CASE REPORT
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Successful percutaneous mechanical thrombectomy treatment for a patient with chronic deep vein thrombosis: a case report

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ABSTRACT

Background: This case report details the management of atypical chronic deep vein thrombosis (DVT) in a 24-year-old male. The treatment of DVT is complex and case-dependent; however, most individuals are managed with oral anticoagulation therapy, while complex cases can be treated with advanced interventions. Only a few publications discuss about endovascular procedure of chronic DVT. This report discusses a singular case of an atypical or complex DVT undergoing a thrombectomy using an Indigo Penumbra system.

Case illustration: A 24-year-old male was admitted to the hospital with bilateral leg swollen for 8 years ago. His history was unremarkable, and he was diagnosed with bilateral lower extremities deep vein thrombosis and was routinely administered anticoagulants. Laboratory results showed a significant increase in d-dimer levels. Venography confirmed bilateral deep vein thrombosis in the femoral vein system. He then underwent percutaneous mechanical thrombectomy with the Indigo Penumbra system. Small fragments of white thrombus were collected from the system container. He was discharged 1 day post-operatively and scheduled for further workup.

Conclusion: This case report elaborates on a patient with an atypical chronic white thrombus DVT who underwent a thrombectomy after imaging showed extensive thrombotic disease in the right lower extremity. Despite the few publications, percutaneous mechanical thrombectomy using the Indigo Penumbra System showed promising results in chronic DVT.

Keywords: deep vein thrombosis, percutaneous mechanical thrombectomy.
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INTRODUCTION

A deep vein thrombosis is a multifactorial disorder in which a thrombus or blood clot forms in the deep veins of the upper or lower limbs. While age, gender, obesity, smoking, and other variables all contribute to the development of thrombosis, the most significant risk factors are venous stasis, endovascular damage, and hypercoagulability, also known as thrombophilia. These components are collectively known as Virchow's Triad.[1-3]

Endothelial wall damage and underlying inflammatory processes cause subendothelial collagen to be exposed, activating clotting factors that lead to platelet aggregation and thrombus formation. While thrombus can form spontaneously, underlying hereditary or acquired thrombophilias, such as coagulation cascade factor abnormalities, platelet disorders, malignancies, oral contraceptive drugs, or infections, can significantly enhance the risk of thrombosis. Increased venous stasis caused by extended immobility or vascular diseases might promote the formation of DVTs.[3,4,5]

The treatment of DVT is complicated and case-specific; nonetheless, oral anticoagulation medication is used for the majority of patients. Advanced procedures, such as catheter-directed thrombolysis and thrombectomy, can be used to treat complex patients. This report discusses a singular case of an atypical or complex DVT in a young man with prior venous thromboembolic events who underwent a thrombectomy using a Penumbra with Indigo Catheter system.[5-7]

Percutaneous mechanical thrombectomy (PMT) is an alternate means of treating DVT. PMT uses a variety of percutaneous devices, and mechanical techniques for removing a thrombus clot mainly include suction, rotation, rheolytic thrombectomy, and ultrasound, or a combination of these. However, until now no recommendations for PMT for the treatment of chronic DVT. This case represents an atypical case of atypical DVT where thrombectomy was successfully performed with PMT.

CASE PRESENTATION

A 24-year-old male came to the hospital with enlargement of both legs for 6 years. He had a history of a lower left leg bone fracture and had undergone external fixation 14 years ago. No history of prolonged bedridden, immobilization, and high-risk activity could induce DVT. He has also routinely consumed Xarelto 15 mg twice daily for the past year. On examination, both legs were swollen, and there was no resting pain; distal perfusion and pulsation were unremarkable. There

Figure 1. Showed clinical picture of the patient, venography, and ultrasound of lower extremities.

