

Life-Threatening Acute on Chronic Pulmonary Thromboembolism Requiring Extracorporeal Membrane Oxygenation

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A 71-year-old female patient was admitted to the emergency department with sudden aggravation of chest pain and severe dyspnea. Computed tomography showed extensive pulmonary thromboembolism. Venoarterial extracorporeal membrane oxygenation (ECMO) was instituted due to sudden bradycardia and hypotension. An emergency operation was performed. However, chronic pulmonary thromboembolism combined with an acute pulmonary embolism was detected in the operating room. Embolectomy and endarterectomy were performed. ECMO was then discontinued. The patient was discharged on postoperative day 13 with warfarin for anticoagulation. The patient was followed up for 46 months as an outpatient without further thromboembolic events.

Key words: 1. Pulmonary artery
2. Pulmonary embolism
3. Extracorporeal membrane oxygenation

Case report

A 71-year-old female patient was admitted to the emergency department with sudden aggravation of chest pain and severe dyspnea. She had complained about progressive dyspnea for 2 months despite receiving bronchodilator therapy as an outpatient. Her initial vital signs were a blood pressure of 120/91 mm Hg with a pulse rate of 119 beats/min and a respiratory rate of 30 breaths/min. Her body temperature was 36.8°C. Based on a suspicion of pulmonary thromboembolism, computed tomography (CT) was

performed. The CT scan showed extensive pulmonary thromboembolism involving the bilateral main pulmonary arteries and branches and deep vein thrombosis in the right popliteal vein (Fig. 1). However, she developed bradycardia and her arterial pulse became undetectable. Therefore, cardiopulmonary resuscitation was initiated. Venoarterial extracorporeal membrane oxygenation (ECMO) was instituted, and an emergency operation was planned. The operation was performed through median sternotomy. Cardiopulmonary bypass (CPB) was performed using bicaval cannulation. The operation was performed with

Received: August 24, 2017, Revised: October 23, 2017, Accepted: October 24, 2017, Published online: June 5, 2018

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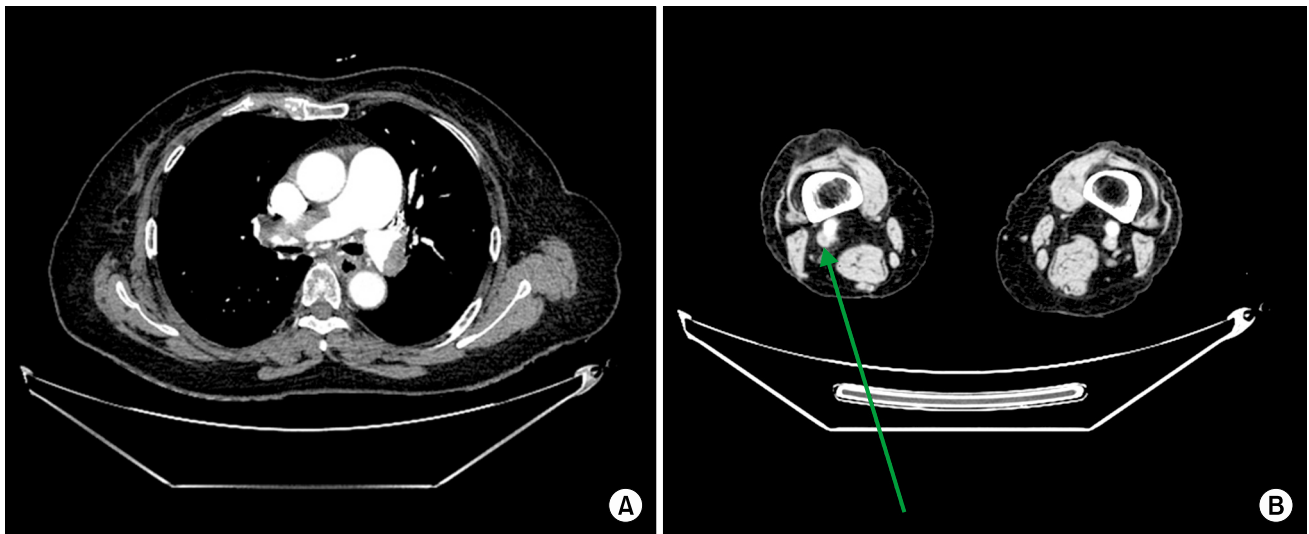


Fig. 1. Axial computed tomography scan showing (A) extensive pulmonary thromboembolism obstructing the bilateral main pulmonary arteries and the branches and (B) deep vein thrombosis in the right popliteal vein (arrow).

