Pulmonary embolism complicated by impending paradoxical embolism – a case report and a review of literature

Zatorowość płucna powikłana zatorem skrzyżowanym – opis przypadku i przegląd piśmiennictwa

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Abstract

Pulmonary embolism (PE) is a common CV emergency that may lead to acute life-threatening right ventricular failure. Right-sided heart thrombi are relatively rare (4-18% of patients presenting with acute PE). The presence of right heart thrombi, particularly when mobile, is associated with a significantly increased risk of mortality. Thrombus straddling the patent foramen ovale (TSFO) in PE is even rarer and it is at high risk of impending paradoxical embolism (PDE). We report a case of a PE complicated by a right-sided heart thrombus and impending PDE and we analysed different therapeutic options.

Key words: pulmonary embolism, paradoxical embolism, patent foramen ovale

Kardiol Pol 2010; 68: 314-316

Case report

On 3 June 2008, an 81-year-old woman was admitted to a local hospital due to progressive dyspnoea at rest with hypoxemia (PaO_2 57 mmHg) and desaturation (86%). The D-dimer plasma levels were high (8557 mg/dL). She had a history of chronic atrial fibrillation and she had a stroke in 2007 after discontinuing the oral anticoagulation therapy for post-traumatic haematoma.

A ventilation-perfusion scintigraphy was performed and revealed multiple mismatched perfusion defects, strongly suggestive of multiple pulmonary embolism.

Intravenous heparin was started and on 4 June, the patient was transferred to our intensive care unit. At admission to our hospital the systemic blood pressure was normal (130/80 mmHg), she had tachycardia (HR 100/min) and electrocardiography (ECG) showed negative T-waves in anterior leads (V_1-V_4). Doppler ultrasounds of the lower limbs revealed a right femoral deep vein thrombosis. Cardiac necrosis markers (Tn T) were positive.

Transthoracic echocardiography showed normal left ventricular function, right ventricular enlargement with systolic dysfunction and pulmonary hypertension (50 mmHg). A mobile large thrombus (cross sectional area 5 × 0.5 cm) was detected in the right atrium, near the foramen ovale, not involving the left side of the heart.

The patient was treated with systemic thrombolysis (rTPA 100 mg over 2 h) and continued intravenous unfractioned (UF) heparin. After 2 h from thrombolysis, transthoracic echo was performed revealing the right thrombus extending to the left atrium through the patent foramen ovale (PFO), with an extremely mobile portion in the left chamber (Figure 1). The surgery option was excluded for the possibility of acute pulmonary and cardiac complications related to the extracorporeal circulation and for the high risk of thrombus dislodging in the systemic circulation.

Another dose of fibrinolysis was then administered (rTPA 50 + 50 mg). After 8 h, transesophageal control echo showed the disappearance of the intracardiac thrombus.

Clinical and hemodynamic conditions of the patient improved during the following hospital stay and after one week, echo revealed a significant decrease in the right ventricular size with progressive normalisation of the right ventricular function. Patent foramen ovale was closed percutaneously after two weeks.

The patient was doing well during one year follow-up, continuing anticoagulation therapy.

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Received: 25.07.2009. **Accepted:** 30.07.2009.

