Saudi Journal of Radiology
December 2025, 87-95
Proceeding of the 16th Annual Meeting of Radiology Society of Saudi Arabia (RSSA)
Original Article

# FIBRIN SHEATH THROMBOSIS TREATMENT OPTIONS IN A POST PARTUM PATIENT WITH CARDIOGENIC SHOCK, THE ROLE OF INTERVENTIONAL RADIOLOGY: A CASE REPORT

Bashar Babkour[1], Mohanned Banaamah[2], Ahmed Elsakhawy[3], and Noha Guzaiz[4]

[1,2,3,4]Department of Radiology, King Abdullah Medical City, Makkah, Saudi Arabia.

**Corresponding Author**

Bashar Babkour, Department of Radiology, King Abdullah Medical City, Makkah, Saudi Arabia Arabia
Email: babkour.b@gmail.com

**Copyright:** © 2025 The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**eISSN:** 1658-8959

## ABSTRACT

Thrombosis among childbearing women represents a rare yet serious complication, wherein the interplay of endothelial injury, altered flow dynamics, and the prothrombotic state of this period promotes clot formation. When IVC thrombus coexists with high-risk pulmonary embolism accompanied with refractory cardiogenic shock, maternal mortality is extremely high despite aggressive systemic therapy. In such cases, extracorporeal membrane oxygenation (ECMO) is a rescue modality, providing cardiopulmonary support while further interventions are planned. Although data remain limited, recent reports suggest maternal survival rates above 80 % (1-4). We present the case of a 27-year-old postpartum woman who developed acute respiratory distress and rapid cardiovascular collapse only three days after an uncomplicated vaginal delivery. Initial evaluation revealed elevated troponin and D-dimer levels, raising suspicion for pulmonary embolism. Computed tomography pulmonary angiogram was inconclusive. Despite aggressive medical management, the patient progressed to severe cardiogenic shock and required veno-arterial ECMO followed by Impella support. Repeat echocardiography demonstrated a large, highly mobile thrombus at the upper IVC. Ongoing hemodynamic instability persisted despite systemic thrombolysis, prompting urgent mechanical thrombectomy. The thrombus was successfully aspirated with hemodynamic improvement and no procedural complications. Post-intervention, the patient exhibited progressive stabilization, underscoring the role of interventional thrombectomy as a rescue strategy in cases of refractory caval thrombosis with advanced circulatory support.

**Keywords:** Thrombosis, Post Partum, Cardiogenic Shock, Maternal Mortality, Prothrombotic State

# 1. BACKGROUND

Venous thromboembolism (VTE) is a significant clinical condition that can lead to severe morbidity and mortality. It is the third most common cardiovascular disorder globally, following myocardial infarction and stroke [1]. In women of childbearing age, the risk of VTE is generally low but can increase due to physiological and hormonal changes. Pregnancy, in particular, creates a hypercoagulable state due to increased levels of fibrinogen and factors VII, VIII, and X, along with decreased fibrinolytic activity, the risk estimated to be four to five times higher than in non-pregnant women of similar age [2,3]. The risk is highest during the postpartum period, particularly in the first six weeks after delivery. Physiological changes such as venous stasis due to uterine compression of pelvic veins, hormonal-induced vascular changes, and reduced mobility post-delivery all contribute. VTE is a leading cause of maternal morbidity and mortality worldwide [4].

Catheterization is a well-established risk factor for VTE. Indwelling catheters can disrupt endothelial integrity and promote thrombus development, an amplified effect in the hypercoagulable states of pregnancy and the postpartum period. Catheter-related thrombosis (CRT) has become increasingly significant with the widespread use of central venous lines, which are essential for chemotherapy administration, parenteral nutrition, hemodynamic monitoring and long-term intravenous therapy [5]. Clinically, CRT effects may be minimal as the patient may present with arm swelling, erythema or pain (post thrombotic syndrome). Other substantial consequences can include pulmonary embolism (PE) in 10-15%, loss of venous access in 10% and infection [6].

