Paradoxical Peripheral Embolism Coincident with Acute Pulmonary Thromboembolism

Tatsuyuki INOUE, Futoshi TADEHARA, Toshihide HINOI, Shuji TSUJIYAMA, Shusuke MATSUO, Takeshi SHICHIJO*, Takeshi SHICHIJO, Tetsuya ONO and Michio YAMAKIDO

Abstract

Paradoxical embolism may occur in patients with acute pulmonary thromboembolism, when patent foramen ovale (PFO) coexists with pulmonary hypertension (right-left shunt). There have been few case reports of paradoxical embolism in peripheral arteries coincident with acute pulmonary thromboembolism. Here, we describe a case of paradoxical peripheral embolism associated with PFO complicated by acute pulmonary thromboembolism. The patient had severe peripheral ischemia due to a massive thrombus and was treated successfully by peripheral thrombectomy, thrombolysis, implantation of a permanent inferior vena cava filter and anticoagulation.

Case Report

A 67-year-old woman was admitted because of dyspnea and bilateral pain in the lower limbs. She had suffered from cough and exertional dyspnea for two weeks before admission, and her condition had been treated as a common cold. She denied any history of cardiovascular disease. Physical examination showed an accentuation of the pulmonary component of the second heart sound, a right heart heave, and absence of any pulse in the bilateral femoral arteries. Electrocardiography showed right axis deviation and an inverted T wave in leads V1 and V2, suggestive of right ventricular loading. Chest X-ray films showed neither marked congestion nor pneumonia. Examination of arterial blood gases revealed hypocapnic hypoxia (PaO2 47.4 mmHg, PaCO2 26.0 mmHg, during 3 liters of oxygen inhalation via a nasal cannula). Echocardiography showed dilatation of the right ventricle and severe reverse blood flow across the tricuspid valve due to pulmonary hypertension. Contrast whole-body CT showed a massive thrombus in the bilateral iliac arteries and a massive thrombus in the main pulmonary artery, but there were no findings suggestive of deep vein thrombosis in the lower limb veins. Emergency heart catheterization was performed after implantation of a temporary inferior vena cava filter (IVC filter), and the right cardiac catheter revealed marked pulmonary hypertension (pulmonary artery pressure 70/15 mmHg, mean 34 mmHg, right ventricle 66/2 mmHg, right atrium 6/8 mmHg, left atrium 3/0 mmHg) and communication between the right and left atria (Fig. 1A). Pulmonary and lower extremity arteriography showed occlusion of bilateral pulmonary arteries (Fig. 1B) and bilateral external iliac arteries (Fig. 2A) by thrombi. To decrease the risk of further pulmonary and systemic emboli, the temporary IVC filter was replaced with a permanent one under a diagnosis of coexisting PFO or atrial septal defect with paradoxical embolism concomitant with acute pulmonary thromboembolism.
The patient was subsequently admitted to the coronary care unit, and on the following day underwent a peripheral thrombectomy using a Fogarty catheter (Fig. 2B). Continuous administration of heparin, urokinase and warfarin was instituted, and the patient’s pulmonary hypertension and oxygen saturation improved. After her recovery, PFO was diagnosed by transesophageal echocardiography using contrast medium during the Valsalva maneuver, but no abnormal extrapulmonary accumulation of $^{99}$Tc-MAA was observed on lung perfusion scintigraphy. Therefore we considered that mechanical closure of the PFO was unnecessary. The patient was discharged 14 days after admission, and no recurrent emboli have been observed.
Discussion

Paradoxic emboli are relatively rare, accounting for fewer than 2% of all cases of systemic arterial emboli (3). The most common intracardiac defect associated with paradoxical embolism is PFO, which may be present in as many as 35% of the normal population (2). PFO has been identified as a source of paradoxical embolism, allowing the occurrence of air, thrombi and fat emboli with their subsequent systemic sequelae (4, 5). Paradoxical embolism is frequently associated with cryptogenic stroke (6, 7), peripheral embolism (7, 8), brain abscess (9), and decompression sickness in underwater divers (10). An association of PFO with peripheral embolism has been demonstrated by several groups, and paradoxical embolism is most likely to occur in patients with the cerebral ischemia, although the frequency of peripheral embolism is reportedly fairly low (4.5–8%) (11–13).

The presence of PFO is an important predictor of adverse outcome; according to Goldhaber (14), patients with PFO have a nine-fold higher mortality rate than those without it. Also, Konstantinudes et al demonstrated in a prospective study that echocardiographic detection of PFO signifies a particularly high risk of morbidity and mortality; the death rate increased from 14% to 33%, the ischemic stroke rate increased from 2.2% to 13%, and the risk of peripheral arterial embolism increased from 0% to 15% (13). Lewis-Carey et al reported a patient with pulmonary thromboembolism and associated acute paradoxical embolus in the right subclavian artery who was treated with systemic and catheter-directed thrombolysis, temporary IVC filtration, and percutaneous closure of PFO (15). Decousus et al evaluated an effectiveness of IVC filters for the prevention of pulmonary embolism in patients with proximal deep-vein thrombosis by a meta-analysis, and reported a reduction in the occurrence of symptomatic or asymptomatic pulmonary embolism (16).

The present patient was considered to be at high risk, and was treated successfully by thrombectomy, thrombolysis, a permanent IVC filter and anticoagulation. In this case, the following issues need to be considered: 1) the type of IVC filter, temporary or permanent that should be used, 2) the possible complications associated with a permanent filter, and 3) whether mechanical closure of PFO should be indicated. We decided to use a permanent IVC filter for our patient considering her age and the risk of relapse. A radioisotope examination in pulmonary circulation led us conclude that mechanical closure of her PFO was unnecessary in this case (17).

In conclusion, we described the diagnosis and treatment of massive pulmonary thromboembolism complicated by a paradoxical embolus in the bilateral external iliac arteries in an aged woman. The therapeutic options for paradoxical embolus include thrombectomy, thrombolysis, the use of an IVC filter and anticoagulation.

References