

Purpose

- We describe two cases of intermediate-high risk pulmonary embolism (IHRPE) treated with initial mechanical thrombectomy who experienced post-procedural clinical decompensation, ultimately requiring repeat thrombectomy in the absence of new embolic events.

Background

- Intermediate High Risk Pulmonary Embolism (IHRPE) is defined by elevation of cardiac biomarkers and radiographic evidence of right heart strain.
- There is uncertainty around the optimal therapeutic approach in this patient population.
- Percutaneous catheter directed thrombectomy (CDT) is increasingly used in IHRPE, but cases of clinical decompensation despite prompt intervention with thrombectomy is not well understood.
- Clinical decompensation is often attributed to a "second-hit" hypothesis, where deep vein thrombosis (DVT) re-embolizes post-procedure.
- Few studies have explored the underlying mechanism of clinical decompensation in the IHRPE population treated with CDT.

Methods

- Use of a single-center registry of over 600 Pulmonary Embolism Response Team-activated PE cases
- Identification of two patients with IHRPE who underwent CDT with initial clinical improvement followed by significant clinical decompensation leading to repeat thrombectomy
- Multidisciplinary review of clinical data, procedural details, angiographic images, and outcomes to evaluate for evidence of recurrent embolism and alternative mechanisms of decompensation

Case 1

- 46-year-old male admitted with large left frontal lobe parenchymal hemorrhage secondary to a ruptured aneurysm
- On day 22 of hospitalization, developed tachypnea, tachycardia, and increasing oxygen (O₂) requirements
- CTPA with pulmonary emboli in both left and right main pulmonary arteries with right heart strain (RV/LV ratio 1.46), duplex ultrasound with bilateral non-occlusive DVTs of femoral veins, NT proBNP of 247 pg/mL, high sensitivity troponin T of 265 ng/L
- Underwent CDT with improvement in PA pressures and vital signs but developed acute decompensation 4 hours later
- Repeat CTPA showed decreased thrombus burden in right PA with notably similar thrombus burden in pulmonary arteries when compared with initial post-angiographic imaging, and persistent right heart strain.
- Underwent repeat CDT and IVC filter placement
- Eventual discharge to a skilled nursing facility on apixaban

