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Case Report

Miraculous life-saving role of patent foramen ovale: a case report

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ABSTRACT

Patent foramen ovale (PFO) is a relatively uncommon anatomical variant that predisposes patients to several complications, such as atrial septal aneurysm, thromboembolism, stroke, platypnea-orthodeoxia, and paradoxical embolism. Despite this, in rare cases, PFO can be a life-saving factor. We present a 72-year-old man with a PFO and fulfilled Virchov's triad after being stationary, dehydrated, and suffering from chronic venous insufficiency. A subsequent transesophageal echocardiogram revealed a large thrombus (approx. 20 cm in length) dwelling in the PFO in between both atria. In this case, PFO effectively saved the patient from such complications as pulmonary embolism and paradoxical embolism.

Keywords: PFO, Impending paradoxical embolism, Immobilization

INTRODUCTION

Patent foramen ovale (PFO) is a condition in which the foramen ovale, a small opening between the heart's upper chambers, remains open past the first year of life. It is found in about 27.3% of adults and is often discovered incidentally, as many patients remain asymptomatic. However, PFO is associated with several conditions, including atrial septal aneurysm, thromboembolism, stroke, platypnea-orthodeoxia, and paradoxical embolism.

A unique and rare complication of PFO is an impending paradoxical thrombosis (IPDE), which describes the presence of a thrombus in the PFO. IPDE usually is diagnosed by echocardiography during the evaluation of a patient presenting with suspected pulmonary embolism.[1]

A common comorbidity that is tightly associated with IPDE is deep vein thrombosis, which is often underdiagnosed. Deep vein thrombosis may remain undiagnosed in as many as 40% of asymptomatic patients.[1]

An important factor that falls under the Virchow triad that could lead to the development of such a life-threatening complication as IPDE is prolonged immobilization. The risk of venous thromboembolism is approximately doubled in bedridden patients.[2] The use of anticoagulant medications is a widely adopted approach that is used to prevent venous thromboembolism among immobilized patients, with the ultimate goal of reducing the incidence of associated life-threatening complications, including pulmonary embolism or IPDE. Prophylactic administration of low-molecular weight heparin was effective in preventing 48% of cases of pulmonary embolism, 48% of symptomatic deep vein thrombosis, and 51% of asymptomatic deep vein thrombosis.[2]

This case presents a patient with a PFO, and a large thrombus trapped within it. While PFO is often associated with embolisms and strokes, in rare cases like this, it arguably can also be a life-saving factor.

CASE REPORT

A 72-year-old man presented to the emergency department with acute loss of sense and motor function in both lower limbs. He had a previous history of vertebral spondylosis with multiple osteoporotic compression fractures in vertebrae Th6, Th7, Th8, Th11, Th12, and L1. In addition, he had a history of coronary heart disease, primary arterial hypertension, chronic heart failure, and chronic venous insufficiency. The patient also had a previous myocardial infarction and underwent percutaneous coronary stent implantation in 2011. The patient's daily pharmacological therapy consisted of Aspirin 100 mg and Bisoprolol 5 mg. The patient had no history of smoking or alcohol abuse. Family history was not provided.

After the admission patient underwent a comprehensive examination. The patient was in stable condition, and oriented, vital signs were within normal limits. Apart from lower paraparesis, no other neurological deviations were to be found. Consequently, a computer tomography (CT) was indicated for further diagnostic evaluation.

A CT revealed paramedian L4-L5 intervertebral disc hernia with cauda equina compression. In order to relieve the spinal canal compression an L4-L5 microdiscectomy was performed. After the procedure was performed patients, symptoms improved but the patient was still bedridden. The patient was charged out of the hospital with further rehabilitation recommendations and no anticoagulation prescribed.

Two days following the discharge from the hospital patient developed a fever and diarrhea. Since the symptoms were severe patient was admitted to a hospital that specializes in infectious diseases. Over the ensuing days, the patient's condition deteriorated, leading to hypovolemia, while blood and urine cultures yielded *Staphylococcus epidermidis* and *Pseudomonas aeruginosa*, respectively. During the evaluation a transthoracic echocardiogram (TTE) was performed, which revealed a vegetation-like structure on mitral valve. Considering the positive blood culture result and associated fever, empirical therapy with intravenous Vancomycin was initiated, suspecting infectious endocarditis. Additionally, intravenous imipenem was initiated following the detection of *Pseudomonas aeruginosa* in the urine culture.

To verify the diagnosis of infectious endocarditis, the patient was referred to a clinical university hospital to undergo a transesophageal echocardiogram (TEE). The TEE revealed a large thrombus (approximately 20 cm in length and 1 cm in width) in the right atrium that reaches the right ventricle during diastole and is protruding into the left atrium through the PFO and reaches the left ventricle during diastole (Figures 1 and 2). Ultimately describing a thrombus trapped in a PFO.

