Combined catheter thrombus fragmentation and percutaneous thrombectomy in a patient with massive pulmonary emboli and acute cerebral infarct

Aylin Özsancak Uğurlu, Özlem Çınar*, İsmail Caymaz, Halime Çevik**, Burçak Gümüş****

Departments of Pulmonary, *Anesthesiology and Reanimation, **Radiology, Faculty of Medicine, Başkent University; İstanbul-*Turkey*

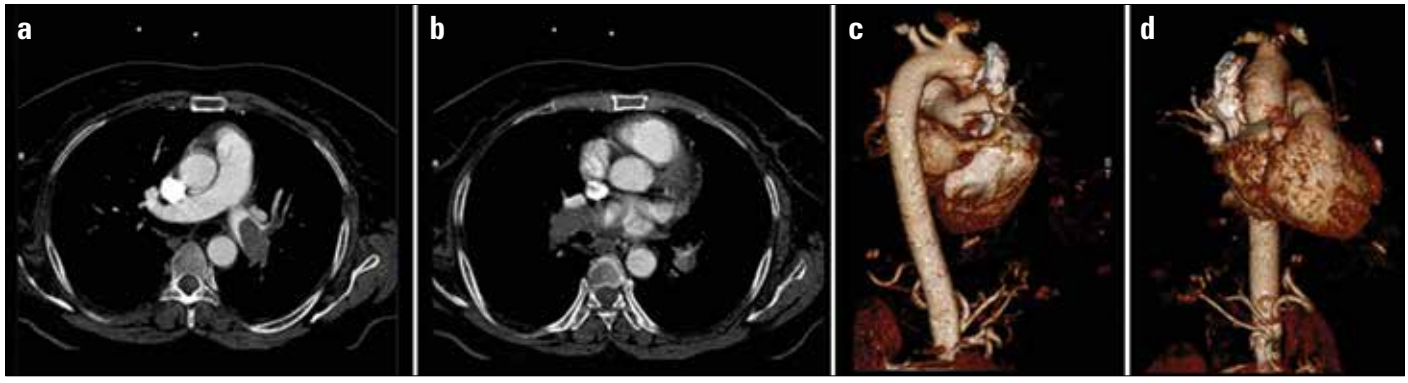

Figure 1. a-d. CT angiography and 3D images of intraluminal filling defect in the left (a, c) and right (b, d) main pulmonary arteries, extending into lobar branches

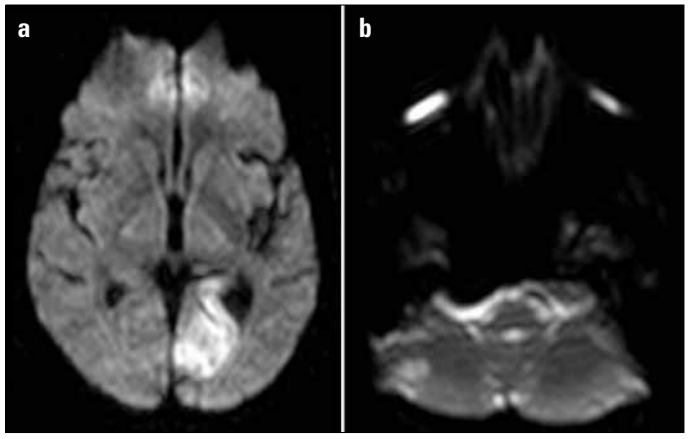

Figure 2. a, b. Brain diffusion MRI (b1000): demonstrated acute infarct areas in the left occipital (a) and bilateral cerebellar lobes (b)

Introduction

Acute massive pulmonary embolism (PE) constitutes approximately one-fifth of all PE events and is a life-threatening condition (1, 2). Although systemic thrombolysis is the recommended first-line treatment, in the case of high risk of bleeding, surgical embolectomy and percutaneous interventions are the alternative treatment options (3, 4). Here, we present a patient with massive PE and an acute cerebrovascular accident (CVA), treated successfully with a relatively lesser known and practiced treatment option.