Cardiogenic shock (CS) is a life-threatening condition that occurs when the heart is unable to pump sufficient blood to meet the body's demands. It is commonly caused by severe heart failure, acute myocardial infarction (MI), or complications related to cardiac surgery. The condition is characterized by hypotension, tissue hypoperfusion, and organ dysfunction, making it one of the most critical emergencies in cardiology and intensive care medicine [7]. The incidence of cardiogenic shock during pregnancy is relatively low but can be devastating when it occurs, it places a strain on the cardiovascular system due to increased blood volume, cardiac output, and heart rate [8].

In severe cardiogenic shock, when conventional therapies such as medications and mechanical ventilation are insufficient, advanced circulatory support is required. Extracorporeal Membrane Oxygenation (ECMO) is one of the most

advanced modalities, providing both cardiac and respiratory support by withdrawing blood, oxygenating it outside the body, and returning it to circulation. In childbearing women, ECMO has been successfully used in cases of peripartum cardiomyopathy and other acute heart failure conditions. Another option is the Impella device, a percutaneous ventricular assist device (VAD) that directly unloads the left ventricle and enhances cardiac output. Impella may be considered when ECMO is not feasible.

Prompt diagnosis and treatment of VTE are critical to reduce both acute and long term complications [9]. Anticoagulation is yet the cornerstone of treatment. Direct oral anticoagulants (DOACs) such as rivaroxaban and apixaban are now first-line for most patients due to their efficacy, ease of use, and favorable safety profiles [10]. Low molecular weight heparin (LMWH) remains important, especially in patients with cancer, renal dysfunction, or during pregnancy [11]. Catheter-directed thrombolysis (CDT) and sprevent long-term complications [12,13]. Current guidelines recommend consideration of thrombectomy when anticoagulation alone is insufficient or in life-threatening scenarios [14].

## 2. CASE SCENARIO

A previously healthy woman was transferred to our tertiary care center after developing acute respiratory distress three days following an otherwise uncomplicated normal vaginal delivery. Her pregnancy and peripartum course had been uneventful. The patient reported sudden onset of shortness of breath, pleuritic chest discomfort, and near-syncope. At the referring facility, vital signs showed hypotension, tachycardia, and hypoxemia requiring high-flow oxygen.

Initial laboratory assessment revealed markedly elevated troponin and D-dimer levels. Arterial blood gas demonstrated metabolic acidosis with elevated lactate, consistent with systemic hypoperfusion. Electrocardiography revealed nonspecific ST-T changes. Findings along with the clinical presentation are suspicious of a thromboembolic or acute cardiac process.

Given the postpartum state a recognized hypercoagulable period and laboratory profile, pulmonary embolism was strongly suspected. A high-resolution computed tomography (CT) pulmonary angiogram was performed using a dedicated pulmonary embolism protocol to identify obstructing thrombus within the pulmonary arterial tree. Surprisingly, the study was inconclusive, showing neither definitive embolus nor a clear alternative explanation for the patient’s profound hemodynamic instability.

### 2.1 Diagnosis And Medical Management:

Despite initiation of broad supportive measures including high-flow oxygen, vasopressors, and intravenous diuretics the patient's clinical status deteriorated rapidly. Blood pressure remained unstable, lactate levels elevated, and oliguria developed, threatening of impending cardiogenic shock. Echocardiography at the referring institution showed global hypokinesis of the left ventricle. Given her worsening hemodynamics and profound hypoxemia, the decision was made to transfer the patient to our facility for advanced mechanical circulatory support.

Upon arrival, she was emergently cannulated for veno-arterial extracorporeal membrane oxygenation (VA-ECMO). This provided immediate systemic perfusion and oxygenation, stabilizing her blood pressure and oxygen saturation while unloading the failing heart and sustaining circulation during further diagnostic evaluation. Intravenous heparin was initiated at a rate of 300 IU/hr to maintain circuit patency and prevent thrombotic complications associated with ECMO. An urgent transthoracic echocardiogram performed after cannulation revealed severe left ventricular dilation with globally depressed systolic function. The estimated ejection fraction was 10–15%, consistent with profound myocardial dysfunction and critical cardiogenic shock. Right ventricular function was moderately reduced but showed no overt signs of pressure overload.

Although ECMO provided initial stabilization for the last seven days, persistent left ventricular dilation raised concern for pulmonary congestion and left heart distension. After a multidisciplinary team consultation involving cardiology, cardiac surgery, and critical care specialists, the decision was made to transition from ECMO to Impella support, which provides direct left ventricular unloading by actively pumping blood from the left ventricle into the ascending aorta, thereby reducing ventricular filling pressures and improving coronary perfusion.

