

Bilateral Pulmonary Thrombectomy and in Situ Thrombolysis in a Secondary Care Hospital: Case Report

López Marroquín Brenda Citlalic^{*1}, Quintero Pánuco Jair Alexander²

^{1,2} Hospital General de Zona No.1 Dr. Luis Ernesto Miramontes Cárdenas, Instituto Mexicano del Seguro Social; Tepic, Nayarit.

ABSTRACT

High-risk pulmonary embolism is a life-threatening emergency caused by acute right ventricular failure. In hemodynamically unstable patients, the lack of computed tomographic angiography in secondary health care justifies immediate invasive diagnosis and management in the cath lab.

The patient, a presenting with sudden dyspnea, chest pain, hypotension, and desaturation, showed atrial fibrillation and an S1Q3T3 pattern on the electrocardiogram, while the echocardiogram confirmed severe right ventricular dysfunction. Due to the unavailability of computed tomographic angiography at a secondary-care facility, urgent right heart catheterization was performed, revealing severe pulmonary hypertension and angiography demonstrating massive bilateral pulmonary embolism with an absence of distal flow in the right upper branch. Multiple mechanical thrombectomy passes were performed combined with low-dose in situ localized fibrinolysis using alteplase which achieved immediate angiographic improvement in antegrade flow without complications. In accordance with international cardiology guidelines, mechanical thrombectomy combined with in situ thrombolysis constitutes a highly effective and safe percutaneous rescue strategy for high-risk PE, serving as a viable therapeutic alternative in secondary health care when advanced imaging is unavailable or systemic lysis is restricted.

KEYWORDS: Pulmonary Embolism; Mechanical Thrombectomy; Thrombolytic Therapy; Cardiac Catheterization; Pulmonary Hypertension.

ARTICLE DETAILS

Published On:
27 July 2026

Available on:
<https://ijmscrs.com>

I. INTRODUCTION

Acute high-risk pulmonary embolism (PE) represents a critical cardiovascular emergency associated with profound short-term morbidity and mortality, driven primarily by acute right ventricular failure and subsequent obstructive shock (1, 2). Pathophysiologically, the abrupt occlusion of the pulmonary arterial bed induces a sharp increase in RV afterload, triggering a maladaptive cascade characterized by right ventricular myocardial ischemia, decreased left ventricular preload, diminished systemic cardiac output, and eventual circulatory collapse (2, 3). Clinically, severe pulmonary embolism manifests as an acute syndromic spectrum, predominantly presenting with sudden-onset dyspnea, pleuritic chest pain, tachypnea, syncope, or hemoptysis (1, 4). Upon physical examination, hallmark signs predictive of adverse clinical outcomes include persistent hypotension (defined as a systolic blood pressure

<90 mmHg or a drop ≥ 40 mmHg lasting more than 15 minutes), profound tachycardia, central cyanosis, and macroscopic markers of systemic venous congestion, such as jugular venous distension (2, 4).

In accordance with the recent 2026 Guideline for the Evaluation and Management of Acute Pulmonary Embolism in Adults, the clinical approach to suspected PE has been reclassified into a precision framework based on categories from A to E (1). While early stages (Categories A and B) dictate outpatient care or accelerated discharge pathways, advanced presentations involve Category C (Intermediate Risk), Category D (Incipient Cardiopulmonary Failure), and Category E (Cardiopulmonary Failure/High Risk) (1). For stable cohorts, diagnostic algorithms validated by the European Society of Cardiology (ESC/ERS) prioritize clinical probability indexing via modified Wells or Geneva scores combined with age-adjusted D-dimer testing,

Bilateral Pulmonary Thrombectomy and in Situ Thrombolysis in a Secondary Care Hospital: Case Report

establishing computed tomographic pulmonary angiography (CTPA) as the gold standard for definitive confirmation (2, 5). However, in hemodynamically unstable individuals or secondary-care hospital settings lacking immediate CTPA availability, bedside transthoracic echocardiography serves as the core diagnostic and discriminative instrument (2, 6). Key echocardiographic signs indicative of severe RV pressure overload encompass an increased RV/LV end-diastolic diameter ratio (>1.0), flattening of the interventricular septum (the left ventricular "D-shaped" sign), reduced tricuspid annular plane systolic excursion (TAPSE <16 mm), a decreased tricuspid valve systolic velocity (S' wave <9.5 cm/s), the 60/60 sign, and McConnell's sign (regional mid-free wall RV akinesis with sparing of the apex) (2, 6).

