

Rheolytic thrombectomy with local thrombolysis in a patient with COVID-19 pneumonia and acute pulmonary embolism

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It has been shown that COVID-19 is associated with high rates of venous thromboembolism, particularly acute pulmonary embolism (APE).¹ However, it has also been suggested that the APE phenotype seen in patients with COVID-19 pneumonia differs from the one observed in patients without infection.^{1,2} COVID-19-associated APE likely represents a combination of thromboembolic disease and in situ immunothrombosis.¹ There are limited data on whether catheter-directed therapy (CDT) can safely and effectively cure high or intermediate-high risk APE in patients with SARS-CoV-2 infection.^{3,4}

We report a case of a 54-year-old man, positive for SARS-CoV-2, who was admitted to a tertiary hospital due to severe dyspnea at rest and mild chest pain. He was a non-smoker with no chronic comorbidities. On admission, physical

examination revealed a body temperature of 36.6°C, blood pressure of 110/75 mm Hg, heart rate of 120 bpm, respiratory rate of 30 breaths per minute, and oxygen saturation of 84% on room air. Electrocardiography showed a sinus tachycardia of 120 bpm, right axis deviation, and an S1Q3T3 pattern. The D-dimer level was significantly elevated at 5250 ng/ml (reference range, 0–500 ng/ml), the N-terminal pro-B type natriuretic peptide (NT-proBNP) concentration was elevated at 6362 pg/ml (reference range, 0–125 pg/ml), and the cardiac troponin level was within the reference range. Transthoracic echocardiography showed signs of right ventricular (RV) dysfunction with a tricuspid annular plant systolic excursion (TAPSE) of 13 mm, RV to left ventricular ratio greater than 1, paradoxical movements, and flattening of the intraventricular

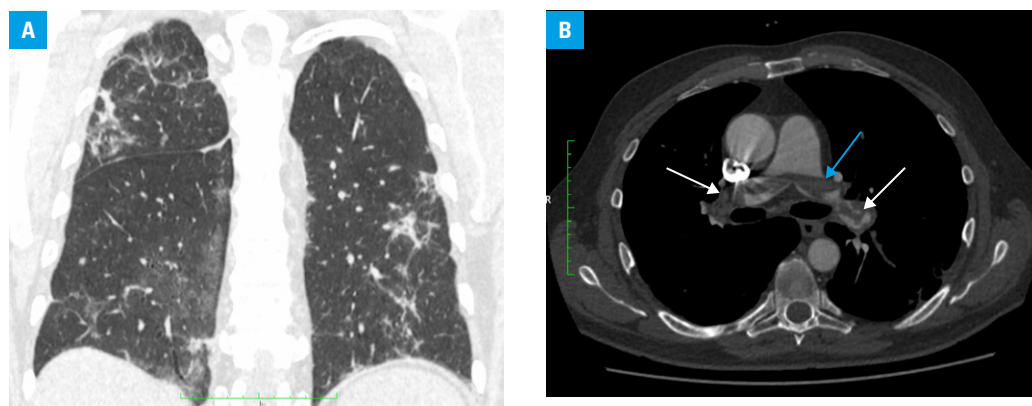
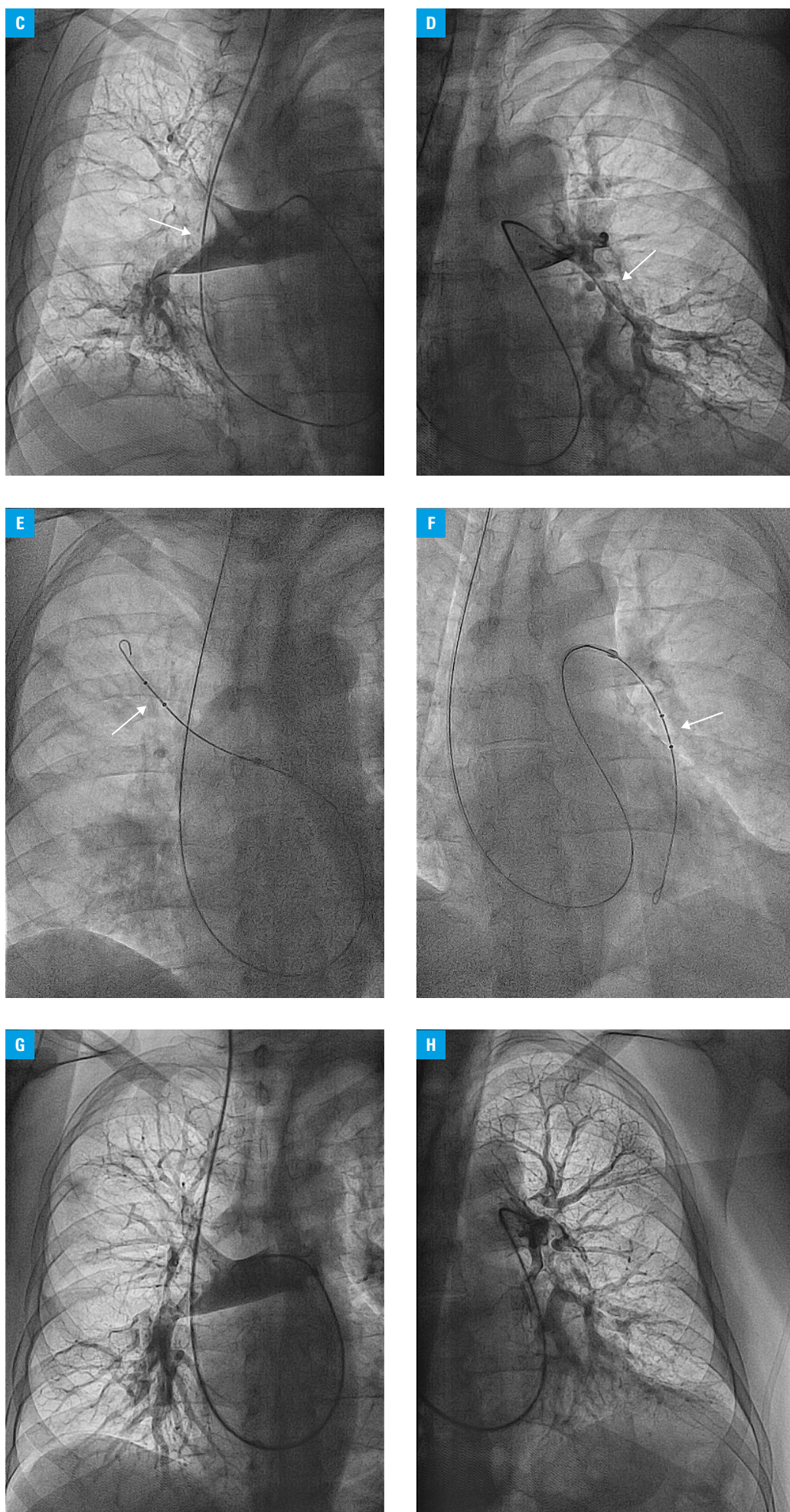