During follow-up imaging to reassess cardiac function, a repeat echocardiogram incidentally revealed a highly mobile echogenic mass within the upper inferior vena cava (IVC), near its junction with the right atrium which represent a floating thrombus tethered to the fibrin sheath of the recently removed ECMO cannula. This finding was alarming. A mobile thrombus at this location carries an immediate risk of embolization into the right atrium and pulmonary circulation, potentially causing massive pulmonary embolism and sudden death (Figure 1). Given the high risk, bivalirudin was administered at a steady rate of 1.2 mg per hour for a total of four days to reduce the likelihood of thrombus embolization. Despite prompt systemic anticoagulant therapies administered at the bedside, the

patient's clinical status remained unwarranted. Lactate levels continued to climb, signifying worsening tissue hypoperfusion. The combination of refractory cardiogenic shock and the presence of a mobile IVC thrombus created a scenario of extreme risk. Continuing with medical therapy was considered inadequate and potentially fatal.

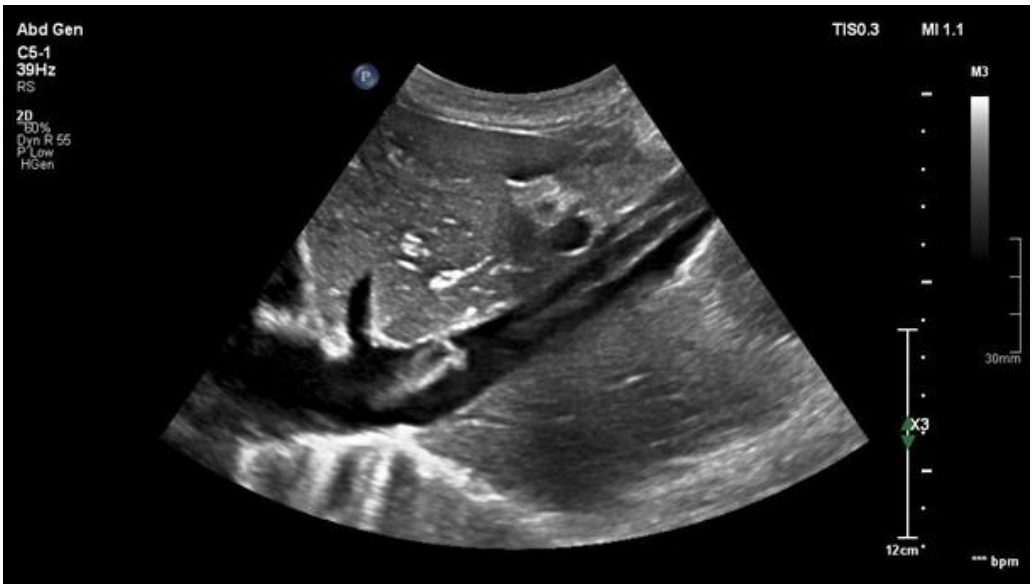


**Figure 1.** An echogenic mass is seen incidentally during routine follow-up echocardiogram at hepatic segment of the IVC, appears attached to fibrin sheath of ECMO and has a free-floating distal portion that moves with the blood flow.

### 2.2 Interventional Management:

A multidisciplinary team discussion involving cardiology, interventional radiology, critical care, and hematology concluded that urgent mechanical thrombus aspiration offered the best chance for rapid source control, immediate restoration of venous flow, and reduction of embolic risk. Under general anesthesia, the patient was brought to the interventional radiology suite. Continuous hemodynamic monitoring was maintained throughout. Intra-procedural venogram delineated the exact location of the thrombus (Figure 2). Given the risk of clot fragmentation during manipulation, a high-level IVC filter was first deployed above the thrombus under fluoroscopic guidance through the right internal jugular vein, to ensure protection of the right atrium and pulmonary arteries should embolization occur during the procedure.