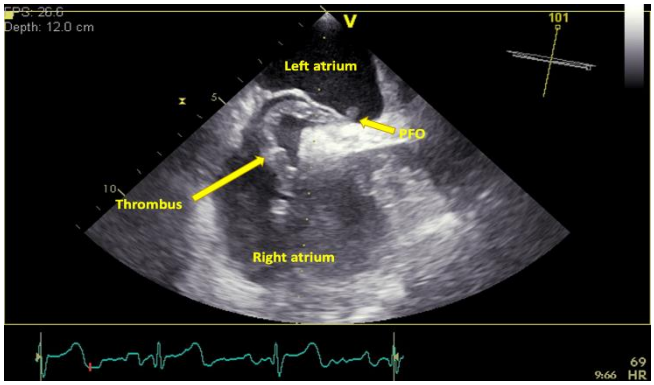

Figure 1: Transesophageal echocardiography in a 101° view. A large and mobile thrombus is seen across the foramen ovale.

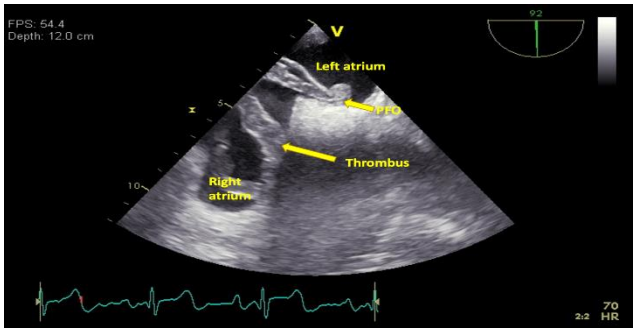

Figure 2: Transesophageal echocardiography in a 92° view. A large and mobile thrombus is seen across the foramen ovale.

Given the emergency of the situation and the potential for systemic arterial thromboembolism and massive pulmonary artery thromboembolism, the patient was expeditiously initiated on anticoagulant therapy, which encompassed Dabigatran and unfractionated heparin. Although a cardiac surgeon was notified, undisclosed circumstances precluded their availability to participate in the case. Consequently, the patient solely received the above-mentioned anticoagulative conservative therapy.

Three days after the discovery of the intracardiac thrombus a control TEE was performed. The echocardiographic examination demonstrated no evidence of thrombi or any other discernible pathological structures (Figure 3).

Over the subsequent days, the patient's condition improved gradually, which was attributed to the administration of antibiotics, leading to the resolution of fever and diarrhea. The patient exhibited partial recovery and was ultimately discharged from the hospital with recommendations for further rehabilitation to aid verticalization, along with an anticoagulant regimen comprising of dabigatran 150 mg, 2 times a day.

Regrettably, no additional information about the patient's status subsequent to discharge is available.

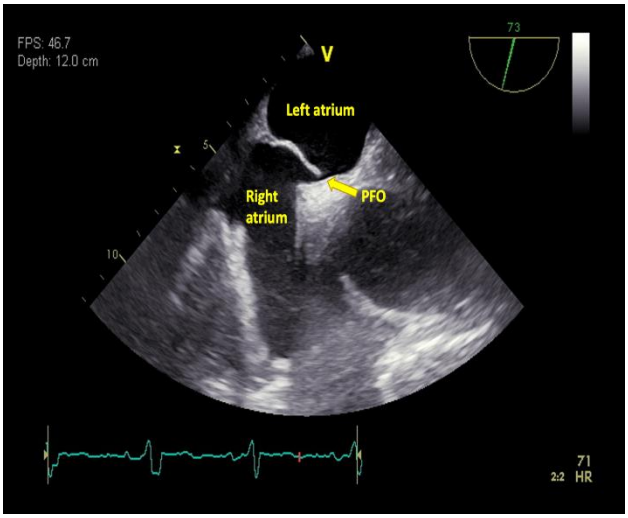

Figure 3: Transesophageal echocardiography in a 73° view. No evidence of thrombus.

DISCUSSION

Foramen ovale is an opening in the interatrial septum of the heart that is considered a normal anatomical structure in fetuses. At birth, the foramen ovale usually closes functionally, anatomical closure typically occurs by the third month. According to available literature, it has been observed that roughly 25% of the general population displays the presence of a PFO, a condition where functional and anatomical closure does not occur as it should, resulting in a right-to-left intracardiac shunting, which is a potential risk factor for paradoxical embolism.[4]

The main complications associated with PFO are cryptogenic stroke and peripheral (non-cerebrovascular) embolism.[5,6] In these conditions, a blood clot from the venous circulation enters the systemic circulation. Other complications associated with right-to-left intracardiac shunting include Platypnoea-orthodeoxia syndrome and migraine.[7,8]

Various methods can detect PFO, including contrast-enhanced TTE, contrast-enhanced TEE, and contrast-enhanced transcranial Doppler. However, because these methods have variable sensitivity and specificity, none of them can be considered a gold standard. A combination of diagnostic techniques should be recommended to achieve maximal accuracy in PFO diagnosis.

Treatment options for PFO include medical therapy, such as antiplatelet drugs, oral anticoagulation drugs (OAC), or interventional therapy, such as percutaneous PFO closure or surgical closure via thoracotomy and direct access to the heart. The decision regarding the most suitable therapy method for each patient should be based on the evaluation of several factors, such as patient age, presence of associated neurological conditions, bleeding risk, the causal link between the PFO and current complication.[9]

In this case report, we depict how immobilization after the surgery and an absence of adequate anticoagulation, might have played a crucial role in developing a thrombus in the patient's venous system, which resulted in embolization and entrapment in the PFO. Impending paradoxical embolisation is a rare complication, and information about similar cases is limited.

