# CASE REPORT: SUBCLAVIAN VEIN THROMBOSIS TREATED BY PULSE-SPRAY THROMBOLYSIS USING A RETROGRADE APPROACH

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## ABSTRACT

We report a case of subclavian vein thrombosis in a 44 year old lady with SLE that was successfully treated with transcatheter thrombolytic techniques. The treatment was unusual in that a retrograde approach to the thrombosed vessel had to be employed due to the failure to canulate a distal peripheral vein. We also used the Pulse Spray technique to administer the thrombolytic drugs, the technique being originally described for thrombolysis in the arterial system. The patient has been followed up for 8 months with no recurrence of the problem.

## INTRODUCTION

The axillary and subclavian veins is one area in the venous system in which local transcatheter low-dose fibrinolytic therapy is rapidly becoming the treatment of choice for thrombosis. We describe a case of acute axillary vein thrombosis that was successfully treated using a retrograde approach for pulse-spray thrombolysis.

## CASE REPORT

A 44 year old Chinese lady with SLE of 12 years presented with a one day history of progressive swelling of the left upper limb. Distended veins were noted over her chest wall. Oedema was pitting and the arm not tender. Distal pulses were normal. In the past, she had biopsy proven Class IV nephritis, lupus gut and autoimmune hemolytic anemia. She also had pulmonary tuberculosis and steroid induced osteoporosis resulting in cough fractures. Prior to the current problem, she did not have livido reticularis, thrombocytopenia, miscarriages or clinical thrombotic events.

Diagnostic venography performed via an antecubital vein demonstrated an abrupt cut-off at the subclavian vein (Fig. 1) consistent with acute thrombosis. Unfortunately, the examining radiologist removed the venula after the procedure.

As no other suitable superficial veins for thrombolysis could be found in the left upper limb, a 5 French Head Hunter 1 catheter (Cook) was introduced into the subclavian vein via the right common femoral vein. Proximal venography (Fig 2) demonstrated the thrombus to be approximately 3cm in length. Due to the small thrombus load and a satisfactory respiratory reserve, we decided against prophylactically deploying a central caval filter in the SVC. A guide wire (0.035 inch curved hydrophilic Glidewire, Terumo) was negotiated through the thrombus and the catheter exchanged for a 5F, multi-sidehole Pulse Spray Catheter (Meditech, Boston Scientific) which was positioned across the thrombus. Using the Pulse Spray Technique described by Bookstein et al[1], 200,000 units of Urokinase (Ukidan, Serono) and 5000 IU of Heparin was administered over a period of 20 minutes. This

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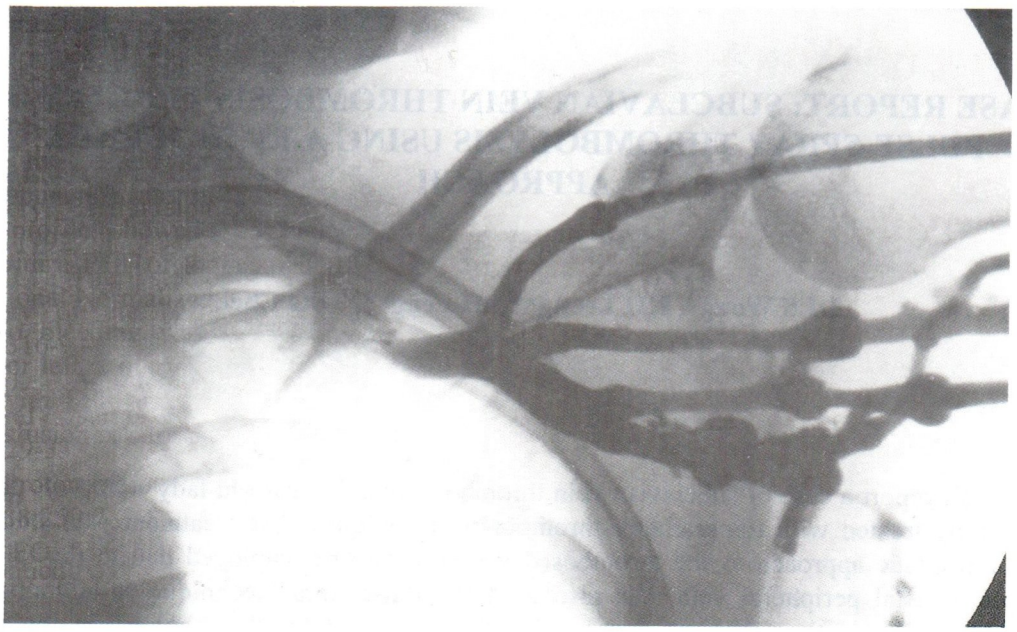

