Popliteal Venous Aneurysm with Pulmonary Embolism

Yoshihiko Seino, Hiromi Fujimori, Shinichirou Shimai, Keiji Tanaka, Teruo Takano, Hirokazu Hayakawa and Yayoi Niimi

A 29-year-old female was admitted to the hospital because of increasing exertional dyspnea, chest oppressive feeling and palpitation. Lung perfusion scan, pulmonary angiography, and venography of the lower extremities revealed multiple pulmonary embolism and a right popliteal venous aneurysm as the probable source of emboli. B-mode/Doppler echography and magnetic resonance imaging were useful for the preoperative evaluation. Following anticoagulant therapy and thrombolytic therapy using intravenous heparin and urokinase, respectively, the popliteal venous aneurysm was surgically excised; the walls contained organized thrombus. She delivered a baby without any complication 2 years after the surgery.

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Introduction

The most common cause of pulmonary embolism is thrombosis of the pelvic or lower extremity veins. There are three factors involved in thrombogenesis; i.e., hemostasis, anatomical or histological abnormalities in the vessel walls, and alterations in the blood coagulation system. Conditions which are associated with a high risk of venous thrombosis include chronic deep venous insufficiency following prolonged bed rest, postoperative period, pregnancy, injury of lower extremities, congestive heart failure, or use of oral contraceptives (1).

This is a case report of pulmonary embolism in which the source of emboli was thought to be a popliteal venous aneurysm, which is a very rare condition, and is easily overlooked, since the venous aneurysm is asymptomatic and undetectable from the outside. Noninvasive examinations using B-mode/Doppler echography and magnetic resonance imaging were useful for the preoperative evaluation of popliteal venous aneurysm.

Case Report

A 29-year-old female physician was admitted to the hospital because of increasing exertional dyspnea, chest oppressive feeling and palpitation. The patient was apparently in excellent health until 5 days earlier, when she began to notice episodes of shortness of breath and palpitation on mild exertion. On physical examination, she was alert and well oriented, with a body temperature of 36.8°C, blood pressure of 90/52 mmHg, heart rate of 90/min, and respiratory rate of 22/min. There was no pretibial edema, no superficial varices, and no evidence of thrombophlebitis in both lower extremities.

On auscultation, the pulmonary component of 2nd heart sound was augmented. Her chest X-ray film was interpreted as negative. Electrocardiogram showed sinus tachycardia with inverted T waves in V1 to V3. Arterial pO₂ was 53.8 mmHg and pCO₂ 29.9 mmHg in room air. Echocardiography demonstrated right ventricular enlargement and flattened intraventricular septum with moderate tricuspid and pulmonary regurgitation, indicating acute right ventricular overload.

Because pulmonary embolism was highly suspected from the findings of hypoxia and acute right ventricular overload, intravenous administration of heparin was immediately started, and lung perfusion scan using a 99m Tc-macroaggregated albumin was performed. It revealed multiple perfusion defects in both lungs (Fig. 1). An emergency pulmonary angiography showed multiple emboli in both lungs, confirming the diagnosis of multiple pulmonary thromboemboli (Fig. 2). Following angiographic examinations, 960,000 units of urokinase was infused from the main pulmonary trunk, and partial improvement of pulmonary blood flow in the right upper and middle lobes was obtained; 600,000 units per day of urokinase was then administered intravenously for 3 days. Her symptoms improved gradually, and the finding of acute right ventricular overload on echocardiography diminished day by day. 99m Tc-macroaggregated albumin lung perfusion scan performed 8...
Fig. 1. Lung perfusion scan using 99mTc-macroaggregated albumin revealed multiple perfusion defects in both lungs.

days after the start of the thrombolytic therapy revealed almost completely normalized lung perfusion results.

The patient had no past history or risk factors for pulmonary embolism. Antithrombin-III (AT-III) was 87%, cryoglobulin was negative, and both of protein C activity (80%) and protein S activity (81%) were within normal limits.

In order to determine the cause of pulmonary emboli, bilateral lower extremity venography was performed a week after the pulmonary angiography. A 4×5 cm aneurysmal venous dilatation was discovered in the right popliteal vein (Fig. 3). The veins were otherwise normal. Echographic (B-mode and Doppler) examination and a magnetic resonance imaging of popliteal fossa disclosed a 4.2×4.8×2.0 cm popliteal venous aneurysmal dilatation surrounding the right popliteal artery (Figs. 4, 5). To prevent a recurrence of pulmonary embolism, the popliteal venous aneurysm was surgically excised. The histopathological examination revealed a true venous aneurysm consisting of a three-layered structure and containing organized thrombus attached to its wall.

She delivered a baby without any complication 2 years after the surgery. She is in good condition at 4 years follow-up, and her activity as a physician is remarkable.

Discussion

In 1976, popliteal venous aneurysm was first described as a rare source of pulmonary thromboembolism by Dahl et al (2). According to the review of 25 cases by Quandalle et al in 1989 (3), it occurs more frequently in females than in males (4–6). Age distribution ranges from 7 to 69 years old. However, more than 75% are over 40 years old. The most common clinical manifestation is pulmonary embolism due to clot migration from the thrombosed aneurysmal pocket (14 of 25 cases). Local symptoms or signs are much more rare. Only 6 of 16 cases referring to local findings showed a palpable mass in the popliteal fossa, and 3 of these were diagnosed as developing pulmonary embolism. Aneurysmal venous dilatation is characteristic, and histopathological investigations revealed a typical three-layer structure containing small organized thrombus (2, 4). The histopathological findings in the present case were completely consistent with the previous reports of primary popliteal venous aneurysm.

Treatment of choice is surgical resection of the venous aneurysm as well as temporary anticoagulation. Most cases had a favorable outcome after this modality of treatment, although there is one reported case of sudden death before surgery (7). The incidence of popliteal venous aneurysm is not clear, and
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Fig. 2. Pulmonary angiograms before and immediately after the intrapulmonary arterial administration of urokinase. Right pulmonary artery branches (A3 and A8) were occluded. Left pulmonary arteriography showed reduced blood flow in A1+2, A3, and A8. After the infusion of urokinase (960,000 units) from the main pulmonary trunk, partial improvement of pulmonary blood flow in the right upper and middle lobes was obtained.

Fig. 3. Venography of bilateral lower extremities performed a week after the pulmonary angiography revealed a 4×5 cm venous aneurysm in the right popliteal vein.

may be higher than generally recognized because this disorder is typically discovered in cases of pulmonary embolism only after venography, which can be skipped at the first routine work-up.

In this case, the patient was young and had no predisposing condition of pulmonary embolism. Venography was performed in order to determine the source of embolism, and venous aneurysm was discovered in the popliteal vein. Although venography is indispensable for a definite diagnosis of the origin of pulmonary embolism, B-mode and Doppler echography and magnetic resonance imaging of leg vessels are noninvasive and useful as a preliminary or adjunctive examination. This is the first case of pulmonary embolism caused by a popliteal venous aneurysm in Japan and also the youngest case in the world. Since the patient could not recall a history of injury at the site, venous aneurysm was considered to be primary or congenital in origin. It is important to be aware of the possibility of venous aneurysm as a cause of pulmonary embolism, especially in a young patient with no predisposing risk factors.

References

Fig. 4. B-mode and Doppler echographic examination of popliteal fossa disclosed a 4.2x4.8x2.0 cm popliteal venous aneurysm surrounding the right popliteal artery.

Fig. 5. Magnetic resonance imaging showing the anatomical location of popliteal venous aneurysm in the right knee.