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Case Report

A case of upper extremity deep vein thrombosis with long-term patency using pharmaco-mechanical catheter-directed thrombolysis in the acute phase

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ABSTRACT

Although upper-extremity deep vein thrombosis (UEDVT) is considered rare, its prevalence appears to be increasing, and this may be related to expanding indications for catheter-based interventions. In contrast, few cases have been reported related to strenuous exercise, especially in healthy young adults with thoracic outlet syndrome (Paget-Schroetter syndrome). In contrast to lower-extremity DVT, optimal treatment strategies for UEDVT have not been robustly studied.

In this report, we describe a 56-year-old man with primary UEDVT presenting with left arm swelling, paresthesia, and visible collateral veins around the shoulder. Venography revealed thrombotic occlusion of the left subclavian vein. Emergent pharmaco-mechanical catheter-directed thrombolysis (PCDT) was performed, and his left subclavian vein was recanalized. A novel oral anticoagulant was initiated to prevent reclosure. The patient's symptoms subsided without major bleeding complications and at six months, he has no disability for daily activities. Follow-up ultrasonography revealed almost complete patency of the left subclavian vein, after which anticoagulation therapy was terminated.

We discuss the role of PCDT in the management of primary UEDVT from the perspective of efficacy and contribution to quality of life.

<**Learning objective:** UEDVT is relatively rare and has not been examined as extensively as lower-extremity DVT. Nonetheless, patients may have a variety of unpleasant symptoms that substantially decrease quality of life. Pharmaco-mechanical catheter-directed thrombolysis may be effective to reduce clot burden and mitigate the risk of post-thrombotic syndrome. Although there is no current consensus about exact indications for UEDVT patients, the procedure may be more useful than the standard anticoagulant therapy.>

Introduction

Upper-extremity deep vein thrombosis (UEDVT) is estimated at less than 4–10% of all deep vein thromboses [1–3], occurring in 0.4–1 out of 10,000 people annually [1]. Compared to lower-extremity deep vein thrombosis, the incidence of UEDVT is low [4]; however most cases, especially primary forms, develop in young, healthy adults in the setting of strenuous upper extremity activity [1,2]. Thus its complications, including post-thrombotic syndrome (PTS), may compromise quality of life and aggravate disability if the dominant arm is involved.

The optimal treatment for primary UEDVT remains unclear. While standard anticoagulation may prevent thrombus propagation, it has limited value in eliminating clot burden. Systemic thrombolytic therapy may be more effective [4], but the risk of serious bleeding complications remains problematic [5]. Here, we present a case of UEDVT in left subclavian vein with successful clot resolution using pharmaco-mechanical catheter-directed thrombolysis (PCDT) followed by the novel oral anticoagulant, edoxaban, without major complications.

Case report

A previously healthy 56-year-old man, employed in the transportation business, visited the hospital with a four-day history of left upper-extremity pain and swelling. He initially complained of sudden left arm paresthesia while clearing snow,

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with symptoms worsening and becoming painful after repetitive arm activity. He reported neither a significant past medical history, denying any recent trauma, nor a personal or family history of thromboembolic disease. On physical examination, vital signs were as follows: body temperature, 37.1 °C; pulse, 64 beats per minute and regular; blood pressure, 127/74 mm Hg; respiratory rate, 21 breaths per minute; and oximetry, 96% on room air. His left upper limb was swollen and erythematous. Dilated subcutaneous venous collaterals were seen from the left shoulder to left anterior chest wall (Fig. 1A). Cardiac examination revealed no significant abnormalities and there was no enhanced pulmonary secondary heart sound. The initial blood examinations were normal except for a modestly elevated C-reactive protein (0.76 mg/dl). D-dimer (0.8 μg/ml) and fibrin degradation products (2.6 μg/ml) were not elevated. Chest radiograph and electrocardiography showed no abnormalities. Echocardiography revealed no evidence of right ventricular overload or pulmonary hypertension. Duplex ultrasonography revealed large thrombus in the left subclavian vein between the clavicle and first rib, corroborated on contrast computed tomography (CT) which showed no evidence of pulmonary thromboembolism (PTE) (Fig. 1B–D). Serological examinations including antinuclear antibody, lupus anticoagulant, anticardiolipin antibodies, antiphospholipid units for IgG, protein C, protein S, and antithrombin III showed no significant abnormalities. Complement levels and antineutrophil cytoplasmic antibodies were normal.

