

Incidental catheter-associated upper extremity deep venous thrombosis detected by point-of-care ultrasound

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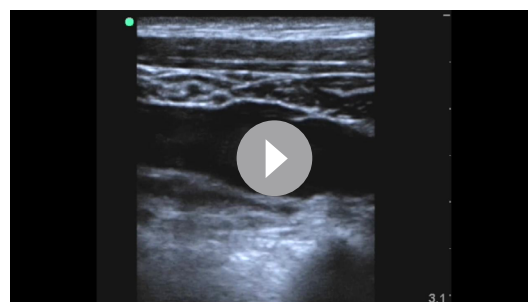
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DESCRIPTION

A woman in her 50s presented for surveillance bronchoscopy 3 months after bilateral lung transplantation for alpha-1 antitrypsin deficiency. She was asymptomatic and her physical examination was unremarkable. While performing a prebronchoscopy pleural ultrasound examination to assess for lung sliding, a large mobile thrombus was incidentally found in the proximal right axillary vein below the clavicle. The thrombus was adhered to a venous valve and wavered with each venous pulsation (figure 1A, video 1). Further evaluation of the right upper extremity veins revealed complete thrombosis of the basilic vein where a peripherally inserted central venous catheter (PICC) had been previously placed. The lung transplantation team initiated subcutaneous enoxaparin and bridged her to warfarin as an outpatient. She returned for her next surveillance bronchoscopy 4 weeks later, and the same team performed a repeat ultrasound examination over the same venous valve, which showed complete resolution of the thrombus (figure 1B, video 2).

Upper extremity deep venous thrombosis (UEDVT) accounts for 5%–10% of all deep venous thromboses (DVTs).^{1,2} The incidence of venous thromboembolism (VTE) is high among lung transplant patients, with a reported incidence of 6%–9% in retrospective studies.^{3,4} Postmortem examination of lung and heart-lung transplant patients found 27% had evidence of pulmonary embolism.⁵ VTE among lung transplant patients is associated with



Video 1 Incidental upper extremity deep venous thrombosis. An upper extremity deep vein thrombus adherent to a venous valve is seen wavering in the lumen of the proximal right axillary vein.

increased length of stay, costs of hospitalisation and in-hospital mortality.³

Approximately 50% of UEDVTs are caused by central venous catheters (CVCs),^{1,2} and 30% of patients with indwelling venous catheters can have asymptomatic UEDVTs.⁶ PICC has a 2.6-fold increased risk of thrombosis compared with CVC.⁷ Other important risk factors for UEDVT include malignancy, recent surgery or trauma, pregnancy, hormone therapy and thrombophilic disorders. UEDVT occurs most frequently in the subclavian, axillary, jugular, brachial and brachiocephalic veins but can involve more distal veins.¹

Point-of-care ultrasound (POCUS) is a well-validated tool for detection of lower extremity DVTs, with a sensitivity of 86%–96% and a specificity >96%.^{8,9} Conversely, data on the ability of POCUS to detect UEDVT are limited. One study comparing POCUS versus radiology-performed ultrasound examinations found no discordance for

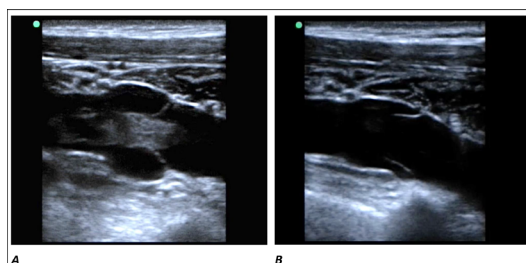
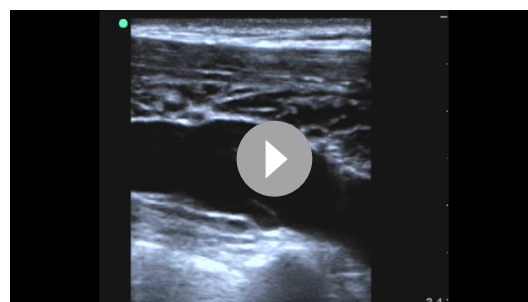


Figure 1 Incidental upper extremity deep venous thrombosis. (A) A mobile upper extremity deep vein thrombus adherent to a venous valve was detected incidentally in the proximal right axillary vein during a prebronchoscopy lung ultrasound examination. (B) Complete resolution of the deep venous thrombosis is seen over the same valve after 4 weeks of anticoagulation.



Video 2 Resolution of deep venous thrombosis. After 4 weeks of anticoagulation, complete resolution of the upper extremity deep venous thrombosis is seen over the same venous valve.



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nine UEDVTs that were detected.¹⁰ In children, POCUS demonstrated 28% sensitivity and 91% specificity for identifying catheter-associated thrombosis in both upper and lower extremities. Most discordant findings involved the subclavian vein, likely due to difficulty performing venous compression with an ultrasound probe at this site.¹¹

Evidence for specific treatment of UEDVT is limited. No large randomised controlled trials have been published to date.^{1 2} Despite this, general consensus exists to treat UEDVT in the axillary and more proximal veins with anticoagulation therapy for at least 3 months.^{1 2 12 13} Current evidence suggests that anticoagulation using warfarin, low-molecular-weight heparin or direct oral anticoagulants (specifically rivaroxaban, apixaban, edoxaban or dabigatran) is effective and safe, with the latter two options preferred in cancer-associated UEDVTs.^{1 2} In catheter-associated thrombosis, anticoagulation therapy should be initiated despite line removal and continued for at least 3 months after removal. Thus, a thrombosed catheter can remain in place if indicated with concurrent anticoagulation treatment.^{1 13}

In conclusion, catheter-associated DVTs are common and may be incidentally detected by POCUS. Controversy exists about the best management strategy for catheter-associated UEDVTs due to the lack of high-quality evidence.

Learning points

- Catheter-associated venous thrombosis is common and likely can be detected accurately by point-of-care ultrasound when performed by a trained provider.
- Current guidelines recommend treating thrombosis of the axillary and more proximal veins with anticoagulation therapy for at least 3 months.
- Controversy exists about the best management strategy for catheter-associated venous thrombosis, but general consensus is to treat these patients with anticoagulation.

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critical revisions and approved the final manuscript. NS, M-PTL, MIV and KCP are accountable for all aspects of the manuscript.

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