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CATHETER-BASED THROMBECTOMY FOR CLOT-IN-TRANSIT AND MASSIVE PULMONARY EMBOLISM IN A YOUNG PATIENT WITH RHEUMATOID ARTHRITIS: INFLAMMATION AS A HIDDEN CATALYST FOR CATASTROPHIC THROMBOEMBOLISM

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ABSTRACT

Introduction: Pulmonary embolism (PE) is a life-threatening condition with well-defined management strategies; however, the presence of a clot-in-transit (CIT)—a mobile thrombus within the right heart—introduces a uniquely high-risk scenario associated with a significantly elevated mortality rate. While several therapeutic approaches are available—including anticoagulation, systemic thrombolysis, surgical embolectomy, and catheter-directed therapies—there is no established consensus on a superior treatment modality. Catheter-based mechanical thrombectomy has emerged as a promising, minimally invasive alternative that mitigates the bleeding risks of systemic thrombolysis and the invasiveness of surgery.

Case description: A 37-year-old male with untreated rheumatoid arthritis presented to the emergency department with dyspnea and chest pain, ultimately found to have massive bilateral PE with CIT. This was successfully treated with percutaneous thrombectomy using the INARI FlowTriever device (Inari Medical, USA).

Discussion: This case is accompanied by uncommon post-thrombectomy imaging that vividly demonstrates the thrombus burden in the majority of bilateral pulmonary vessels, providing valuable visual insight into the disease process and intervention efficacy. Rheumatoid arthritis is an independent risk factor for PE, deep vein thrombosis, and venous thromboembolism, highlighting the importance of treatment.

Conclusion: This report contributes to the limited literature on atypical CIT presentations, highlights the need for standardized treatment algorithms, and demonstrates the success of catheter-directed mechanical thrombectomy in these scenarios.

KEYWORDS

Catheter-directed therapy, clot in transit, hemodynamics, pulmonary embolism, thrombectomy

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LEARNING POINTS

- Rheumatoid arthritis is a risk factor for pulmonary embolism, deep vein thrombosis, and venous thromboembolism.
- Catheter-directed mechanical thrombectomy for massive pulmonary embolism with clot-in-transit is a promising, minimally invasive alternative to systemic thrombolysis.

INTRODUCTION/BACKGROUND

Pulmonary embolism (PE) is a life-threatening condition with well-defined management strategies; however, the presence of a clot-in-transit (CIT)—a mobile thrombus within the right heart—introduces a uniquely high-risk scenario associated with a significantly elevated mortality rate. While several therapeutic approaches are available—including anticoagulation, systemic thrombolysis, surgical embolectomy, and catheter-directed therapies—there is no established consensus on a superior treatment modality. Catheter-based mechanical thrombectomy has emerged as a promising, minimally invasive alternative that mitigates the bleeding risks of systemic thrombolysis and the invasiveness of surgery. We present a rare case of massive bilateral PE with CIT in a young adult with underlying rheumatoid arthritis, successfully treated with percutaneous thrombectomy using the INARI FlowTriever device (Inari Medical, USA). This case is accompanied by uncommon post-thrombectomy imaging that vividly demonstrates the thrombus burden in the majority of bilateral pulmonary vessels, providing valuable visual insight into the disease process and intervention efficacy. This report contributes to the limited literature on atypical CIT presentations and highlights the need for standardized treatment algorithms.

CASE DESCRIPTION

A 37-year-old male with a history of hypertension, type 2 diabetes mellitus, chronic tobacco use, and untreated rheumatoid arthritis presented to the emergency department with a two-day history of progressively worsening dyspnoea and pleuritic chest pain. He was hemodynamically stable on arrival but exhibited sinus tachycardia in the 140 s and oxygen saturation of 88% on room air, improving to 94% with 5 l/min via nasal cannula. Physical examination revealed non-pitting bilateral lower extremity oedema, which the patient reported had been worsening over the previous week.

Laboratory evaluation was notable for mildly elevated brain natriuretic peptide and troponin levels, suggestive of right heart strain. Computed tomography pulmonary angiography (CTPA) demonstrated a large thromboembolic burden with bilateral pulmonary emboli extending from the main pulmonary arteries into lobar and segmental branches. Imaging also revealed right ventricular dilation and a filling defect in the right atrium, concerning for a CITas seen in *Fig. 1*. Lower extremity venous Doppler ultrasound confirmed extensive bilateral deep vein thrombosis.

The patient was promptly started on intravenous heparin. Following multidisciplinary discussion involving critical care, cardiology, and interventional radiology, the decision was made to proceed with emergent percutaneous mechanical thrombectomy. Using the INARI Triever24 embolectomy catheter with transoesophageal echocardiography guidance, a large thrombus was successfully extracted from the right atrium. The catheter was subsequently advanced into the right pulmonary artery, where pre-intervention pulmonary artery pressure measured 38 mmHg. Pulmonary angiography revealed thrombi in the right middle and lower lobes, truncus anterior branches, and the lingular and left

