Catheter-Related Superior Vena Cava Thrombosis—How Do We Face It?

To the Editor,

Occlusion in central venous catheter (CVC) lumen is encountered because of various causes including CVC-related thrombosis (CRT) with a reported incidence of 14–18%.[1] There is an inevitable need for all anesthesiologists to differentiate between the non-thrombotic and thrombotic causes for appropriate management. We report the management of an unusual case of CVC-related superior vena cava (SVC) thrombus.

A 36-year-old female sustained an extensive lower limb degloving injury and was bedridden in the hospital for 5 months. She had undergone multiple debridements and was receiving enoxaparin for thromboprophylaxis. She was also receiving albumin IV and TPN via a CVC placed in the right internal jugular vein (IJV) to improve nutrition.

A week later, debridement was planned again. Before anesthetic induction, the CVC (6 days old) lumens were checked for patency by aspiration. Only the distal lumen had backflow and free flow of IV fluids. We planned to commence anesthetic induction via it. Intra-operatively, we noticed that IV fluid was not flowing freely as compared to pre-induction and there was an inability to aspirate

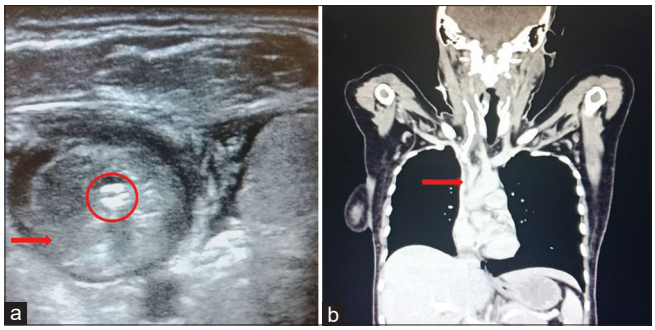

Figure 1: (a) Ultra sonogram (short-axis view) of right IJV showing thrombus (red arrow) engulfing the CVC (encircled). (b) CT venogram (coronal plane) showing the thrombus (red arrow) seen as filling defect extending upto proximal one-third of SVC

Table 1: Risk factors for the development of Catheter-related thrombosis[3]

Components of Virchow's triad	Contributing factors
Hypercoagulation	Sepsis, chronic illness/inflammation, trauma, malignancy, prior thromboembolism, renal failure, thrombophilias, periphlebitis, catheter-related infection
Stasis	The catheter itself (PICC > CVC, larger diameter), viscous infusions (hyperosmolar solutions, TPN, chemotherapy, incompatible mixtures), improper flushing, lack of limb movement (femoral > IJV), location of CVC tip above cavoatrial junction or abutting vessel wall (especially with left IJV due to the acute angle of drainage of left BCV into SVC)
Endothelial injury	Catheter insertion, multiple attempts, periphlebitis, Catheter-related infection

*CVC - Central venous catheter, PICC - Peripherally inserted CVC, TPN - Total parenteral nutrition, IJV - Internal jugular vein, BCV - Brachiocephalic vein, SVC - Superior vena cava. Risk factors in our case are in the red color font.

blood via the distal lumen too. Immediately, we placed a 20 G IV cannula in the dorsum of hand (with difficulty) for rescue. We evaluated the course of the CVC with USG to confirm its position. Surprisingly, we found a thrombus engulfing the CVC circumferentially [Figure 1a]. Transthoracic echo (TTE) did not reveal any extension into right atrium. Postoperatively, CT venogram revealed 1.7 × 1.8 cm thrombus engulfing the CVC for a length of 5.5 cm, extending upto the proximal one-third of SVC [Figure 1b]. After multidisciplinary team discussion, therapeutic anticoagulation was commenced, thrombolysis was deferred because of the high risk of bleeding because of the extensive lower limb wound. We didn't attempt to remove the CVC considering the possibility of thromboembolism during removal as the thrombus was completely engulfing it. Hence, surgical removal was planned. Midline sternotomy and surgical thrombectomy (with CPB standby) were done. SVC was opened and the entire thrombus was removed in pieces along with the CVC. She was observed in HDU for 24 h and extubated uneventfully. Thereafter, she was managed for the lower limb wound with the continuation of anticoagulation and oral protein-rich nutrition, thereby avoiding the need for CVC.

A blocked CVC is an infrequently confronted situation especially during the handling of protracted CVCs.[1-5] Diverse risk factors contribute towards Virchow's trial of coagulation and CRT [Table 1].[3]

The ISTH guidelines recommend addressing the modifiable risk factors to minimize the occurrence of CRT.[5] Whenever feasible, CVCs should be inserted in right IJV with the tip located at the cavoatrial junction, regular flushing, avoidance of PICC lines, use of positive pressure devices/ maintaining a positive-end pressure flush technique is recommended.[2,5] There is no recommendation for routine prophylactic anticoagulation.[4]

Still, there is a dispute in the management of CRT/ malpositioned CVC. The use of a guidewire through CVC lumen for repositioning has been in practice, though it is not recommended as it entails the risk of hematoma, loss of IV access, clot fragmentation, and embolization. Hence it is vital to understand the safe approaches. Duplex USG and TTE can serve as a bedside tool for earlier detection. Yet contrast venogram is the gold standard. Serial evaluation of CVC patency, avoidance of modifiable risk factors and maintaining a high index of suspicion of CRT in the event of difficult aspiration or sluggish infusion is necessary even in asymptomatic patients.

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Conflicts of interest
There are no conflicts of interest.

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