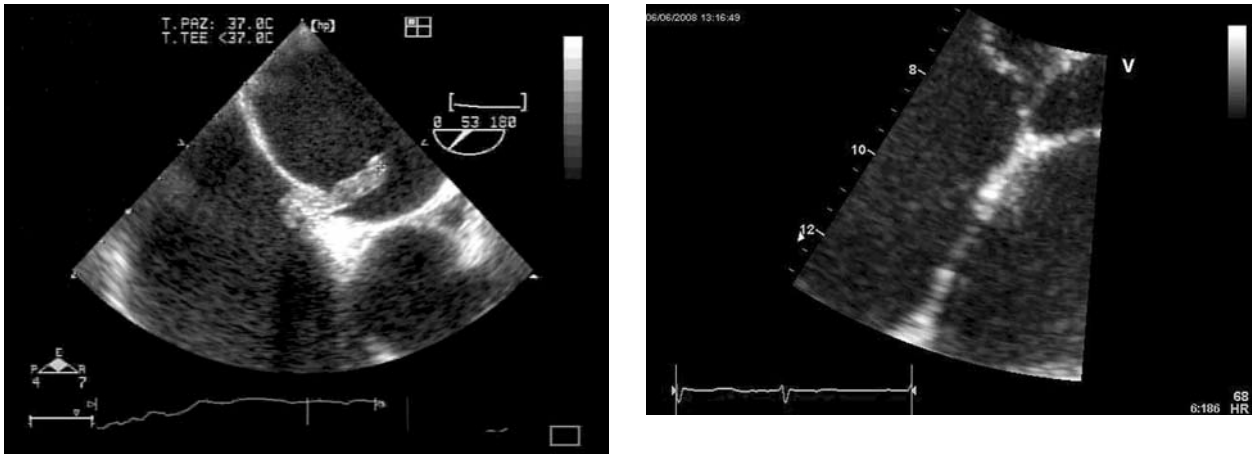

Figure 1. Thrombus straddling the patent foramen ovale, transesophageal echocardiography

Discussion

Thrombus-in-transit is defined as a right heart thrombus unattached to any cardiac structure. A right-sided cardiac thrombus is a rare finding in pulmonary embolism, but it can be life-threatening. It is associated with a higher prevalence of hypotension, higher heart rate (HR) and right ventricular dysfunction with a reported early mortality of 28-45% if treated and as high as 80-100% when left untreated [1-4].

The increased use of two-dimensional echocardiogram has led to an increased detection of intracardiac thrombi. Immediate therapy for this finding is necessary, but the optimal treatment is still controversial in the absence of randomised controlled trials [5, 6].

The therapeutic options are cardiac surgery, thrombolysis, anticoagulation with heparin used alone or a combination of these treatments. According to a review of the literature, no significant advantages for survival were found between the three options (38%, 38% and 30% rate of mortality for embolectomy, thrombolysis and anticoagulation, respectively) [4].

The advantages of systemic fibrinolysis include availability, ease of handling and applicability even in patients with a severe hemodynamic condition [7].

In spite of this, thrombolysis may cause thrombus dislodgement, leading to additional pulmonary embolism and hemodynamic deterioration. It is moreover more effective than the heparin anticoagulation alone even if the risk of haemorrhage is not negligible [8].

On the other hand, surgical embolectomy is an effective treatment for removing the heart thrombus straddling the interatrial septum and it makes it possible to close directly the PFO.

According to a review by Faveau et al., thrombectomy under extracorporeal circulation is the most frequently chosen treatment in the published literature. However, data are scarce and the emergency surgery could be fatal in patients with the right ventricular failure [8, 9].

Anticoagulation with heparin alone seems to be insufficient even in patients with stable clinical conditions. Patients treated with heparin alone were older and they had more comorbidities than operated patients. Thrombolysis is reserved for patients with severe PE and unstable hemodynamic status, who cannot wait for surgery. When initial thrombolytic treatment fails and paradoxical embolism (PDE) is impending, as in our case report, surgical rescue embolectomy or a second thrombolytic dose remain treatment options [9].

In our case, we choose to repeat the thrombolytic therapy because of the high risk related to surgery. Also according to the ICOPER (International Cooperative Pulmonary Embolism Registry), thrombolysis remains the best option, despite the high mortality (21% after 14 days), due to the highest hemodynamical instability [4].

Paradoxical embolism is defined as a systemic arterial embolism requiring the passage of a venous thrombus into the arterial circulatory system through a right-to-left shunt [10-12].

Patients with impending PDE have a very high risk of thrombosis and PE. In these cases, a plan of care based on thrombolysis or thrombectomy, in addition to anticoagulation with heparin, should be undertaken [13]. However, there is no evidence-based data to document which treatment option is better for PDE.

This condition can be related to an abnormal intracardiac communication. The most common cardiac defect associated with paradoxical embolism is the PFO that reaches the prevalence of about 35% in the normal population.

Closure of the PFO has not been recommended in primary prevention up to now. It might be indicated for patients with recurrent PDE despite anticoagulation therapy and in patients with contraindications to anticoagulant [14, 15].

Conclusions

The echocardiography detection of thrombus straddling the PFO is extremely rare and only few case reports have been described in the literature. They usually had atypical clinical presentation, without pulmonary or paradoxical embolism (PDE). However, when this condition appears, it represents a life-threatening state.

Despite the lack of a definitive management strategy, mobile heart thrombi causing acute pulmonary embolism and impending PDE require urgent aggressive therapy as the greatest mortality occurs early in the hospital course [8, 16].

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