Fig. 1. Upper limb venography. Demonstrating thombosis of the subclavian vein.

was sufficient to reestablish blood flow through the thrombus. (Fig. 3) A further 300,000 units was infused over the next 15 hours (20,000 IU/hour) during which time the swelling of the arm gradually improved. The following day, a further 400,000 units was infused over 4 hours via a single end-hole catheter embedded in the distal portion of the clot, achieving complete lysis of the thrombus, and exposing a segment of underlying luminal irregularity (Fig. 4) During the entire treatment period, patient was maintained on 1000 units of Heparin per hour and thereafter for a further 24 hours. The swelling of the arm continued to improved and returned to normal 48 hours after commencement of thrombolysis. At no time during the procedure did patient experience any respiratory symptoms.

## COMPLICATIONS

Perforation of the axillary vein distal to the thrombus occurred on the second day of thrombolysis during catheter manipulation. This was confirmed by contrast injection which outlined the fibers of pectoralis major. Patient did not experience any symptoms related to this and was unaware of the complication. The catheter was withdrawn back into the vessel without embolization of the false tract and

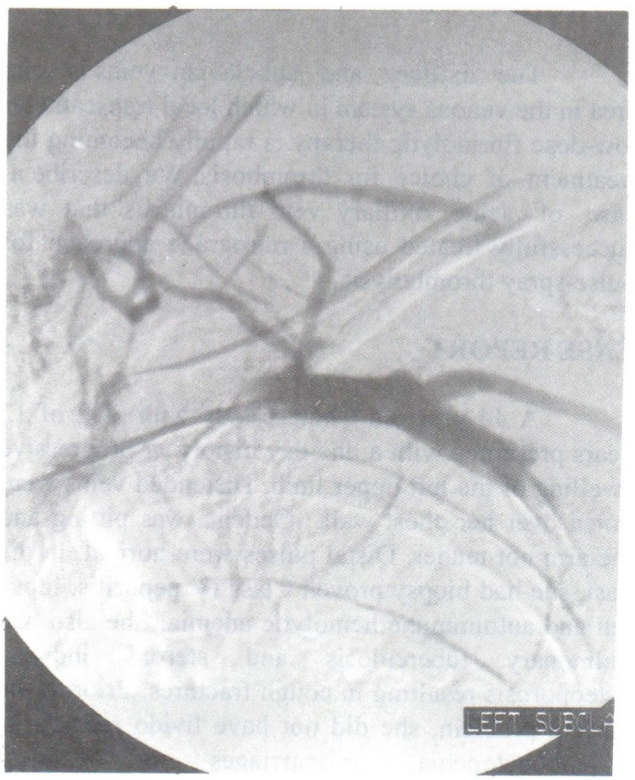


Fig. 2. Venography using a head hunter 1 catheter introduced retrogradely showing the length of thrombus to be about 3 cm., Drainage is via collaterals around the supra-clavicular fossa.