International consensus mandates that the convergence of hemodynamic instability and these echocardiographic markers justifies the immediate initiation of reperfusion strategies without diagnostic delay for tomographic confirmation (2).

Regarding therapeutic decision-making, the 2026 multi-society guidelines heavily emphasize the early activation of Pulmonary Embolism Response Teams to tailor invasive strategies (1, 7). Systemic thrombolysis using recombinant tissue plasminogen activators has historically constituted the first-line reperfusion modality in high-risk PE due to its ubiquitous availability (1, 2). Nevertheless, up to 30% to 50% of critically ill patients exhibit absolute or relative contraindications—such as recent major surgery or high bleeding risks—or present clinical failure following systemic bolus administration (2, 3). To address these limitations, endovascular percutaneous catheter-directed therapies—including aspiration mechanical thrombectomy, clot fragmentation, and ultrasound-assisted thrombolysis combined with low-dose in situ localized pharmacologic fibrinolysis—have emerged as a Class IIa rescue recommendation for Category D and E patients (1, 8). Contemporary clinical data demonstrate that these endovascular techniques achieve a rapid reduction in mean pulmonary artery pressure and RV afterload, optimizing anterograde flow and systemic perfusion while drastically reducing the incidence of major hemorrhagic complications, such as intracranial hemorrhage, compared with systemic regimens (1, 8).

We present the case report of a patient with severe bilateral high-risk PE and acute RV dysfunction whose diagnosis was established via urgent right heart catheterization.

II. CASE PRESENTATION

A 51-year-old male patient with a history hypertension and a surgical history of Fournier's gangrene in December 2025.

The patient experienced a sudden onset of resting dyspnea and precordial pain that worsened upon inspiration,

prompting them to present to the emergency department of a secondary care hospital. Upon presentation, the patient was found to have an oxygen saturation of 88%, tachycardia, and hypotension. A 12-lead electrocardiogram was performed, revealing atrial fibrillation, a Q wave in lead III, and T-wave inversion in lead III.

An echocardiogram was performed, demonstrating right ventricular dysfunction with a tricuspid annular plane systolic excursion (TAPSE) of 13 mm, a tricuspid S-wave velocity of 7.5 cm/s, D-shaped left ventricle, McConnell's sign, an RV/LV ratio > 1 , and the 60/60 sign.

A computed tomography pulmonary angiogram (CTPA) was requested to confirm the diagnosis; however, the imaging equipment was unavailable. Therefore, in the clinical context of high-risk pulmonary embolism, urgent right heart catheterization and pulmonary angiography were performed.

The procedure revealed a dilated main pulmonary artery trunk and confluent, dilated pulmonary artery branches. The right pulmonary artery exhibited a thrombus extending toward the right upper lobe branch, with a complete absence of distal flow, poor arborization, and impaired tapering (Figure 1). The left pulmonary artery showed a thrombus in the lobar branch with reduced distal contrast opacification. The pulmonary valve was competent without regurgitation. Severe pulmonary hypertension was documented, with a mean pulmonary artery pressure (mPAP) of 47 mmHg and a pulmonary wedge pressure (PWP) of 25 mmHg (Table 1).

Table 1. Baseline Right Heart Catheterization Pressures

Chambers	Initial Pressure
TAP	64/36 mmHg
MPAP	47 mmHg
PWP	25 mmHg

A diagnosis of severe bilateral pulmonary embolism was established. Consequently, targeted mechanical thrombectomy was performed at the site of occlusion in multiple passes, followed by catheter-directed fibrinolysis: a 20 mg bolus of alteplase was administered into the right pulmonary artery, and a 10 mg bolus into the left pulmonary artery.

