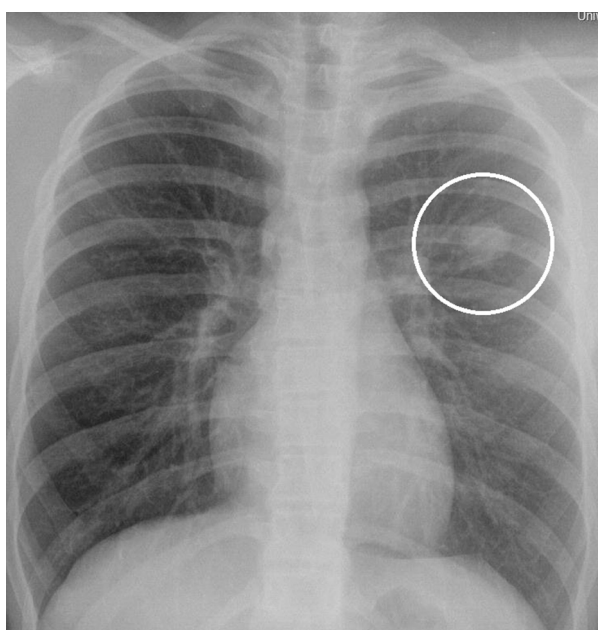


Fig. 1 – Posteroanterior chest radiograph showing a single PAVF in the upper part of the left lung (white circle).

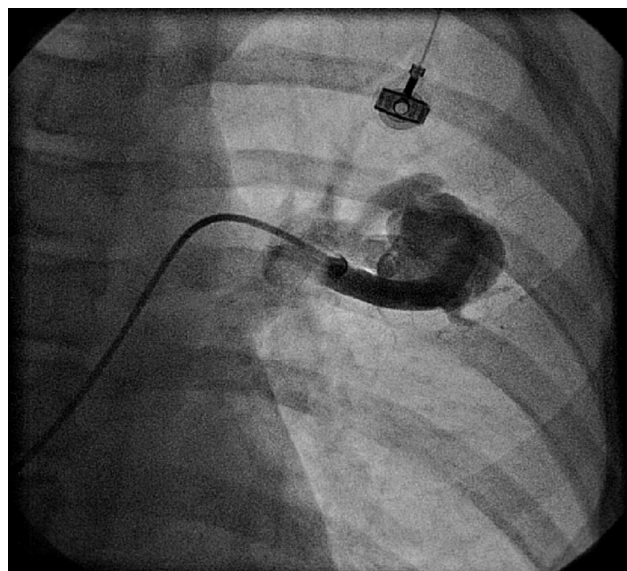


Fig. 2 – Angiogram showing a single PAVF in the upper lobe of the right lung.

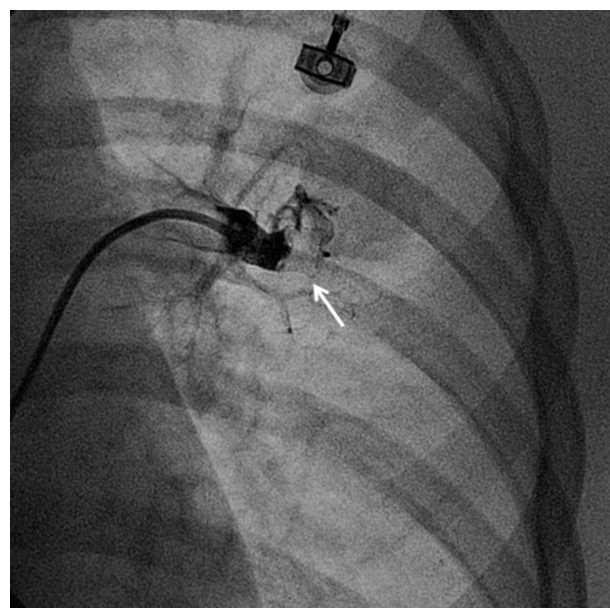


Fig. 3 – Angiogram showing complete occlusion of PAVF with 10 mm Amplatzer Vascular Plug device (arrow).

Flex II 23/25 mm device (Fig. 4). The patient was discharged two days later. There was no recurrence of TIA noted at the 6 months follow-up and there are no signs of right-to-left shunting in contrast TCD.

3. Discussion

The most common cause of paradoxical embolism is widely described right-to-left shunting (RLS) at cardiac level through a patent foramen ovale (PFO). Our case emphasizes the fact that other RLS could exist simultaneously and be responsible for

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