The diagnosis of UEDVT was made. Initially we planned anticoagulation with intravenous infusion of unfractionated heparin (UFH), followed by an oral vitamin K antagonist. However, the patient hoped for an early discharge by reason of his employment. Therefore, we decided to perform catheter intervention. An 8 Fr guiding sheath was inserted from the left ulnar vein. Venography revealed occluded left axillary and subclavian veins filled with large thrombus (Fig. 2A). We advanced an AngioJet rheolytic thrombectomy catheter (Boston Scientfic, Natick, MA, USA) into the thrombus, from which heparinized saline jet was emitted to crush the thrombus via Venturi effect. We performed thrombus aspiration using a 6 Fr straight catheter and the 8 Fr guiding sheath directly (Fig. 2B,C). The procedure was repeated until successful recanalization was achieved. We injected 10,000 units of UFH in total through the AngioJet catheter during procedure. As the final venography revealed 50% residual thrombotic stenosis (Fig. 2D), we left the guiding sheath in the left axillary vein for catheter-directed thrombolysis (CDT) with urokinase (240,000 IU/day) injected through the catheter for 24 h. On the following day, the patient had gross hematuria and hemolysis. His laboratory data revealed normal range of activated partial thromboplastin time (31.7 s) and prothrombin time (1.18 international normalized ratio). However, hemoglobin value decreased significantly (14.0 g/dl to 11.6 g/dl). Therefore CDT therapy was discontinued and intravenous infusion of UFH (10,000 units/day) was started. On the 3rd hospital day, duplex ultrasonography revealed partial blood flow in the thrombus although his left upper limb remained swollen. Left arm swelling showed remarkable improvement over the following several days, and he was discharged on a novel oral anticoagulant (edoxaban, 60 mg once daily) on the sixth hospital day.

Three months after his discharge, we performed follow-up duplex ultrasonography and venography. Although both revealed preservation of flow and persistent mural thrombus in the left subclavian vein, the degree of stenosis had improved by approximately 25% stenosis (Fig. 3A). In order to investigate the possibility of thoracic outlet syndrome, the positional venography during arm abduction was performed, which did not clearly demonstrate positional narrowing (Fig. 3B). However, both Eden and Wright tests were positive on physical examination, suggesting thoracic outlet syndrome as the underlying etiology. Except for mild arm edema and numbness of the thumb and forefinger during repetitive overhead activity, he had no complaints and no dysfunction in activities of daily life; anticoagulation was discontinued. At six months, despite discontinuation of anticoagulation therapy, he remained well with no restrictions in his

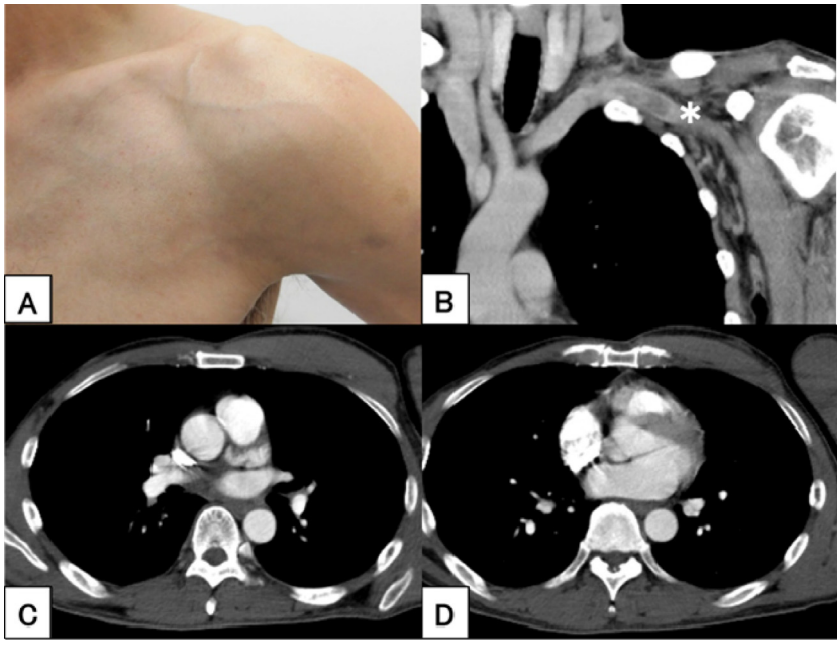

Fig. 1. Dilated subcutaneous venous collaterals from the left shoulder to left anterior chest wall (A). Contrast-enhanced computed tomography on admission revealed thrombotic occlusion of the subclavian vein (B; white asterisk). Findings suggestive of pulmonary thromboembolism were not seen (C, D).

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