Post-procedure angiography of the main pulmonary artery trunk demonstrated improved antegrade flow into both the right and left pulmonary arteries, along with superior arborization and tapering (Figure 1).

Bilateral Pulmonary Thrombectomy and in Situ Thrombolysis in a Secondary Care Hospital: Case Report

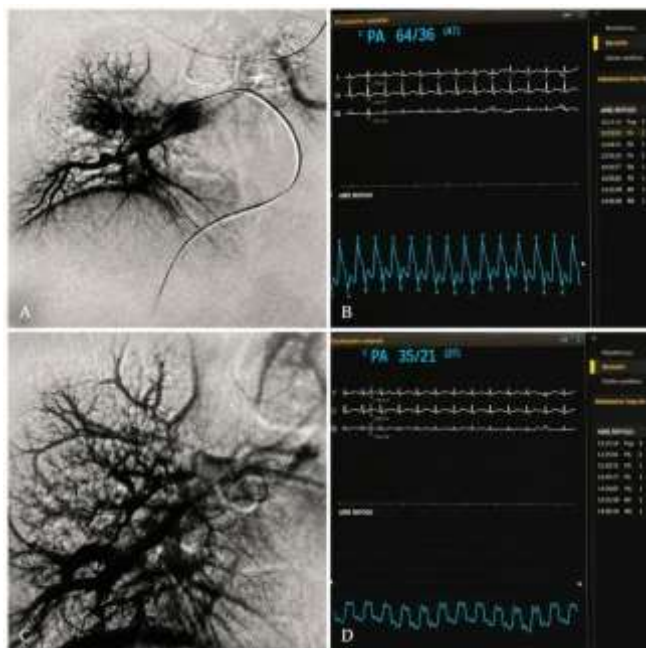


Figure 1. A. Right pulmonary artery demonstrating a thrombus extending toward the right upper lobe branch, with complete absence of distal flow. B. Baseline main pulmonary artery pressure. C. Angiogram demonstrating improved antegrade flow into the right pulmonary artery. D. Post-intervention main pulmonary artery pressure.

Final pressure measurements showed significant improvement, indicating mild pulmonary hypertension with a post-intervention mPAP of 27 mmHg (Table 2).

Table 2. Post-Intervention Right Heart Catheterization Pressures

Chambers	Final Pressure
TAP	35/21 mmHg
MPAP	27 mmHg

III. CONCLUSIONS

The successful resolution of this clinical case demonstrates that the percutaneous endovascular approach via repetitive mechanical thrombectomy combined with low-dose in situ localized fibrinolysis represents a highly effective, safe, and reproducible rescue strategy for patients presenting with severe high-risk bilateral pulmonary embolism, hemodynamic instability, and severe right ventricular dysfunction. In a secondary-care hospital setting, where the unavailability of computed tomographic pulmonary angiography infrastructure frequently delays critical decision-making, bedside echocardiography and urgent right heart catheterization establish themselves as decisive diagnostic and discriminative instruments to initiate advanced therapies immediately.

Despite the inherent resource limitations and lack of high-complexity diagnostic imaging modalities in community secondary-care facilities, this report underscores that the availability of a functional cardiac catheterization laboratory

coupled with clinical expertise is sufficient to rapidly reverse obstructive shock. The timely intervention not only achieved immediate hemodynamic restoration and normalization of pulmonary artery pressures without associated complications but also favorably modified the patient's short-term prognosis and survival.

This outcome is strongly supported by contemporary international scientific evidence, including recent clinical trials and meta-analyses (2020–2026), which validate catheter-directed therapies over anticoagulation alone and confirm their superior hemorrhagic safety profile compared to traditional systemic thrombolysis. In conclusion, this case highlights the clinical viability and the critical need to expand complex endovascular interventions to secondary-level community hospitals, establishing local endovascular intervention as a definitive first-line therapeutic alternative for severe PE, particularly when conventional systemic thrombolysis is restricted or contraindicated.