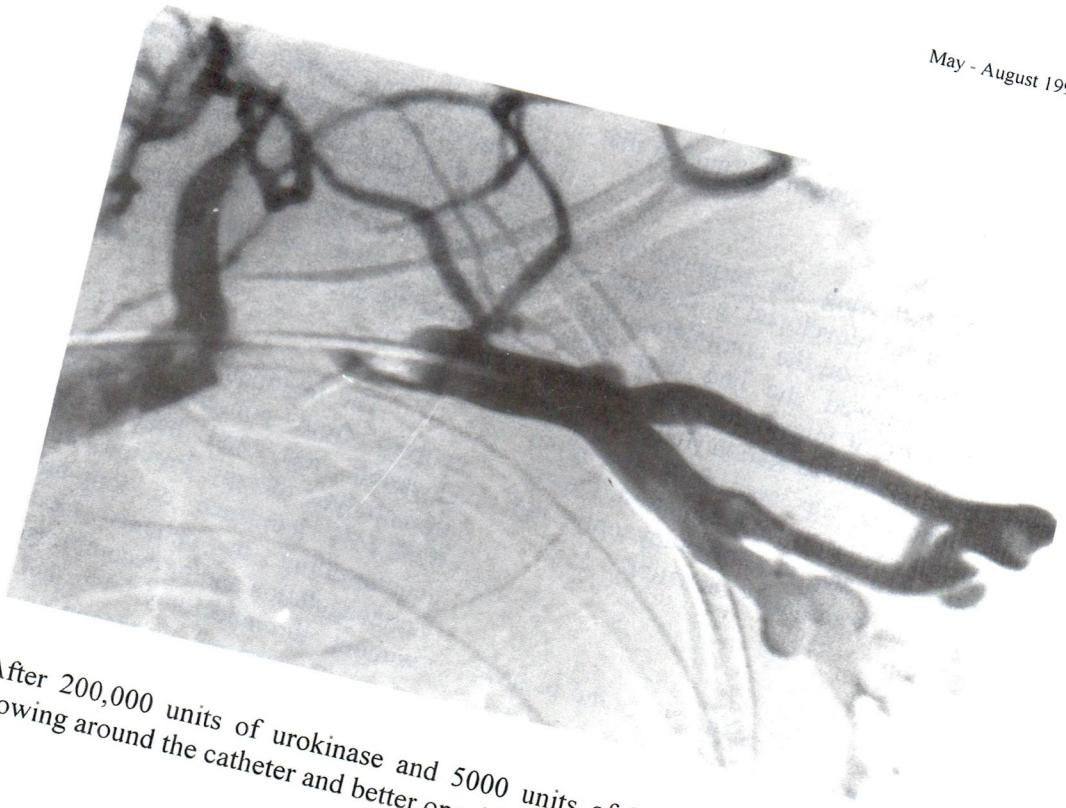

Fig. 3. After 200,000 units of urokinase and 5000 units of heparin. Note some contrast flowing around the catheter and better opacification of the innominate vein.

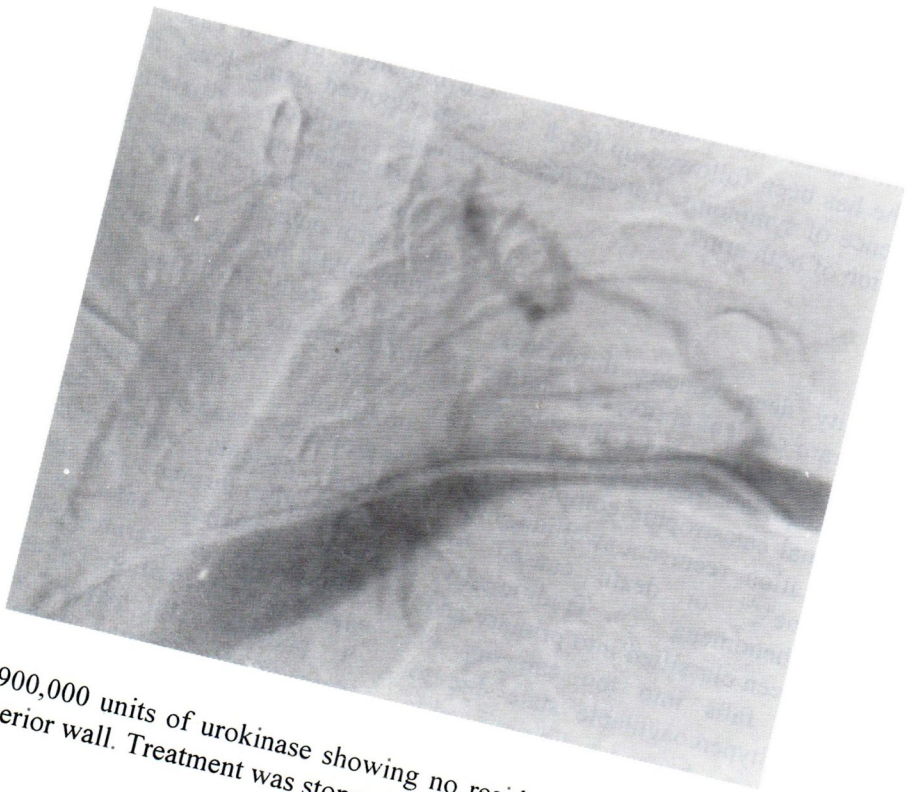

Fig. 4. After 900,000 units of urokinase showing no residual clot but some irregularity of the superior wall. Treatment was stopped at this stage.

thrombolysis continued. No evidence of bleeding or haematoma formation was subsequently found at that site.

On the day following the termination of thrombolysis, the patient developed a haematoma around a venepuncture site on the contralateral arm. Coagulation profile showed she had been over-heparinized with a PTT of longer than 120 seconds and a International Normalized Ration (INR) of more than 5.92. No bleeding was seen from the groin puncture site or left axillary vein perforation. Patient was treated with FFP and physiotherapy only, not requiring transfusion or surgical evacuation.

