



### Assessing Venous Access Devices: When to Obtain a Venogram

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**Q**uestion: When a lack of blood return from a venous access device (VAD) occurs, when should the patient have a venogram? Can the patient receive chemotherapy (particularly a vesicant) through the VAD if no blood return is occurring but the VAD appears to flush well?

**A**nswer: Occluded VADs are not a minor problem, with an estimated 3%–70% failing to yield a blood sample (Mayo, 2001; Rihn, 2001; Whitman, 1996). Partial occlusion exists when a catheter flushes easily but will not aspirate blood. Total occlusion is characterized by the inability to withdraw blood or infuse fluid. Occlusions can occur from a fibrin tail, fibrin sheath, intraluminal thrombus, mural thrombus, drug precipitates, catheter malposition, pinch-off syndrome, or catheter kinkage (see Figure 1). Essentially, all catheters will develop fibrin sheaths, frequently within the first 24 hours after insertion (Hadaway, 2000). All VADs should be evaluated clinically at the initial sign of

occlusion. If an occlusion still is evident after repositioning the patient, and the nurse is confident that the noncoring access needle is in the correct place with an implanted port, administration of a thrombolytic agent usually is recommended (Masoorli & Angeles, 2002; Tilford & Haire, 2001). If no blood return is established after thrombolytic therapy, then the diagnosis of an occlusion can be based on symptoms or evaluated by radiographic techniques including a chest x-ray, venous ultrasound, and/or a venogram (Perry, Sheiman, & Hartnell, 1995).

Obtaining a chest x-ray often is the first step in evaluation for catheter tip malposition, kinkage, and pinch-off syndrome. When a chest x-ray does not reveal an obvious cause for a lack of blood return, other radiologic studies may be necessary to determine a definitive cause (Hadaway, 2000). If the chest x-ray is normal, a venogram would be appropriate to help determine the fluid pathway through the catheter (Hadaway). A venogram allows the use of contrast dye to visualize the catheter's distal tip and backtracking of fluid along the tunnel tract. When a fibrin sheath is present, the administration of thrombolytic agents may help to treat the occlusion (Masoorli & Angeles, 2002). If the patient is unable to undergo a venogram because of a totally occluded catheter, an ultrasound or venous doppler examination may be considered, es-

pecially if clinical symptoms depicting possible deep vein thrombosis are evident.

Although the literature reports the use of chest x-rays, venous ultrasounds, and venograms in the identification of problems with VADs, no published guidelines for evaluation of VAD patency exist, and a workup must be individualized for each patient according to the symptoms presented. If the cause is thought to be related to a thrombotic complication and a chest x-ray has ruled out mechanical occlusion or catheter malposition, then a venogram would be the imaging study of choice. When the VAD has a total occlusion, a venous ultrasound is appropriate. Although serial chest x-rays obtained every one to three months have been recommended to evaluate for pinch-off syndrome (Nace & Ingle, 1993), no other guidelines exist as to how often to evaluate VADs that have inadequate blood return or occlusions.

No studies have provided evidence-based data as to when to give medications through a VAD without a blood return. In numerous clinical settings, medications are given through a partially occluded VAD without a blood return after patency has been verified by an imaging study. Administration of vesicants should be prohibited unless nurses can ensure that the catheter tip placement and catheter body are intact (Camp-Sorrell, 1996). If a fibrin sheath or clot resulting in backflow is present on the catheter tip, the VAD should not be used for vesicant administration (Mayo & Pearson, 1995; Schulmeister & Camp-Sorrell, 2000). Extravasation can occur with backtracking of the vesicant along the tunnel. A physician's order should be obtained to use a VAD without a blood return. Further research is needed to answer these questions.

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Digital Object Identifier: 10.1188/03.CJON.234-237

**Fibrin tail:** Occurs when fibrin located at the catheter tip acts as a one-way valve, in which fluid infuses but no blood return occurs.

**Fibrin sheath:** Occurs when fibrin adheres to the external surface of the catheter and can extend the total catheter length.

**Intraluminal thrombus:** Occurs when fibrin or clots form in the catheter lumen.

**Mural thrombus:** Occurs when fibrin from a vessel wall injury binds to the fibrin covering the catheter surface, leading to a venous thrombus formation.

**Drug precipitates:** Occur from infusion of incompatible solutions or inadequate flushing, resulting in drug crystallization in the catheter or at the distal tip.

**Catheter malposition:** Catheter tip no longer is located in the superior vena cava at the right atrial juncture.

**Pinch-off syndrome:** Refers to the anatomic mechanical compression of a catheter as it passes between the clavicle and first rib at the costoclavicular space; the catheter lies in the costoclavicular space next to the subclavian vein instead of inside the vein.

**Catheter kinkage:** Occurs when the catheter migrates and becomes twisted or bends inside the vein or in the subcutaneous tunnel tract.

#### FIGURE 1. DEFINITION OF TERMS

Note. Based on information from Camp-Sorrell, 1996; Mayo, 2001.