REFERENCES

- I. AHA/ACC/CHEST/SCAI/Multi-Society. 2026 AHA/ACC/ACCP/ACEP/CHEST/SCAI/SHM/SIR/SVM/SVN Guideline for the Evaluation and Management of Acute Pulmonary Embolism in Adults: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. 2026
- II. Konstantinides, S. V., 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 Heart Journal*, 41(4), 543–603.
- III. Piazza, G. Advanced Management of Acute Pulmonary Embolism. *Journal of the American College of Cardiology*, 76(18), 2117–2129. 2020.
- IV. Kabrhel, C., et al. Clinical presentation and diagnostic evaluation of suspected acute pulmonary embolism in the emergency department. *Journal of the American College of Emergency Physicians Open*, 2(3), e12432. 2021.
- V. Klok, F. A., et al. Diagnosis of acute pulmonary embolism: when to use computed tomographic pulmonary angiography. *Lancet Respiratory Medicine*, 8(6), 614–622. 2020.
- VI. Rudski, L. G., et al. Guidelines for the echocardiographic assessment of the right heart in adults: a report from the American Society of Echocardiography. *Journal of the American Society of Echocardiography*, 23(7), 685–713.
- VII. Rivera-Lebron, B., Matusov, Y., Khan, M. R., et al. Diagnosis, Treatment and Follow Up of Acute Pulmonary Embolism: Consensus Practice from the

Bilateral Pulmonary Thrombectomy and in Situ Thrombolysis in a Secondary Care Hospital: Case Report

- National PERT Consortium. Clinical and Applied Thrombosis/Hemostasis, 25, 1-16. 2019.
- VIII. Pruszczyk, P., Klok, F. A., Kucher, N., et al. Percutaneous treatment options for acute pulmonary embolism: a clinical consensus statement by the ESC Working Group on Pulmonary Circulation and Right Ventricular Function and the European Association of Percutaneous Cardiovascular Interventions. *EuroIntervention*, 18(8), e623-e638. 2022.
- IX. Stevens SM, Wollphardtsen Z, Kreuziger LB, et al. Antithrombotic Therapy for VTE Disease: Second Update of the CHEST Guideline and Expert Panel Report. *Chest*, 2021;160(6):e545-e608.
- X. Randomized Controlled Trial of Mechanical Thrombectomy With Anticoagulation Versus Anticoagulation Alone for Acute Intermediate-High Risk Pulmonary Embolism: Primary Outcomes From the STORM-PE Trial. *Circulation*, 2025/2026.
- XI. Large Bore Mechanical Thrombectomy Versus Catheter-Directed Thrombolysis for the Treatment of Intermediate-Risk Pulmonary Embolism (The PEERLESS Study). Presentado en las Sesiones Científicas de TCT/AHA y publicado en revistas de alto impacto, 2025
- XII. Toma C, Jaber WA, Weinberg MD, et al. Acute Outcomes for High-Risk Pulmonary Embolism: Results From the FLASH Registry. *EuroIntervention*, 2023;19(2):154-162.
- XIII. Rosenfield K, et al. Higher-Risk Pulmonary Embolism Thrombolysis (HI-PEITHO) Randomized Controlled Trial. Publicado en literatura intervencionista indexada, 2024/2025.
- XIV. Khan MZ, et al. Efficacy and Safety of Catheter-Directed Therapies Versus Systemic Thrombolysis and Anticoagulation Alone in Acute Pulmonary Embolism: A Systematic Review and Network Meta-Analysis. *Journal of the American Heart Association (JAHA)*, 2024.
- XV. Al-Hakim R, et al. Safety and Efficacy of Large-Bore Mechanical Thrombectomy for Acute Pulmonary Embolism: A Systematic Review and Meta-Analysis. *Journal of Vascular and Interventional Radiology (JVIR)*, 2022;33(10):1150-1158.