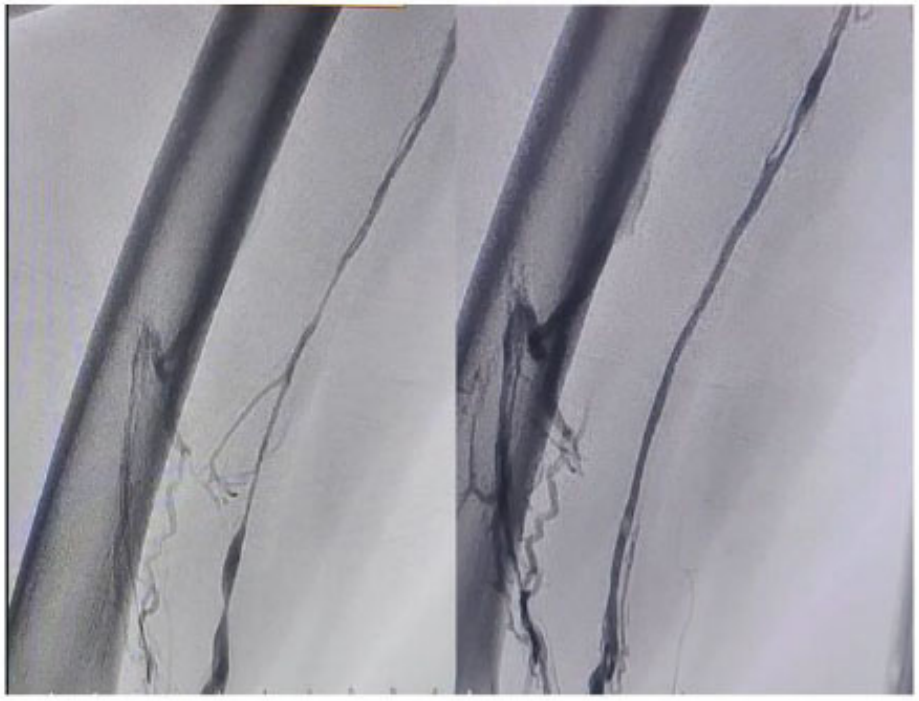

Figure 2. Showed the right deep femoral vein before and after PMT.

was a non-healing ulcer on the anterior left leg. Laboratory findings indicated a white blood count of 9.7 × 109/L, hemoglobin of 14.5 g/dL, hematocrit of 42.9%, platelets of 202 × 10^3/uL, and potassium of 3.77 mEq/L. Additional findings noted were a prothrombin time (PT) of 9.1 seconds, a partial thromboplastin time (PTT) of 27 seconds, an international normalized ratio (INR) of 1.07, and D-Dimer of 19.19. Based on his clinical presentation and significant medical history, an initial Well's score was determined to be greater than two, thus placing him in the high-risk category for DVT.

Doppler ultrasound and CT-Venography findings both confirmed deep vein thrombosis at the right common femoral, superficial femoral, profunda femoral, and popliteal vein. Also, on the left side, 1/3 proximal superficial femoral vein was occluded (Figure 1).

Due to extensive thrombus burden, extremity swelling, and a prior history of thrombosis, a plan was made for a right lower extremity thrombectomy. Due to the chronicity of the onset, we expect that it is supposed to be hard thrombus.

Before the procedure, the patient was placed prone on the angiographic table, and prepped sterilely. An ultrasound-guided percutaneous puncture of the right popliteal vein was performed using the micropuncture Seldinger technique. Next, an exchange was made to the 0.035-inch system, Glidewire was inserted and navigated into the inferior vena cava (IVC). The venogram showed multiple thrombi involving the femoral and popliteal veins and extensive collateral formation (Figure 2).

Thrombectomy with the Penumbra system and 8CAT Indigo catheter was then performed for 1 hour. The patient receives a 3000-unit heparin bolus throughout the procedure. A post-thrombectomy venogram showed <30% narrowing at the femoral vein. A brisk, patent flow was demonstrated throughout the right venous system on the final venogram, and the procedure was subsequently concluded. After the procedure, small particles of white thrombus were collected (Figure 3). The patient was discharged 1 day postoperative and was prescribed an anticoagulant for DVT Prophylaxis. The following procedure for the left leg was scheduled.

DISCUSSION

This patient presented with classic signs of DVT, Once thrombosis was suspected, the workup began with a pre-test probability formulated using Well's Criteria. If the Wells score is higher than or less than two and the D-dimer is positive, a venous ultrasonography examination of the afflicted extremity is recommended to determine the existence of a thrombus. In this patient's instance, a history of past thromboembolic episodes and right leg swelling with discomfort put him in the high-risk category, with a Wells score of more than two. As a result, a