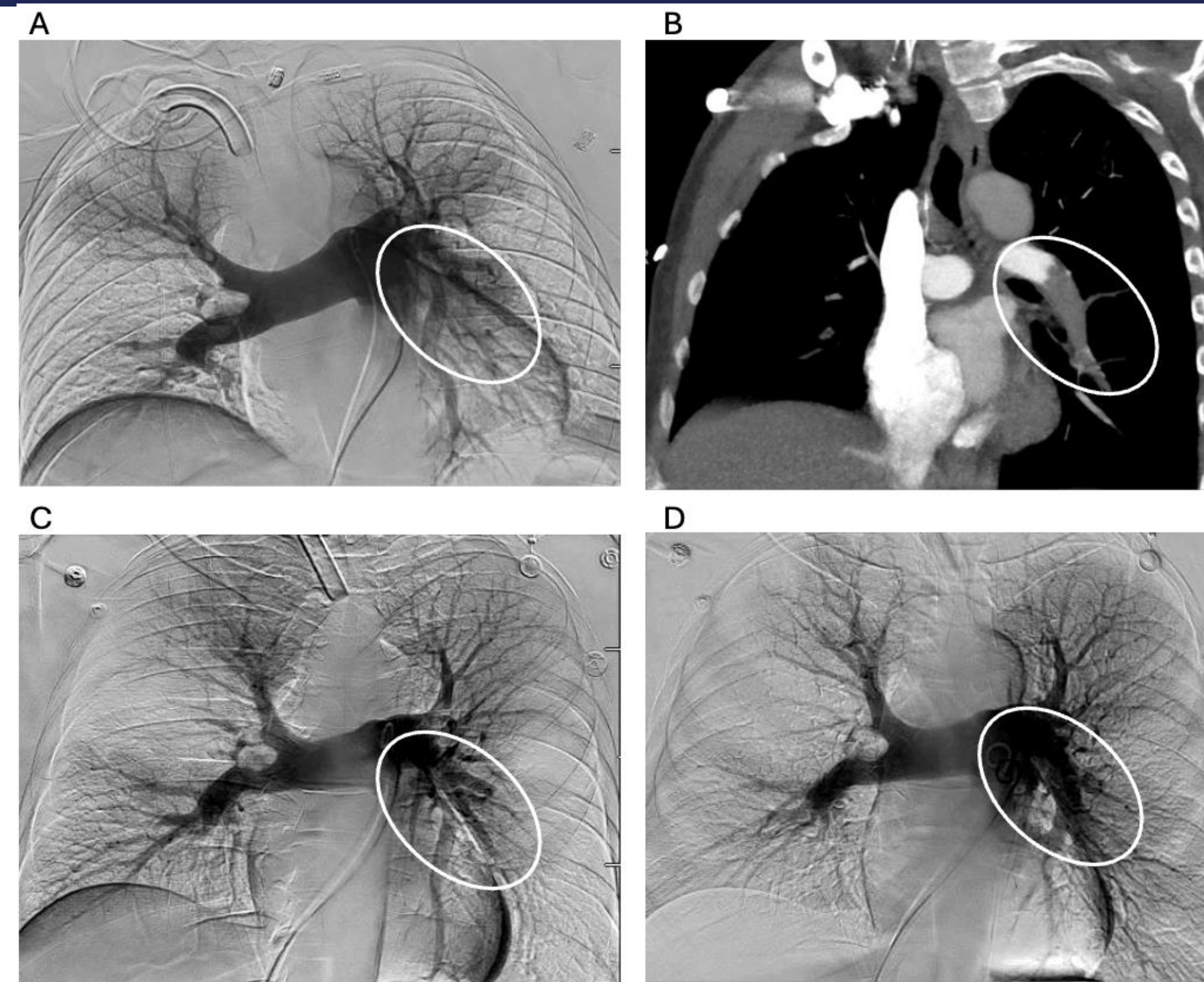


Figure 1. (A) Final fluoroscopic image from first thrombectomy procedure for patient in Case 1 showing filling defect in the left interlobar pulmonary artery. (B) CT coronal maximal intensity projection (MIP) image after decompensation event showing similar thrombus. (C) Pre-second thrombectomy pulmonary angiogram showing similar filling defect in left interlobar artery. (D) Post-second thrombectomy showing improved patency in left interlobar artery.