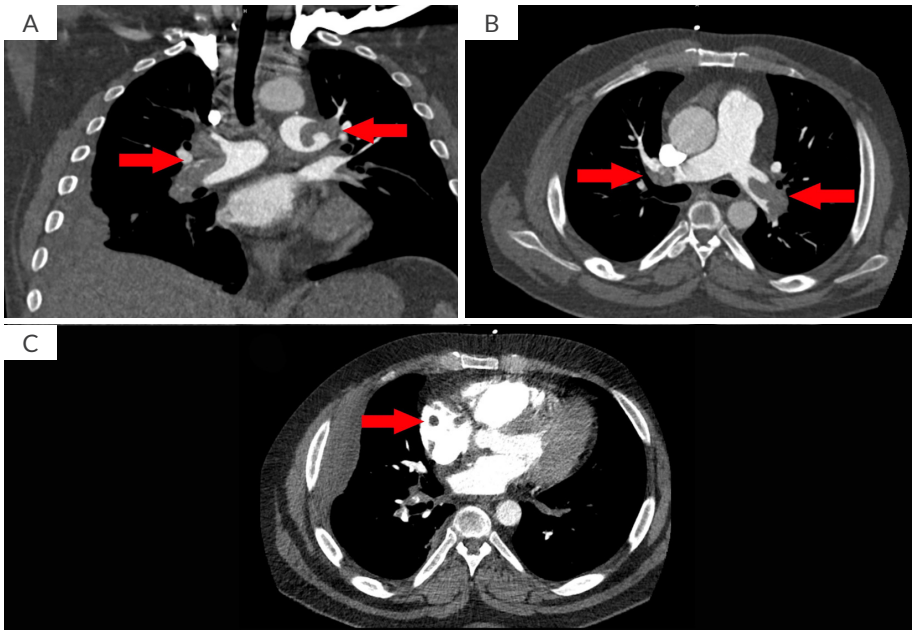


Figure 1. A) Coronal computed tomography angiography (CTA) delineates an extensive thromboembolic burden within the central and segmental pulmonary arterial tree (red arrows). B) Axial CTA slice further characterizes the severity of pulmonary arterial occlusion, highlighting near-complete obstruction of multiple distal branches (red arrows). C) Large serpiginous thrombus visualized within the right atrium, consistent with a clot-in-transit, poised for embolization (red arrow).



Figure 2. Post-thrombectomy anatomical reconstruction illustrating the total extracted thrombus burden, meticulously arranged to reflect its original intravascular distribution and anatomical provenance.

lower lobe segmental branches. Mechanical thrombectomy was performed with successful extraction of thrombotic material, as seen in *Fig. 2*, reducing mean pulmonary artery pressure to 16 mmHg. Estimated blood loss during the procedure was 250 ml.

A post-procedural transthoracic echocardiogram demonstrated concentric left ventricular hypertrophy with preserved systolic and diastolic function, normal chamber dimensions, and no valvular abnormalities. The patient tolerated the procedure without complications and was discharged in stable condition the following day. Given his underlying inflammatory disorder and absence of provoking risk factors, he was discharged on indefinite anticoagulation therapy, with plans for outpatient rheumatologic and hematologic evaluation.

DISCUSSION

Clot-in-transit (CIT) is reported in 2.6 to 18% of PE cases and is associated with significantly elevated mortality rates, particularly when accompanied by right heart strain or massive embolic burden[1,2]. CIT tends to occur more frequently in patients with underlying malignancy, congestive heart failure, or older age groups[1,3]. Presentation in a young adult with untreated rheumatoid arthritis and no clear provoking factor, as in this case, is unusual and underscores the importance of considering autoimmune-driven hypercoagulability in atypical PE presentations[4]. Additionally, it has been demonstrated in the literature that the risk of PE, deep vein thrombosis, and venous thromboembolism is higher in patients with rheumatoid arthritis compared to the general population, independent of other risk factors[5]. This also highlights the importance of encouraging rheumatoid arthritis treatment.

Despite increasing recognition of CIT as a high-risk PE variant, no consensus guidelines exist to direct optimal management[3]. Systemic thrombolysis, while widely accessible, carries substantial risk in CIT due to potential thrombus fragmentation and paradoxical embolization[3]. Bleeding complications occur in up to 20% of PE patients, making thrombolysis particularly unsuitable for those with contraindications such as recent trauma or coagulopathy. Surgical embolectomy remains an option but is invasive, resource-intensive, and limited to specialized centres, with reported mortality rates up to 11% even without CIT[3,4].

In contrast, catheter-based therapies—particularly percutaneous mechanical thrombectomy—offer a minimally invasive, hemodynamically effective alternative with a more favourable safety profile[3,4]. The FlowTriever system allows direct thrombus extraction without thrombolytics, reducing bleeding risk and often obviating the need for intensive postoperative care. While 250 ml of blood loss may initially appear higher than expected in less complicated scenarios, the amount of blood loss was proportional to the size and distribution of clots removed in the right heart and bilateral pulmonary arteries. One concern during a catheter intervention for CIT is the risk of paradoxical embolism in the setting of a patent foramen ovale and right-to-left flow, which is addressed with pre-operative echocardiography. Fortunately, these anatomical complications were not present in our patient. This case uniquely demonstrates its successful application in a young patient with massive bilateral PE, extensive clot burden, and confirmed CIT, along with rare post-thrombectomy angiography, performed to evaluate residual thrombus burden, showing persistent clot distribution across most of the bilateral pulmonary vasculature[3,4].

Given the patient's age and autoimmune background, as well as the rare anatomical extent of embolism visualized, this report adds novel insight to the growing evidence base for catheter-directed management of CIT. Larger studies are needed to further delineate treatment algorithms and validate outcomes in complex, atypical cases like this[4]. This case also highlights the association of autoimmune conditions such as rheumatoid arthritis with thromboembolic events, although for such a large clot burden, as seen in our patient, to occur is quite rare, especially given the patient's age.

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