

Lightning 12: A new player in the field of pulmonary percutaneous mechanical thrombectomy

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A 32-year-old male professional driver with a few days' dyspnea was admitted to our department. Physical examination revealed a heart rate (HR) of 110 bpm, respiratory rate (RR) of 31/min, and blood pressure (BP) of 114/62 mm Hg. Laboratory tests showed elevated troponin I (0.6 ng/ml; normal value <0.01 ng/ml) and low arterial saturation (SaO₂) — 89% despite oxygen supplementation through a mask with a reservoir bag (12 l/min). Computed tomography pulmonary angiography showed a large thrombus burden in both right (RPA) and left pulmonary artery (LPA). Echocardiography demonstrated right ventricular (RV) overload (increased RV/left ventricular [LV] ratio, 1.2) and decreased tricuspid annular plane systolic excursion

(TAPSE), 18 mm (Figure 1A). The Pulmonary Embolism Severity Index indicated intermediate risk (102 points — class III). Initial therapy with low-molecular-weight heparin (LMWH) in a weight-adjusted dose for 24 hours was ineffective, with symptoms worsening (increase of HR and oxygen demand, without hypotension) and further RV failure progression (RV/LV, 1.3; TAPSE, 16 mm). Thus, our institutional Pulmonary Embolism Response Team (PERT) qualified the patient for catheter-directed mechanical thrombectomy (CDMT).

The procedure was performed *via* right internal jugular venous access obtained with a 12 F vascular sheath. In a first step, selective angiography of RPA and LPA was performed and revealed large central thrombi bilaterally

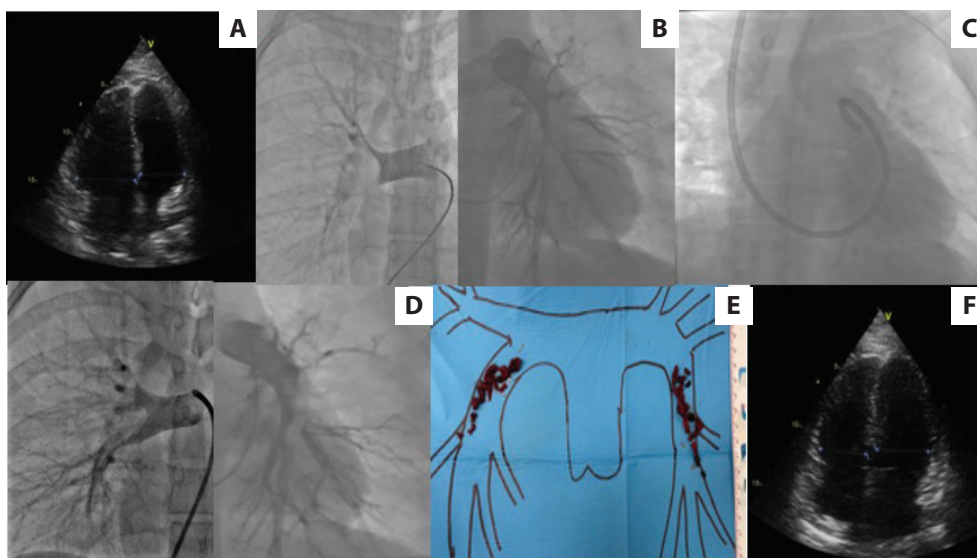


Figure 1. A. Echocardiography (apical four-chamber view) showing enlargement of the right ventricle (RV) before the procedure. B. Selective angiography of the right (RPA) and left pulmonary artery (LPA) before the procedure. C. The catheter-directed mechanical aspiration thrombectomy procedure with the Lightning 12 system in the LPA. D. Selective angiography of the RPA and LPA after the procedure. E. An image of the removed clots. F. Echocardiography (apical four-chamber view) showing normalization of the RV dimension after the procedure

mainly in the RPA and left lobar pulmonary arteries (Figure 1B). Subsequently, a 115 cm CAT12 HTORQ 12 F catheter of the Lightning 12 system (Penumbra, Alameda, CA, US) was inserted (the first use in Poland) through a 90-cm, 12 F Flexor sheath (Cook Medical, Bloomington, IN, US). Several repeated aspirations were performed in branches of the RPA and LPA with separator-wire-facilitated thrombus fragmentation (Figure 1C, E). The procedure resulted in significant bilateral thrombus burden reduction and a drop in mean pulmonary artery pressure from 28 mm Hg to 22 mm Hg, with no complications. However, increased stiffness of the device (due to a larger diameter of the catheter) resulted in worse maneuverability. The periprocedural blood loss was 300 ml. Twenty-four hours after CDMT, the patient's HR was 84 bpm, RR was 22/min, and SaO₂ was 94% on nasal cannula with a flow rate of 3 l/min, respectively. Echocardiography showed significant RV function improvement (RV/LV ratio, 0.9; TAPSE, 24 mm) (Figure 1F), and troponin I decreased to 0.08 ng/ml. LMWH was continued 48 hours after CDMT, and then warfarin was introduced (the patient was diagnosed with antiphospholipid syndrome).

The recent development of advanced endovascular therapies aims to reduce PE-related morbidity and mortality [1, 2]. CDMT involves devices for mechanical thrombus fragmentation and aspiration to quickly relieve the blockage and restore pulmonary blood flow with a subsequent improvement in the hemodynamic status in intermediate or high-risk PE [3, 4]. The key innovations of the novel Lightning 12 system are the new CAT12 catheter, with a large 0.131" lumen and angled tip for an additional circumferential sweep, and the lighting control unit with a pressure/flow sensor system and high-frequency

valves. These innovations aim to efficiently regulate aspiration and prevent excessive blood loss [5]. Our case showed that CDMT with the use of the Lightning 12 system was well tolerated and effective.

Article information

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