FIGURE 1 Computed tomography (CT) pulmonary angiography and pulmonary artery angiography in a patient with COVID-19 pneumonia and acute pulmonary embolism; **A** – coronal reconstruction from the initial CT demonstrating COVID-19 pneumonia; **B** – axial image from CT pulmonary angiography showing bilateral pulmonary embolism (white arrows) and a large saddle thrombus (blue arrow)

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FIGURE 1 Computed tomography (CT) pulmonary angiography and pulmonary artery angiography in a patient with COVID-19 pneumonia and acute pulmonary embolism; **C, D** – initial angiography of the right (**C**) and left (**D**) pulmonary arteries demonstrating massive pulmonary embolism in the proximal pulmonary arteries (arrows); **E, F** – an Angio Jet PE catheter in the right upper (**E**) and left lower (**F**) pulmonary arteries (arrows); **G, H** – angiography of both pulmonary arteries after successful thrombectomy



septum. Pulmonary acceleration ejection time was reduced at 55 ms and estimated RV systolic pressure was elevated at 73 mm Hg. Computed tomography pulmonary angiography revealed a saddle thromboembolus with extension into both main pulmonary arteries, indicating a massive thrombus load, as well as typical findings for COVID-19 pneumonia in the lungs: ground glass opacities and consolidation with over 40% lobar involvement (FIGURE 1A and 1B). Thus, the patient was referred to our local pulmonary embolism response team (PERT)⁵ and was categorized as intermediate-high risk (simplified Pulmonary Embolism Severity Index, 2 points; Bova score, 5 points). Due to the clinical and hemodynamic risk of deterioration, the PERT team decided to proceed with CDT. Pulmonary artery angiography was performed via the right internal jugular vein approach with an angulated 5-Fr pigtail catheter. It revealed a large thrombotic load within the main pulmonary trunk and both pulmonary arteries (FIGURE 1C and 1D). Rheolytic thrombectomy was performed with local thrombolysis using Power Pulse via an AngioJet PE catheter (Boston Scientific, St. Paul, Minnesota, United States) with a 0.035-inch hydrophilic guidewire, starting in the right and followed by the left pulmonary artery (FIGURE 1E and 1F). In total, 20 mg of tissue plasminogen activator (Actilyse) was injected into both pulmonary arteries. Total activation time of the AngioJet PE catheter was 70 seconds, and there were no major complications during the procedure. Final pulmonary artery angiography showed significant improvement in pulmonary arterial flow and restoration of peripheral perfusion (FIGURE 1G and 1H). A significant recovery of hemodynamics and gas exchange was noted whilst in the catheterization laboratory (heart rate reduced from 125 to 85 bpm and oxygen saturation increased from 84% to 97%). After successful CDT, the patient was transferred to the coronary care unit where low-molecular-weight heparin was continued. Control transthoracic echocardiography showed normal RV function with TAPSE of 24 mm and estimated RV systolic pressure reduced to 40 mm Hg. The level of NT-proBNP dropped to 578 pg/ml. The patient was discharged home on oral anticoagulation (rivaroxaban 15 mg twice daily for the first 21 days and 20 mg once a day thereafter) 7 days after the procedure, in good general condition and without supplemental oxygen.

In summary, our report demonstrates the diagnostic and therapeutic challenges in COVID-19-associated APE. The appropriate therapeutic strategy must balance the individual patient's risk of hemodynamic decompensation, the potential risk of complications during CDT, and the risk of exposing healthcare professionals to SARS-CoV-2 infection during the procedure.^{4,5} In this case report of a SARS-CoV-2-positive patient, CDT was deemed feasible and allowed an immediate hemodynamic stabilization and successful discharge home after only a few days.

Nevertheless, this management strategy merits further assessment in a larger cohort of patients with COVID-19 and APE.

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

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