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# Paradoxical emboli as a rare cause of myocardial infarction: treatment and prophylaxis

Zator skrzyżowany jako rzadka przyczyna zawału serca – leczenie i profilaktyka

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#### Abstract

We present the case of 58-year-old male patient hospitalized due to stenocardial pain (CCS Class IV). Cardiac markers and ECG met the criteria for ST-segment elevation myocardial infarction. Urgent coronary angiography revealed a thrombus in intermediate branch of the left coronary artery; the other coronary arteries were normal. The patient underwent successful treatment. Further diagnostics revealed that the cause of paradoxical embolization was a patent foramen ovale (PFO), which has been successfully closed with percutaneously implanted closure device.

Key words: patent foramen ovale, myocardial infarction, ischemic stroke

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#### **Case report**

A 58-year-old male with a history of primary hypertension, obstructive sleep apnea and cerebrovascular disease with two major ischemic strokes and several episodes consistent with transient ischemic attacks (TIA) referred to our hospital suffering acute angina. Electrocardiogram and cardiac markers at presentation were diagnostic for the lateral ST-segment elevation myocardial infarction (STEMI). Urgent coronary angiography revealed a significant thrombus in the intermediate branch of the left coronary artery (Figure 1A, arrow) with no significant atherosclerosis. The subsequent thrombectomy was carried out with an excellent result and final TIMI grade flow 3 (Figure 1B). Previous brain computed tomography (CT) and magnetic resonance imaging (MRI) examinations revealed 6 × 2 cm ischemic focus in occipito--temporal cortex and multiple smaller foci in both cerebral hemispheres and cerebellum. Trans-cranial Doppler (TCD) was strongly positive and transesophageal echocardiography (TEE) revealed a patent foramen ovale (PFO) with a right-to-left shunt using agitated saline contrast. Standard coagulogram and lower extremities Doppler examination were negative. Thus, the hypothesis of paradoxical emboli as a cause of both STEMI and cerebral infarctions appeared strongly evidenced and the patient was started on clexane and warfarin. Four weeks following the initial admission, the patient underwent successful percutaneous implantation of the Occlutech PFO closure device and anticoagulation therapy was reduced to aspirin. Further clinical course was uneventful at three and a half years.

#### Discussion

Thromboemboli originating in the venous system may appear in the systemic circulation crossing the PFO and cause major adverse cardiac and cerebrovascular events (major adverse cardiovascular and cerebrovascular events [MACCE]) including death, myocardial infarction (MI),

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Figure 1A, B. Coronary angiography

revascularization, stroke/TIA as well as migraines with aura. Large body of literature found a prevalence of PFO of 44% to 66% in a cryptogenic stroke subsets [1]. Substantially higher rate of PFO in patients with a cryptogenic stroke as compared to these found in the autopsy allcause series (27%) suggests that at least in some part, the cause of stroke might be paradoxical thromboembolism [1]. On the other hand, in light of current knowledge and scarce data regarding the performance of occluder devices to prevent cerebrovascular adverse events, this approach is still the matter of debate [2-4]. The presented paradoxical embolism exemplifies a rare cause and a potential mechanism of MI where no significant coronary atherosclerosis was documented in coronary angiography. This most often occurs in the presence of additional triggering factors leading to coagulopathies [5], elevated right atrial pressure i.e. mechanical ventilation [6], sleep apnea [7], right ventricular failure of varied

origin including massive pulmonary emboli [8], pulmonary hypertension, congenital heart diseases comprising Ebstein anomaly or those leading to Eisenmenger syndrome or single ventricular hearts [9].

## Conclusions

Herein, we present a rare case of spontaneous paradoxical embolization as a potential cause of MI. This case depicts, that the paradoxical embolisation has to be always considered in differential diagnosis during acute MI. Therefore, the presence of PFO should be extensively evaluated during MI using available imaging technics, especially in young patients, to prevent the following MACCE.

### Conflict of interest

None.

#### Streszczenie

Przedstawiono przypadek 58-latka hospitalizowanego z powodu bólów stenokardialnych (IV klasa wg CCS). Wartości markerów sercowych i krzywa EKG spełniały kryteria zawału serca z uniesieniem odcinka ST. W pilnej koronarografii uwidoczniono skrzeplinę w gałęzi pośredniej, przy poza tym zdrowych pozostałych tętnicach wieńcowych. Pacjenta poddano skutecznemu leczeniu. Dalsza diagnostyka wykazała jako przyczynę zatorowości w mechanizmie skrzyżowanym obecność drożnego otworu owalnego (PFO), który skutecznie zamknięto za pomocą zestawu implantowanego przezskórnie.

Słowa kluczowe: drożny otwór owalny, zawał niedokrwienny, udar niedokrwienny

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#### References

- Khairy P., O'Donnell C.P., Landzberg M.J. Transcatheter closure versus medical therapy of patent foramen ovale and presumed paradoxical thromboemboli: a systematic review. Ann. Intern. Med. 2003; 139: 753–760.
- Furlan A.J., Reisman M., Massaro J. et al. closure or medical therapy for cryptogenic stroke with patent foramen ovale. N. Engl. J. Med. 2012; 366: 991–999.
- Pickett C.A., Villines T.C., Ferguson M.A., Hulten E.A. Percutaneous closure versus medical therapy alone for cryptogenic stroke patients with a patent foramen ovale: meta-analysis of randomized controlled trials. Tex. Heart Inst. J. 2014; 41: 357–367.
- Agarwal S., Bajaj N.S., Kumbhani D.J. et al. Meta-analysis of transcatheter closure versus medical therapy for patent foramen ovale in prevention of recurrent neurological events after presumed paradoxical embolism. JACC Cardiovasc. Interv. 2012; 5: 777–789.

- Croft A.P., Khan J.N., Chittari M.V., Varma C. Paradoxical coronary artery embolism causing acute myocardial infarction in a young woman with factor V Leiden thrombophillia. JR Coll. Physicians Edinb. 2012; 42: 218–220.
- Bennett J., Ong L., Hanratty C. Paradoxical coronary embolism, a rare cause of acute myocardial infarction on positive pressure ventilation. Acta Cardiol. 2012; 67: 477–479.
- Kujime S., Hara H., Enomoto Y. et al. A case of paradoxical embolic ST-segment elevation myocardial infarction triggered by sleep apnea. Intern. Med. Tokyo Jpn. 2012; 51: 1851–1855.
- Hline A., Malik N., Khokhar A., Aggarwal R. Acute myocardial infarction caused by paradoxical embolism with concomitant pulmonary embolism. BMJ Case Rep. 2011; 2011. pii: bcr0320113953.
- Jamiel A., Alsaileek A., Ayoub K., Omran A. Paradoxical embolism in acute myocardial infarction in a patient with congenital heart disease. Heart Views 2012; 13: 111–113.