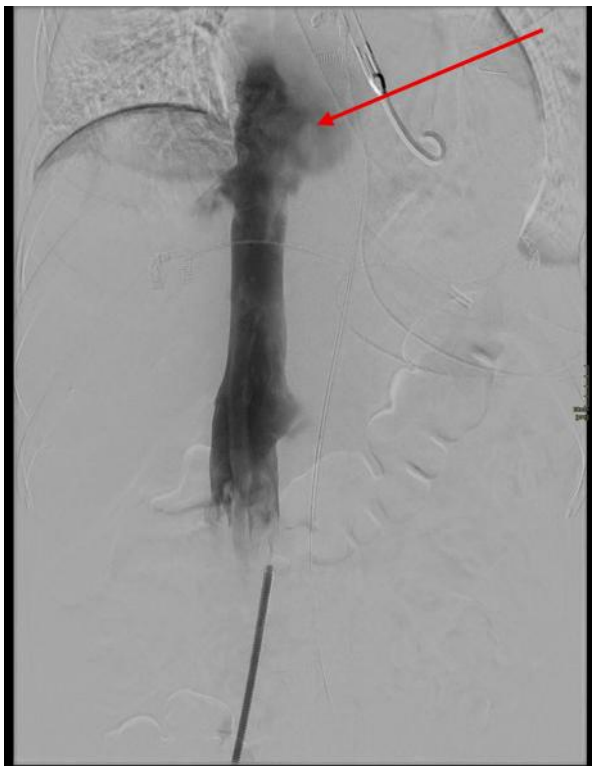

**Figure 2.** A longitudinal eccentric intraluminal filling defect is noted within the IVC in the initial venogram (arrow)

Mechanical aspiration was performed using the Penumbra Indigo® System, a CAT8 aspiration catheter originally designed for peripheral and neurovascular thrombectomy but increasingly utilized for caval thrombus extraction. The system includes a high-suction vacuum pump and a flexible large-lumen catheter capable of navigating the IVC safely. The catheter was advanced to the upper IVC over a guidewire through the right common femoral vein, under real-time fluoroscopic and ultrasound guidance. Continuous aspiration allowed removal of extensive thrombus burden. Careful monitoring of the clot with intermittent venogram to assess thrombus removal and vessel patency. No vascular injury or device malfunction occurred. Total blood loss was minimal, and hemodynamics remained stable throughout the procedure. The protective IVC filter captured small embolic fragments, preventing pulmonary embolism. During the procedure, systemic anticoagulation was maintained with intravenous unfractionated heparin, carefully titrated to balance bleeding risk in the postpartum setting.

Post-procedural venogram confirmed complete clearance of the thrombus and restoration of flow of the IVC (Figure 3). The protective filter was relocated to

the standard infrarenal position to ensure ongoing protection. Importantly, the patient experienced immediate hemodynamic improvement upon returning to cardiac care unit (CCU). Blood pressure stabilized without escalating vasopressor requirements, and lactate levels began to decline within hours. Oxygenation improved, and Impella support requirements decreased.

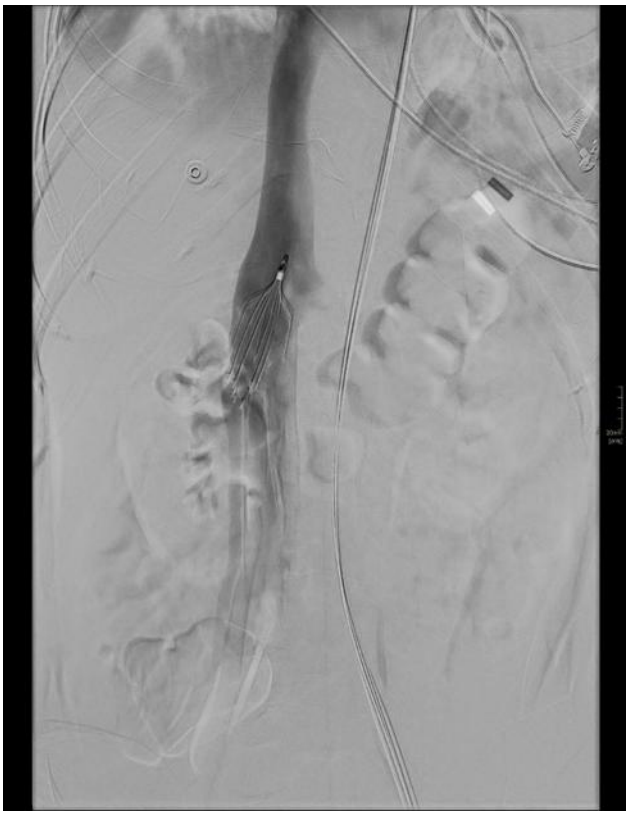

**Figure 3.** A post-procedural venogram shows interval resolution of the eccentric intraluminal filling defect with complete opacification of the IVC.

