

# Ultrasound-assisted thrombolysis for a giant right atrial thrombus and pulmonary embolism in a COVID-19 patient

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A 51-year-old male with type-2 diabetes and hypertension was admitted because of SARS-CoV-2 pneumonia (confirmed by real-time polymerase chain reaction). Physical examination revealed tachypnea, room air oxygen saturation 70%, body temperature 37.8°C, blood pressure 137/89 mm Hg, and a pulse of 100 bpm. Chest computed tomography (CT) showed extensive interstitial pneumonia affecting upper lobes with ground-glass opacities and crazy-paving pattern in lower lobes (Figure 1A). Global CT-score was 19 (severe involvement) [1].

Initial D-dimer was 333 ng/ml (reference range <500 ng/ml), troponin I was 0.003 ng/ml (reference range <0.03 ng/ml). Thromboprophylaxis with enoxaparin 60 mg daily was initiated.

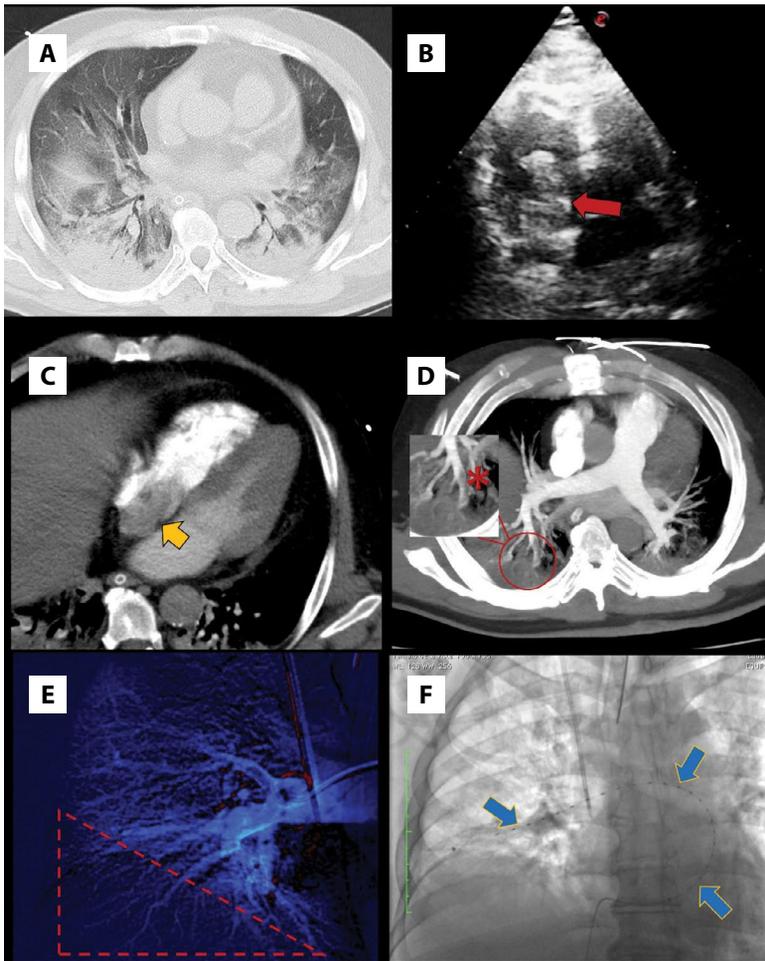
Two days after admission he progressed to severe acute respiratory distress syndrome and hemodynamic instability requiring invasive mechanical ventilation and vasopressors. D-dimer peaked at 30994 ng/ml, and troponin I reached 0.046 ng/ml. Transthoracic echocardiogram (TTE) showed a large, multilobular, highly mobile mass in the right atrium protruding into the right ventricle (Figure 1B; Supplementary material, Video S1). Right ventricular systolic function was impaired (shortening fraction 27%, tricuspid annular plane systolic excursion 15 mm).

Pulmonary CT angiography revealed a 51 × 25 mm filling defect in the right atrium (thrombus) (Figure 1C) and pulmonary embolus in the posterior basal segmental artery (right lung) (Figure 1D). The right ventricular to left ventricular diameter ratio was 1.30.

Hemodynamic instability, a recent self-limited inadvertent subclavian arterial puncture (relative contraindication for systemic

thrombolysis) and concerns about possible incomplete lysis with systemic thrombolysis due to the large size thrombus led to the decision of performing ultrasound-assisted thrombolysis. Before the procedure pulmonary arterial systolic/diastolic/mean pressure was 44/17/26 mm Hg. Invasive pulmonary angiography showed a hypoperfused area in the right lower pulmonary lobe (Figure 1E). The longest EKOS catheter (135 cm length) was chosen, targeting the treatment zone in the right atrium and right pulmonary artery (Figure 1F; Supplementary material, Video S2). Eighteen mg of alteplase (0.75 mg/h) were infused over 24 hours. Unfractionated heparin with a target activated partial thromboplastin time of 46 to 70 seconds was given simultaneously to alteplase. Enoxaparin 60 mg twice daily was administered afterward. The patient improved soon thereafter and was extubated 2 days later. A 24-hour post-procedure TTE showed a 9 × 2 mm remnant thrombus in the right atrium. Repeated TTE 5 days post-procedure showed thrombus resolution (Supplementary material, Video S3). The patient was discharged on day 10 post-procedure with apixaban. At 1 month follow-up, he fully reintegrated to previous life and working activities. However, lung parenchymal damage, incomplete resolution of pulmonary embolism, and endothelial dysfunction might cause persistent pulmonary hypertension [2], and as recommended by international guidelines, screening for chronic thromboembolic pulmonary hypertension will be performed at month 3.

This case highlights the prothrombotic state of patients with SARS-CoV-2 infection and



**Figure 1.** A. Chest computed tomography scan showing ground-glass opacities and crazy paving pattern in lower lobes associated with posterior basal consolidations. B. Transthoracic echocardiogram signalling the thrombus (red arrow). C. Four-chamber computed tomography signalling the thrombus (yellow arrow). D. Computed tomography pulmonary angiography demonstrating the pulmonary embolus (red asterisk). E. Pulmonary angiography demonstrating a hypoperfused area (dotted triangle). F. EKOS catheter inside the right atrium and right pulmonary artery (blue arrows)

demonstrates that ultrasound-assisted thrombolysis is an effective therapy for the treatment of concomitant right atrial thrombus and pulmonary embolism.

Advantages of ultrasound-assisted thrombolysis include the use of lower thrombolytic dose and lower bleeding risk compared with systemic thrombolysis [3]. Additionally, it is less invasive and more rapidly available compared with surgery [4], likely reducing the risk of exposure to a greater number of health personal in the operating and post-surgical care rooms. Potential benefits of a multidisciplinary pulmonary embolism response team strategy are improved outcomes, offering the most optimal strategy across a full range of advanced therapeutic options [5].

### Supplementary material

Supplementary material is available at [https://journals.viamedica.pl/kardiologia\\_polska](https://journals.viamedica.pl/kardiologia_polska).

### Article information

**Conflict of interest:** None declared.

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