

## CASE REPORT

# Acute coronary syndrome of paradoxical origin

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### KEYWORDS

Paradoxical embolism;  
Patent foramen ovale;  
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**Abstract** We describe a rare case of acute myocardial infarction secondary to paradoxical embolism complicating acute pulmonary embolism. A 44-year-old woman presented to the emergency department with chest pain. The physical examination was unremarkable except for oxygen saturation of 75%, and the electrocardiogram showed ST-segment elevation in the inferior leads. Urgent coronary angiography showed a distal occlusion of the right coronary artery and multiple thrombi were aspirated. Despite relief of chest pain and electrocardiogram normalization, her oxygen saturation remained low (90%) with high-flow oxygen by mask. The transthoracic echocardiogram showed a mass in the left atrium and dilatation of the right chambers, while the transesophageal echocardiogram showed a thrombus attached to the interatrial septum in the region of the foramen ovale. Color flow imaging was consistent with a patent foramen ovale. Thoracic computed tomography angiography documented thrombi in both branches of the pulmonary trunk. After five days on anticoagulation, the patient underwent surgical foramen ovale closure.

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### PALAVRAS-CHAVE

Embolia paradoxal;  
Foramen ovale  
patente;  
Enfarte do miocárdio

### Síndrome coronária aguda de origem paradoxal

**Resumo** Descreve-se um caso raro de enfarte agudo do miocárdio por embolia paradoxal em contexto de tromboembolismo pulmonar agudo. Uma mulher de 44 anos recorreu à urgência por dor torácica. A observação foi normal com exceção de saturação periférica de 75%. O electrocardiograma mostrou supradesnivelamento do segmento ST nas derivações inferiores. Realizou-se cateterismo urgente que mostrou coronária direita ocluída distalmente, tendo sido aspirados múltiplos trombos. Verificou-se alívio da dor e desaparecimento do supradesnivelamento de ST. No entanto, a saturação periférica mantinha-se baixa apesar de aporte com oxigénio. O ecocardiograma transtorácico mostrou massa auricular esquerda e dilatação das cavidades direitas. O ecocardiograma transesofágico revelou um trombo no septo interauricular, na região do *foramen ovale*. O estudo por Doppler-cor foi compatível com *foramen ovale*

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patente. A angio-tomografia computadorizada do tórax documentou trombos nos ramos principais da artéria pulmonar. Após cinco dias de anticoagulação a doente foi submetida a cirurgia cardíaca e o *foramen ovale* encerrado.

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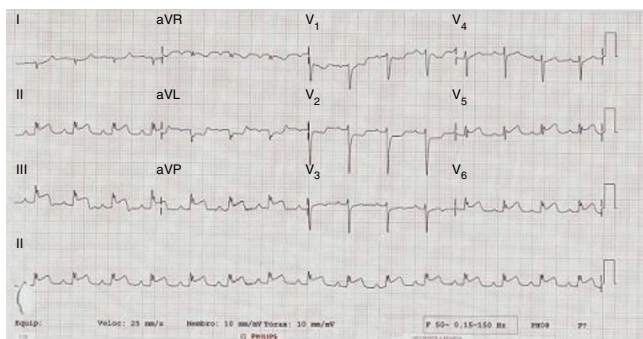
## Introduction

Paradoxical embolism is an uncommon situation, accounting for less than 2% of all arterial emboli.<sup>2</sup> We describe a rare case of acute myocardial infarction secondary to paradoxical embolism complicating acute pulmonary embolism.

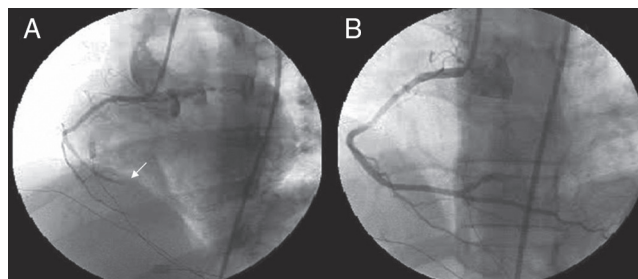
## Case report

A 44-year-old woman, taking oral contraceptives, with a medical history of type 2 diabetes and mild obesity, presented with an acute episode of non-radiating substernal chest pain, which aroused her from sleep. She also suffered dyspnea, nausea, diaphoresis and transient loss of consciousness before reaching the emergency department two and a half hours later. Her vital signs were blood pressure 120/80 mmHg, heart rate 85 beats per minute, respiratory rate 23 cycles per minute and oxygen saturation 75% in room air. The remainder of the physical examination was unremarkable. The electrocardiogram (ECG) showed sinus rhythm and ST-segment elevation in leads II, III, aVF, V5 and V6 (Figure 1). She was diagnosed with acute inferior ST-elevation myocardial infarction (MI) and was admitted to the coronary care unit (CCU).

In the CCU screening transthoracic echocardiography excluded mechanical complications of MI and showed a non-dilated left ventricle, with good global systolic function, akinesia of the inferior wall and dilatation of the right cardiac chambers. In view of a possible inferior MI with extension to the right ventricle, the patient underwent emergency coronary angiography that confirmed an occlusion (TIMI flow 0) of the distal right coronary artery (Figure 2A). The other coronary arteries were normal. An Export® aspiration catheter (Medtronic, Minneapolis, USA) was advanced into the right coronary artery and multiple thrombi were aspirated. After thrombectomy, TIMI flow 3



**Figure 1** 12-lead electrocardiogram with ST-segment elevation in leads II, III, aVF, V5 and V6.



**Figure 2** (A) Coronary angiography showing distal occlusion of the right coronary artery; (B) final result after thrombus aspiration and stent implantation.

was documented, but residual stenosis was noted in the distal right coronary artery and a bare-metal stent was implanted (Figure 2B).

On return to the CCU, the patient experienced complete relief of chest pain and ST-segment normalization on the ECG. Nonetheless, her oxygen saturation level was still 90% despite high-flow oxygen by mask. A full transthoracic echocardiogram examination was then performed. Consistent with a thrombus was noted in the left atrium, appearing to arise from a redundant interatrial septum, while the right ventricle was moderately dilated with positive McConnell sign and the interventricular septum was displaced into the left ventricle, which was D-shaped in short-axis view (Figure 3). The pulmonary artery was dilated and the flow across the pulmonary valve suggested severe pulmonary hypertension with pulmonary artery systolic pressure estimated at 70 mmHg. In apical 4-chamber view, color flow imaging of the interatrial septum showed a right-to-left shunt. It was then decided to perform transesophageal echocardiography (TEE) to better characterize the relationship of the mass with the interatrial septum and its embolic potential, and also to look for masses in the right atrium. TTE showed a long thrombus that appeared to be attached to the atrial septum in the region of the foramen ovale. Color flow imaging was consistent with a patent foramen ovale (PFO) and the atrial septum was aneurysmatic. The thrombus had a snake-like movement inside the left atrium and its distal end was freely mobile, prolapsing through the mitral valve (Figure 4). No mass was observed in the right atrium or pulmonary arteries. Thoracic computed tomography angiography revealed bilateral thrombi in the main and lobar branches of the pulmonary artery (Figure 5).

According to the criteria suggested by Johnson,<sup>1</sup> the patient had a definitive diagnosis of paradoxical embolism: a thrombus crossing an intracardiac defect was seen during echocardiography in the presence of an arterial embolus. The therapeutic options for paradoxical embolism are still a matter of debate. In our case, cardiothoracic

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