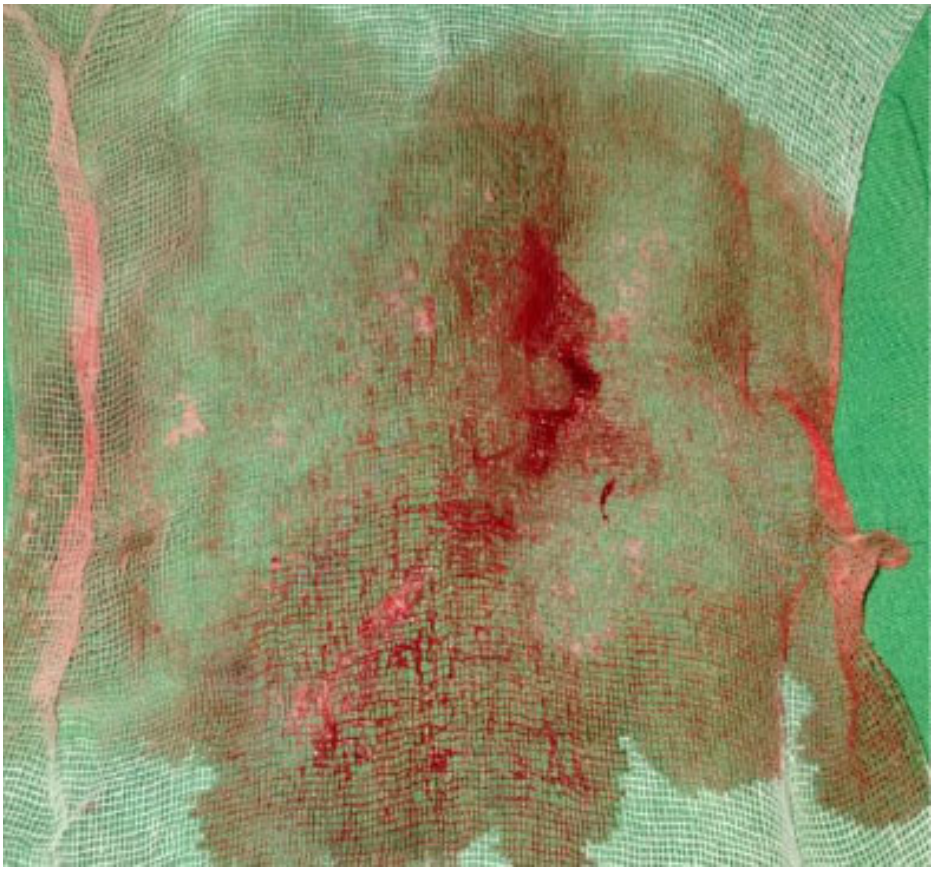

Figure 3. Showed small fragments of white thrombus after thrombectomy.

venous ultrasound was performed, which confirmed thrombosis in several veins across the right and left lower leg.[2-3]

The thrombotic disorder can be classified into platelet aggregates, predominantly "white thrombus" usually affecting the arterial system. In contrast, thrombi that form in low-pressure systems are rich in fibrin and are often referred to "red thrombi". The importance of distinction between both due to red thrombus is usually treated with anticoagulants, whereas white thrombi usually respond to antiplatelet.[1] Our patient has no history that could be a significant risk factor for DVT. Many studies have identified other conditions promoting hypercoagulability, such as factor V Leiden and prothrombin gene mutations, homocysteinemia, antiphospholipid syndrome, and congenital deficiency of factor S, factor C, and antithrombin 3, as well as some rare conditions such as plasminogen inhibitors. If these situations are present in a recessive fashion, a second risk factor is necessary to promote thrombogenesis.[4] Further workup needs to be done for this patient to find the causation of the hypercoagulability.

Catheter-directed interventions include percutaneous mechanical thrombectomy devices, which can break down and remove thrombosis, and catheter-directed thrombolysis devices, which can administer thrombolytics or pharmaceutical drugs directly into a thrombosed vein.[5] ClotTriever, AngioVac, and Indigo Aspirational Systems are among the mechanical thrombectomy devices.[6] Devices, such as the Cleaner Rotational, AngioJet, and JETi Hydrodynamic Thrombectomy Systems, are used for mechanical thrombectomy and catheter-directed thrombolysis. Lastly, the EkoSonic Endovascular System can achieve thrombolysis; however, in conjunction with ultrasound imaging, it can be used for mechanical thrombectomy as well.

In a study treating 10 patients with iliofemoral or central DVT using the Indigo System, six patients had greater than 70% thrombus resolution without the use of lytic therapy. Three patients had to be treated with catheter direct thrombolysis (CDT), angioplasty, and/or stenting due to residual thrombosis. Utilization of this system in another study for acute iliofemoral DVT treatment (n = 16) demonstrated greater than 70% thrombus resolution in all patients. There were no serious post-treatment complications such as transfusions, hematomas, or new renal insufficiency developments. Follow-up one to eight months after treatment showed venous patency in 93.8% of the patients and 85.7% were symptom-free.[7] According to some studies, delivering CDT alongside PMT was better to PMT alone because it facilitated thrombectomy. CDT in combination with PMT improves thrombus removal significantly compared to PMT alone. It is recommended to use CDT alongside PMT unless thrombolysis or anticoagulation is contraindicated.[8,9] The advantage of PMT, facilitates the rapid removal of thrombus, often in a single session, with negligible blood loss, and with most patients requiring no ICU stay. In contrast, thrombolytic-based interventions require attentive monitoring as standard of care due to bleeding risks and may require multiple sessions.

CONCLUSION

Deep vein thrombosis is a rare condition with the highest prevalence in elderly and obese individuals. This case report elaborates on a patient with an atypical chronic white thrombus DVT who underwent a thrombectomy after imaging showed extensive thrombotic disease in the right lower extremity. Choosing the best modality for thrombectomy for this case is challenging due to the minimal available data. PMT appears feasible and safe, though the level of evidence available is poor. A post-procedural venogram indicated improvements in flow throughout the right lower extremity venous system, and the patient showed symptomatic improvement without reporting complications, suggesting that PMT can be considered as a modality in this kind of case. Further workup needs to be done on this patient to find the causation of the hypercoagulability.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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None.

AUTHOR CONTRIBUTION

All authors had contributed to the manuscript writing and agreed on the final version of the manuscript for publication.

ETHICAL CONSIDERATION

The patient had received signed written informed consent regarding publication of the medical data in a scientific medical journal with confidentiality to personal information.

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