## FOLLOW-UP

The patient was subsequently found to have secondary antiphospholipid syndrome with a raised Anti Cardiolipin Antibody of 33. A ventilation perfusion scan performed 10 days after the procedure demonstrated mismatched defects of the posterior basal segments of both lower lobes and the lateral aspect of the left upper lobe. Duplex studies of the deep venous system did not reveal any thrombosis in the lower limbs, IVC and renal veins, and the pulmonary emboli was assumed to have originated from the subclavian vein. Patient was maintained on Warfarin 5mg daily. She has been followed up for 8 months with no recurrence of symptoms. Patient has also regained full function of both arms.

## DISCUSSION

Upper extremity deep venous thrombosis (DVT) is a relatively rare clinical entity, accounting for approximately 2% of total venous thrombosis, with potentially grave sequelae. Significant long-term morbidity and occasional catastrophic complications include venous claudication, recurrent swelling, limb loss due to gangrene[ii,iii] or death caused by pulmonary embolic phenomena[iv,v,vi]. Traditionally, upper limb DVT has been classified into primary and secondary. Our case falls into the category of secondary causes, a hypercoagulable state due to antiphospholipid syndrome, hence we did not need to exclude and treat for external compressive forces on the vein.

We chose to investigate our case by venography as this is the gold standard, doppler ultrasound having been shown to have a poorer sensitivity and specificity[vii,viii]. Having gained access into the venous system through a antecubital vein, thrombolytic therapy would ideally have been instituted immediately. Unfortunately, the examining radiologist did not consider this treatment possibility and removed the venula. Regaining access into the venous system of the upper limb then proved impossible due to the marked oedema already present in the arm.

The treatment of upper extremity DVT has evolved from conservative modalities including elevation, rest, and heat to the current local thrombolytic therapy. Previous studies documented a 50%-74% incidence of long-term morbidity, ie. pain/swelling in patients treated by systemic anticoagulation and/or decompressive surgery with or without thrombectomy.[ix,x,xi] D.L. Steed reported complete symptomatic resolution in 72% of patients with primary thrombosis. However, only 14.2% had complete resolution of thrombus on follow-up venography.[xii] Becker et al showed venous patency in four patients with primary thrombosis using local urokinase or streptokinase and achieved good short-term results in two patients that required decompressive surgery. As in our case, they also described an area of luminal irregularity at the site of the thrombus in each case.[xiii] Variable success has been reported using local fibrinolytic therapy with venous balloon dilatation and/or surgical decompression in a small group of patients with primary thrombosis.[XI] Taylor et al showed successful short-term outcome in two patients treated with local thrombolytic therapy followed by first rib resection.[xiv] In a study involving 50 patients with primary thrombosis by Machleder, long-term venous patency seemed to correlate with initial use of local urokinase. Interestingly, predecompressive angioplasty resulted in a high rate of reocclusion. Those patients who underwent decompressive surgery after thrombolysis showed a 64% versus 44% venous patency rate at 3 years follow-up. Additionally, an overall 93% and 64% asymptomatic status was reported on 3 years follow-up venography in patients with patent versus occluded veins, respectively.[xv] Hence upper extremity DVT is one area in which local thrombolytic therapy is now rapidly becoming the treatment of choice.

To our knowledge, there have been no previous reports on transcatheter thrombolysis administered through a retrograde route in the upper

limb using the pulse-spray technique. Gaining peripheral venous access in an oedematous limb is always difficult, but our case has shown that access via the femoral vein with retrograde catheterization of the subclavian-axillary is a viable alternative. This however lends itself to its own problems. Numerous valves are present along the axillary vein and catheter manipulation through these valves can sometimes be time consuming. Occasionally, prolonged manipulation can lead to perforation of the vein, as in our case, but this appears to be of no significant consequence. On the other hand, this technique allows a central caval filter to be deployed in the SVC without the need of a separate puncture. Also if clinically significant pulmonary embolism should occur, a pulmonary angiogram followed by suction, aspiration or fragmentation embolectomy of the pulmonary arteries can be performed immediately.

Whether a prophylactic caval filter should have been deployed in the SVC is also an issue of contention. It is the authors' belief that small emboli to the lungs are usually of no clinical significance. During the process of thrombolysis, contrast injections demonstrated several small fragments of clot becoming dislodged from the subclavian vein. The patient however, despite having active tuberculosis of the lungs, did not complain of any respiratory distress during the procedure and continuous oxymetry did not show any change in the oxygen saturation. However, it should be emphasized that if the thrombus load is large, or if respiratory reserve if small, it would be prudent to deploy a caval filter prophylactically before thrombolysis is undertaken.

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