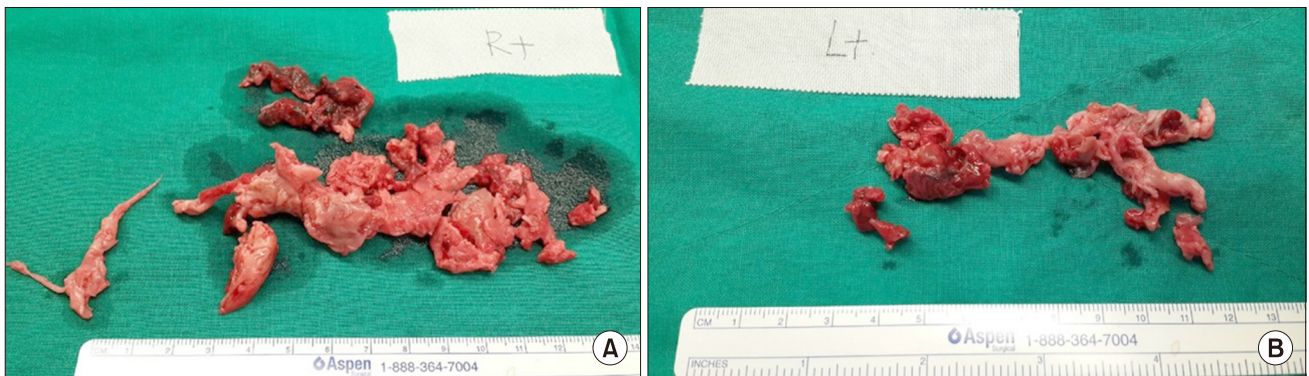


Fig. 2. (A, B) Removed fresh thrombus in the proximal segment of the pulmonary artery, as well as an organized thrombus from the distal branches of the pulmonary artery.

a beating heart. To visualize the pulmonary artery (PA), vent catheters were inserted into the left ventricle via the right upper pulmonary vein and into the right ventricle (RV) via the proximal main PA passing through the pulmonary valve. The proximal main PA was snared to reduce back-flow from the RV. The main PA was opened with a longitudinal incision, which was extended into the right and left PA branches. There was a fresh bloody thrombus in the proximal PA portion. In addition, a chronic whitish organized thrombus was also found extending from the distal right PA and left PA to the peripheral branches (Fig. 2). To remove the distal organized thrombus, endarterectomy was performed. Under in-

termittent total circulatory arrest (total of 40 minutes; 4 times for 10 minutes each) with a body temperature of 18°C, complete endarterectomy was performed. The patient was weaned successfully from CPB. ECMO was also then discontinued. The patient's postoperative course was uneventful. Heparinization was started on the first postoperative day. Warfarin was started on the third postoperative day after extubation. An inferior vena cava filter was inserted on the third postoperative day. The patient was discharged on postoperative day 13 with warfarin for anticoagulation. Warfarin was maintained during outpatient follow-up with a target international normalized ratio of 2.0–2.5. The patient was followed up for

46 months as an outpatient without significant complications or further thromboembolic events.

Discussion

Chronic thromboembolism is rare, and is estimated to account for fewer than 0.1%–0.5% of all cases of acute pulmonary embolism. The pathophysiology of chronic thromboembolism has been suggested to involve recurrent embolic episodes after a sufficiently treated pulmonary embolism [1], in situ propagation of the thrombus into branch pulmonary vessels [2], and large- and small-vessel vasculopathy caused by incomplete resolution of the initial embolism [3].

Patients with chronic thromboembolism may present with progressive dyspnea on exertion, hemoptysis, or signs of right heart dysfunction including fatigue, palpitations, syncope, or edema after a single episode or recurrent episodes of overt pulmonary embolism [4]. In our case, though our patient presented with progressive dyspnea in the outpatient clinic, she was initially suspected to have chronic pulmonary disease rather than a chronic pulmonary thromboembolism. After an overt embolic event, the patient's final diagnosis was confirmed. However, cardiopulmonary resuscitation and ECMO were inevitable due to the severity of her condition.

Approximately 30% of cases of chronic thromboembolism present with recurrent or overt episodes of acute events [5]. Catastrophic cases that may require ECMO are of particular clinical significance [6,7]. Mydin et al. [6] reported the use of central venoarterial ECMO support for 5 days as a bridge to pulmonary thromboembolism. The patient required ECMO due to the progression of multiorgan failure. Faggian et al. [7] reported the case of a 51-year-old female patient who received percutaneous selective pulmonary thrombolysis for acute thromboembolism. Venovenous ECMO was instituted for right ventricular support. However, ECMO weaning failed despite 5 days of ECMO support. Eventually, a pulmonary endarterectomy was required. Our patient experienced a rapid deterioration of vital signs to the point of requiring cardiopulmonary resuscitation. She required venoarterial ECMO support. Early suspicion and early diagnosis may prevent such catastrophic events in the future.

When acute pulmonary thromboembolism is ac-

companied by chronic pulmonary embolism (acute on chronic thromboembolism), pulmonary endarterectomy should be considered in addition to pulmonary embolectomy. Fukuda and Taniguchi [8] stated that pulmonary embolectomy for acute on chronic thromboembolism is contraindicated because of the risk for persistent pulmonary hypertension, right heart failure, and intractable pulmonary hemorrhage. However, in our patient, we not only performed pulmonary embolectomy, but also identified a chronic organized thrombus and performed a pulmonary endarterectomy with a successful recovery.

In conclusion, acute on chronic pulmonary thromboembolism can present as a massive overt embolic event with rapid deterioration, often requiring cardiopulmonary resuscitation. ECMO is a viable option for bridging to pulmonary endarterectomy in catastrophic cases. In addition to embolectomy, endarterectomy should also be considered for patients with acute on chronic pulmonary thromboembolism.

The differential diagnosis of chronic thromboembolism can be difficult. Early suspicion and early diagnosis may help avoid catastrophic events such as cardiopulmonary resuscitation or ECMO.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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