Studies suggest that the incidence of deep vein thrombosis after spinal surgery might be up to 15.5%, and pulmonary embolism up to 13.1%.[10,11] In our case, the underlying pathology was found incidentally because it was masked by a clinical manifestation of an acute infection. Unlike other case reports, it was hard to evaluate and think of underlying thrombus entrapment in the PFO because of the absence of common symptoms of pulmonary embolism that usually accompanies impending paradoxical embolism, such as dyspnea, chest pain, hypoxia, and hypocarbia. However, the patient had an elevation of D-dimer, which is not very specific in this case because of a presenting acute infection.[12]

The patient received medical therapy with dabigatran and unfractionated heparin, which resulted in complete thrombolysis. It is still a matter of debate, which therapy method is the best, as anticoagulation and thrombolysis of larger clots might be dangerous and associated with fragmentation or complete embolization, on the other hand any surgical therapy, especially in older patients with comorbidities, has its risks. According to recent studies, patients who receive conservative treatment may have lower mortality rates compared to those who undergo interventional treatment.[13]

The presented case is a unique instance of impending paradoxical embolism as an isolated finding, that resulted from the combination of various factors, including noneffective post-operative care. Although there is no consensus on appropriate treatment of impending paradoxical embolism, our patient received a therapy consisting of Dabigatran and Unfractionated heparin which resulted in complete thrombolysis.

This case highlights the need for further education and research among healthcare professionals about the possibility of a such a rare occurrence as impending paradoxical embolism.

CONCLUSION

PFO in adults is a relatively uncommon condition and its complication impending paradoxical embolism is an extraordinary finding.

Our case describes a patient, in which the PFO and thrombus dwelling within it were identified accidentally while looking for infectious endocarditis. We suspect this condition was precipitated by a combination of dehydration, immobilization, and the absence of anticoagulation therapy after surgical intervention.

Our case highlights the importance of adequate anticoagulant and physical therapy in the post-operative stage, improving patient outcomes. Additionally, we propose the heightened need for awareness of PFO in adults and the danger they pose.

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REFERENCES

1. Ma X, Song L, Yang H, Xia J, Wu C, He Y. Impending Paradoxical Embolism. Ann Thoracic Surg. 2019;108(2):e73-e75.
2. Pottier P, Hardouin J, Lejeune S, Jolliet P, Gillet B, Planchon B. Immobilization and the risk of venous thromboembolism. A meta-analysis on epidemiological studies. Thrombosis Res. 2009;124(4):468-76.
3. Själander A, Jansson J-H, Bergqvist D, Eriksson H, Carlberg B, Svensson P. Efficacy and safety of anticoagulant prophylaxis to prevent venous thromboembolism in acutely ill medical inpatients: a meta-analysis. J Internal Med. 2008;263(1):52-60.
4. Silva GV. Patent foramen ovale. Tex Heart Inst J. 2014;41(3):306-8.
5. Di Tullio M, Sacco RL, Gopal A, Mohr JP, Homma S. Patent foramen ovale as a risk factor for cryptogenic stroke. Ann Intern Med. 1992;117(6):461-5.
6. Farjat-Pasos JI, Guedeney P, Houde C, Alperi A, Mesnier J, Côté M, et al. Transcatheter Closure of Patent Foramen Ovale in Patients With Peripheral (Noncerebrovascular) Embolism. J Invasive Cardiol. 2022;34(10):E720-5.
7. Kubler P, Gibbs H, Garrahy P. Platypnoea-orthodeoxia syndrome. Heart. 2000;83(2):221-3.
8. Liu K, Wang BZ, Hao Y, Song S, Pan M. The Correlation Between Migraine and Patent Foramen Ovale. Front Neurol. 2020;11:543485.
9. Pristipino C, Sievert H, D'Ascenzo F, Louis Mas J, Meier B, Scacciatella P et al. European position paper on the management of patients with patent foramen ovale. General approach and left circulation thromboembolism. Eur Heart J. 2018;40(38):3182-95.
10. Oda T, Fuji T, Kato Y, Fujita S, Kanemitsu N. Deep venous thrombosis after posterior spinal surgery. Spine (Phila Pa 1976). 2000;25(22):2962-7.
11. Rosner MK, Kuklo TR, Tawk R, Moquin R, Ondra SL. Prophylactic placement of an inferior vena cava filter in high-risk patients undergoing spinal reconstruction. Neurosurg Focus. 2004;17(4):E6.
12. Doğan M, Erat M, Sunman H, Yeter E. Successful treatment with anticoagulant therapy of a thrombus trapped in a patent foramen ovale in a patient with acute pulmonary embolism. Turk Kardiyol Dern Ars. 2015;43(7):660.
13. Rose PS, Punjabi NM, Pearse DB. Treatment of right heart thromboemboli. Chest. 2002;121(3):806-14.

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