## 3. CONCLUSION

This case underscores the high mortality associated with high-risk caval thrombosis complicated by persistent cardiogenic shock, particularly in the postpartum setting. The successful outcome demonstrates that interventional thrombectomy, especially when combined with prophylactic IVC filter placement, can be a life-saving rescue strategy when conventional medical therapy is inadequate. This combined approach can lessen the overall thromboembolic burden.

This case represents the importance of early recognition of device-related thrombosis, multidisciplinary collaboration, and the thoughtful use of emerging thrombectomy technologies to achieve favorable outcomes in otherwise fatal clinical scenarios.

## 4. CONFLICTS OF INTEREST

All authors declare no conflict of interest

## 5. ACKNOWLEDGMENT

The authors acknowledge the primary team for referring this critical case and extend appreciation to the treating physicians for their crucial role in its successful management.

## 6. DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work the authors used GPT-4 (OpenAI, San Francisco, USA) to improve the readability of some of the sections, assure homogeneity of the passages and reduce redundancies in writing. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

## 7. REFERENCES

[1] Heit JA. Epidemiology of venous thromboembolism. Nat Rev Cardiol. 2015 Aug;12(8):464–74.

[2] Pomp ER, Lenselink AM, Rosendaal FR, Doggen CJM. Pregnancy, the postpartum period and prothrombotic defects: risk of venous thrombosis in the MEGA study. J Thromb Haemost. 2008 Apr;6(4):632–7.

[3] Bates SM, Greer IA, Middeldorp S, Veenstra DL, Prabulos AM, Vandvik PO. VTE, thrombophilia, antithrombotic therapy, and pregnancy: Antithrombotic Therapy and Prevention of Thrombosis. Chest. 2012;141(2_suppl):e691S–e736S.

[4] Knight M, Kenyon S, Brocklehurst P, Neilson J, Shakespeare J, Kurinczuk JJ, editors. Saving Lives, Improving Mothers' Care. Oxford: National Perinatal Epidemiology Unit, University of Oxford; 2014.

[5] Wall C, Moore J, Thachil J. Catheter-related thrombosis: A practical approach. J Intensive Care Soc. 2016;17(2):160-7.

[6] Verso M, Agnelli GJ. Venous thromboembolism associated with long-term use of central venous catheters in cancer patients. J Clin Oncol 2003; 21: 3665–3675.

[7] Thiele H, Zeymer U, Neumann FJ, et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2011;32(23):2999–3054.

[8] Hilfiker-Kleiner D, Schafers M, Pieske B, et al. Peripartum cardiomyopathy: new insights in pathophysiology, diagnosis, and treatment. Heart Fail Rev. 2013 Jul;18(4):463–9.

[9] Heit JA. Epidemiology of venous thromboembolism. Nat Rev Cardiol. 2015 Aug;12(8):464–74.

[10] Kearon C, Akl EA, Ornelas J, et al. Antithrombotic Therapy for VTE: CHEST Guideline. Chest. 2016 Feb;149(2):315–52.

[11] Bates SM, Rajasekhar A, Middeldorp S, et al. VTE, thrombophilia, antithrombotic therapy, and pregnancy: ASH guideline. Blood Adv. 2018 Nov;2(22):3317–59.

[12] Vedantham S, Goldhaber SZ, Julian JA, et al. Pharmacomechanical Catheter-Directed Thrombolysis for DVT. N Engl J Med. 2017 Dec;377(23):2240–52.

[13] Chatterjee S, Chakraborty A, Weinberg I, et al. Thrombolysis for PE and mortality: meta-analysis. JAMA. 2014 Jun;311(23):2414–21.

[14] Konstantinides SV, Meyer G, Becattini C, et al. ESC Guidelines on PE management. Eur Heart J. 2020 Aug;41(4):543–603.