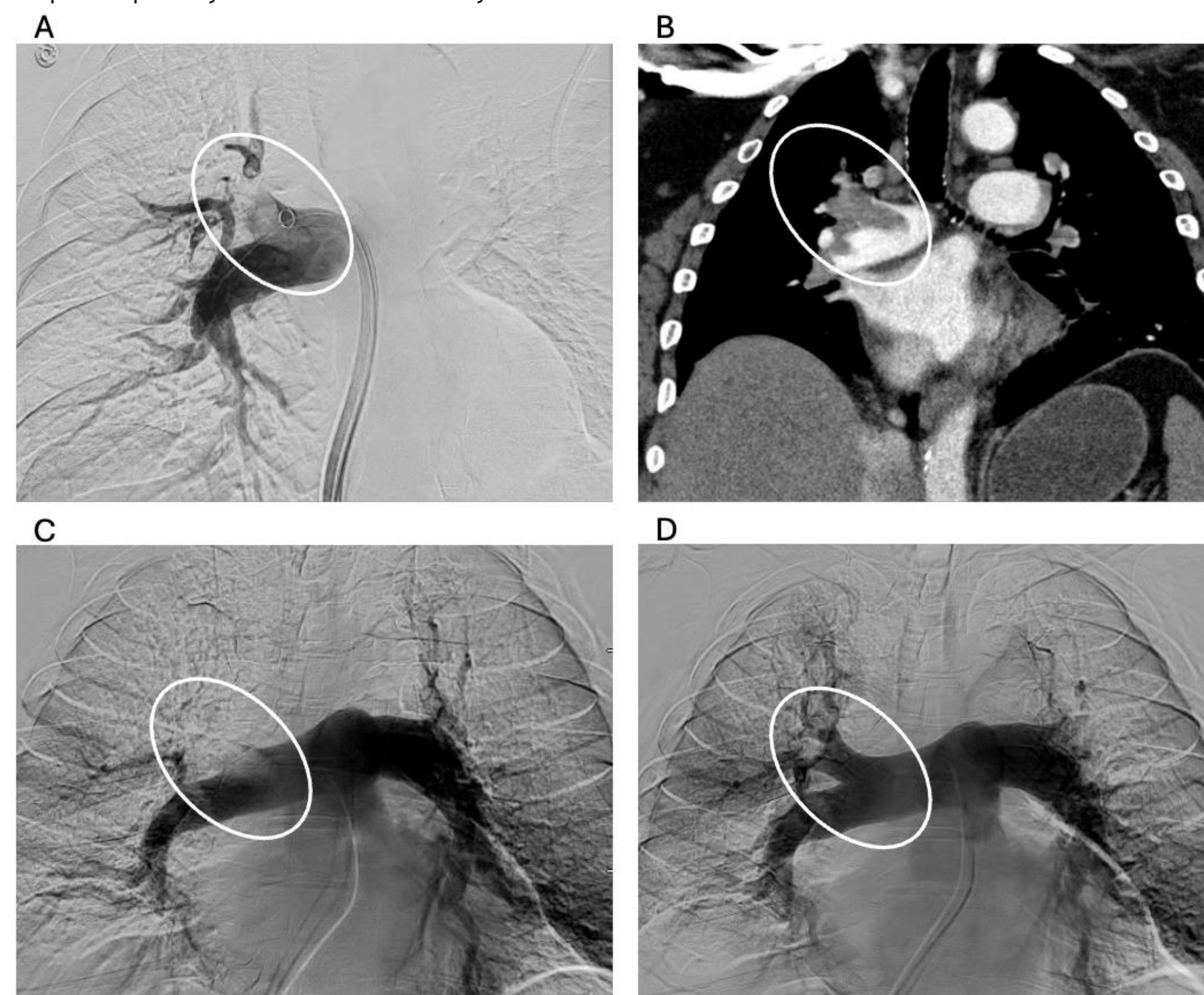


Figure 2. (A) Final fluoroscopic image from first thrombectomy procedure for patient in Case 2 showing filling defect in the truncus anterior. (B) CT coronal image after decompensation event showing similar thrombus. (C) Pre-second thrombectomy pulmonary angiogram showing similar filling defect in the truncus anterior. (D) Post-second thrombectomy showing improved patency in the truncus anterior.

Case 2

- 56-year-old male with recent arthrodesis and distal fibula autograft presenting to the emergency department on post-up day 44 with dyspnea, calf pain and swelling
- Found to be tachycardic, hypoxic requiring 6 L nasal cannula, and hypotensive with blood pressure 80/50 mm Hg
- CTPA with extensive bilateral pulmonary edema, most prominently in the left main pulmonary artery with evidence of right heart strain (RV/LV ratio 1.82), NT proBNP > 35,000 pg/mL, high sensitivity troponin 170 ng/L, duplex ultrasound with acute DVT in the left femoral and popliteal vein
- Underwent CDT with improvement in his oxygen requirements and work of breathing but developed acute decompensation on day 2 of hospitalization
- Repeat CTPA interpretation noting possible new right main pulmonary artery thrombus though comparison with index procedure post-thrombectomy images showed similar clot burden
- Repeat CDT and IVC filter placement performed
- Discharged on apixaban with home oxygen

Results

- Both patients had radiographic and biochemical evidence of right ventricular (RV) strain and bilateral PE, underwent initial mechanical thrombectomy, and showed transient clinical improvement.
- Hours later, both experienced hemodynamic and respiratory deterioration necessitating vasopressors and respiratory support.
- Both underwent repeat CDT due to presumed "second hit", but interventional radiology review of serial pulmonary angiograms showed stable clot burden, indicating no new embolic event. Both patients improved following repeat thrombectomy.

Discussion and Conclusion

- Decompensation following percutaneous thrombectomy in patients with IHRPE with concomitant DVT may result from a non-thrombotic mechanism, as opposed to previously thought "second hit hypothesis".
- Possible mechanisms include pulmonary vasoconstriction or worsening right ventricular dysfunction due to myocardial injury.
- Further studies needed to identify risk factors for post-thrombectomy decompensation and which patients may benefit from early intervention.

References

- Chandra VM, Khaja MS, Kryger MC, et al. Mechanical aspiration thrombectomy for the treatment of pulmonary embolism: A systematic review and meta-analysis. *Vascular Medicine*. 2022;27(6):574-584. doi:10.1177/1358863x221124681
- Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *European Respiratory Journal*. 2019;54(3):1901647. doi:10.1183/13993003.01647-2019
- Hennemeyer C, Khan A, McGregor H, Moffett C, Woodhead G. Outcomes of Catheter-Directed Therapy Plus Anticoagulation Versus Anticoagulation Alone for Submassive and Massive Pulmonary Embolism. *Am J Med*. Feb 2019;132(2):240-246. doi:10.1016/j.amjmed.2018.10.015