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Concomitant high-risk pulmonary embolism and paradoxical ischemic stroke: aspiration thrombectomy as a treatment option

Short title: Concomitant high-risk pulmonary embolism and paradoxical stroke

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A 31-year-old man, with a history of steroid-dependent Crohn's disease and paraparesis, experienced simultaneous pulmonary embolism (PE) and paradoxical ischemic stroke. This patient was admitted to the emergency department with sudden dyspnea and chest discomfort. Initial examination revealed a hemodynamically stable patient but with severe type 1 respiratory failure and hypocapnia. His electrocardiogram showed sinus tachycardia (166/minute) and slight ST-segment depression in left precordial leads. Bedside transthoracic echocardiography revealed pulmonary artery acceleration time of 83 msec, moderate tricuspid regurgitation estimating a pulmonary artery systolic pressure of 35 mm Hg, mild right ventricular dilation with preserved systolic function, no signs of short axis pressure overload,

non-dilated inferior vena cava with normal inspiratory collapse, and preserved left ventricular function. Cardiac biomarkers were elevated (high-sensitivity troponin T was 0.147 ng/ml [reference values 0.000–0.014] and NT-pro-BNP was 2275 pg/mL [reference value <300]). Considering the clinical presentation of acute respiratory failure in a patient with prolonged immobilization, it was assumed a high clinical probability of PE and anticoagulation with enoxaparin was initiated without delay. Pulmonary computed tomography (CT) angiography further confirmed bilateral PE with a subocclusive thrombus in the right pulmonary artery and segmental thrombi in the left branches with filling defects (Supplementary material, *Figure S1*). One hour after admission, the patient suddenly developed focal neurological deficits. An urgent CT angiography of the cerebral arteries revealed an endoluminal thrombus occluding the proximal M1 and M2 segments of the right middle cerebral artery. Due to anticoagulation used initially for PE treatment, tissue plasminogen activator was not used for management of stroke, and thrombectomy of the right middle cerebral artery was performed with neurological improvement (Supplementary material, *Figure S2*, *Videos S1*, *S2*). At first, a conservative PE treatment with anticoagulation was favored since the patient was hemodynamically stable (intermediate-high risk PE). Nevertheless, the patient evolved with shock and transthoracic echocardiography showed progressive signs of right heart chambers overload: dilated right ventricle (44 mm) with signs of short axis pressure overload; pulmonary artery systolic pressure of 52 mm Hg; hypokinesia of the right ventricle mid-free wall; dilated inferior vena cava (22 mm) with normal respiratory variability. Considering the catastrophic progression to high-risk PE and the formal contraindication to systemic thrombolysis (concomitant ischemic stroke), it was decided to proceed with pulmonary aspiration thrombectomy. Pulmonary thrombectomy was successfully performed with the Indigo aspiration system (Indigo CAT 8Fr XTORQ) (Figure 1, Supplementary material, *Videos S3–S11*). During the procedure, mean pulmonary artery pressure dropped from 37 mmHg to 25 mmHg, improving lung perfusion and resolving the obstructive shock (aminergic support was stopped within the following hour).

This clinical case illustrates the catastrophic possibility of synchronous high-risk PE and ischemic stroke due to an intracardiac shunt (bubble study further revealed the presence of a patent foramen ovale in this patient) [1]. Concomitant presentation of massive PE and paradoxical ischemic stroke is considered a “double jeopardy” since the risk of brain hemorrhage contraindicates systemic thrombolysis for combined high-risk PE [2]. Currently, there is no agreed upon standard treatment in this situation [2]. Since systemic thrombolysis leads to a higher risk of hemorrhagic complications, percutaneous catheter-directed strategies

(such as pulmonary aspiration thrombectomy and catheter-directed thrombolysis) are emerging as potential alternatives [3–5]. In this case, pulmonary aspiration thrombectomy demonstrated to be a reliable and safe treatment option in patients who experience concomitant high-risk PE and ischemic stroke.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

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Figure 1. Pulmonary aspiration thrombectomy for management of concomitant high-risk pulmonary embolism (PE) and paradoxical stroke. **A.** Pulmonary angiography showing total

occlusion (black arrow) of the right pulmonary artery (white arrow). **B.** Pulmonary angiography revealing segmental occlusion (black arrow) of the left pulmonary artery (white arrow) and filling defects of its branches. **C–F.** Pulmonary angiography showing the final result with improved lung perfusion after aspiration thrombectomy

Abbreviations: PE: pulmonary embolism