Case Report

A 64-year-old female was admitted to the emergency department with increased shortness of breath, chest pain, recurrent syncope, and convulsion. She was normotensive and had dyspnea and tachypnea with oxygen saturation of 85% on room air. Arterial gases confirmed hypoxemic respiratory failure, and an electrocardiogram revealed incomplete right bundle-branch block and nonspecific T wave changes. D-dimer and troponin I levels were 3889 and 0.61 ng/mL, respectively. A subsequent CT pulmonary angiogram (CTPA) showed intraluminal filling defects in both main arteries, extending into the lobar branches (Fig. 1a-d). Brain diffusion MRI demonstrated acute infarct areas, as well as chronic ones (Fig. 2a, b). The echocardiography demonstrated right ventricular dilatation and free-wall akinesis and flattening of the interventricular septum with an estimated pulmonary artery systolic pressure of 60 mm Hg. However, the patient deteriorated clinically 1 hour after admission, with the need for intubation, Gelofusine, and inotrope infusion. The patient had major contraindications for systemic thrombolytic treatment because of the acute CVA and was also considered a poor surgical candidate for embolectomy. Therefore, she was taken to the interventional radiology catheter laboratory for percutaneous intervention.

Pulmonary angiography via a 5-F pigtail catheter, advanced through the inferior vena cava to the pulmonary truncus, revealed increased filling defects in both pulmonary arteries extending into the lobar branches compared to CTPA (Video 1). A 6-F guiding catheter was then advanced through both pulmonary arteries, and with assistance of a 0.035-inch hydrophilic guidewire, the guiding catheter was advanced beyond the thrombus, and large amounts of fragmented thrombus were recurrently aspirated. The control angiogram revealed a significant reduction in thrombus burden from both pulmonary arteries, with significant restoration of blood flow (Video 2). Oxygenation parameters and hemodynamics improved gradually. After the procedure, the patient was re-started on i.v. unfractionated heparin infusion. A reduction in systolic pulmonary arterial pressure (from 55-60 mm Hg to 40-45 mm Hg) with relatively increased right ventricular systolic functions was revealed in the echocardiography 1 day after the procedure. The patient was extubated on the 7th day and discharged on the 16th day.

Discussion

Acute massive PE is a relatively common condition with most hazardous life-threatening manifestations of venous thromboembolism (1, 3, 4). Systemic thrombolysis, in addition to anticoagulation, is the currently approved treatment of acute massive PE (3, 4). Surgical embolectomy is indicated in selected centers as an alternative in massive PE with contraindications to thrombolytics, failed thrombolysis, or shock with a high risk of sudden mortality before thrombolysis can take effect; however, it has rarely been performed even in the large registries (2, 4, 5). Percutaneous embolectomy is the only alternative in massive PE patients with contraindications to or failure of the treatment modalities mentioned above, if appropriate expertise and resources are available (3, 4).

Selective catheterization of the main right and left pulmonary arteries is routinely performed for percutaneous interventions for PE, with the frequent necessity of selective or sub-selective catheterization of pulmonary segments (6). Thrombus fragmentation (with or without use of local thrombolytics) breaks apart large emboli by direct mechanical action, with a risk for macroembolization, hemoptysis, or temporary mechanical hemolysis (7). Percutaneous thrombectomy can be per-

formed by direct aspiration of emboli or with rheolytic thrombectomy devices, with later devices (e.g., AngioJet rheolytic devices) being recommended to be avoided because of the higher rate of major complications (like bradycardia, heart block, hemoglobinuria, and procedure-related deaths) (6, 8-10).

There are no randomized controlled trials comparing the effects of different mechanisms or devices used for percutaneous intervention for PE. According to the most extensive meta-analysis results, the clinical success (defined as the stabilization of hemodynamics, resolution of hypoxia, and survival to hospital discharge) rate was 86.5%, with a major complication rate of only 2.4% (9).

Conclusion

This case shows that percutaneous interventions performed in experienced centers can be the only life-saving treatment option in patients otherwise dying from acute massive PE.

Video 1. Pulmonary angiography: before filling defects in both pulmonary arteries extending into lobar branches
Video 2. Control pulmonary angiography: reduction in thrombus from both pulmonary arteries

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Address for Correspondence: Dr. Aylin Özsancak Uğurlu, Başkent Üniversitesi Tıp Fakültesi, Oymacı Sok. No: 2 Altunizade, İstanbul-*Türkiye*
Phone: +90 532 742 52 33
Fax: +90 216 651 66 26
E-mail: aozsancak@hotmail.com
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