

Central Venous Catheters: Checking for Blood Return

Question:

We hear from many doctors that the lack of a blood return from a central venous catheter should not be considered a problem and so in such a situation we are instructed to proceed with giving the medications. Many physicians even write orders to not check for a blood return. Is this a safe practice? Should we always check for a blood return? What should be done if we do not see blood flow back into the catheter lumen with aspiration?

Answer:

There seems to be a lot of confusion about this issue because the question is frequently asked. I think some professionals may think that frequent checking for blood return from a central venous catheter will increase the risk of fibrin and thrombus accumulation inside the catheter lumen. Some may postulate that it will also increase thrombus in the vein around the catheter tip due to tip movement when pressure is applied to aspirate from the catheter.

These concerns may be warranted however, we also must consider the risks when a blood return is not easily obtained. Extravasation, defined as the escape of vesicant solutions into extravascular space, is the major concern. Causes of extravasation include:

1. retrograde fluid flow due to a fibrin sheath;
2. catheter fracture;
3. dislodgment of port access needles; and
4. erosion of the catheter tip through the vessel wall.

Fibrin is composed of fibronectin, fibrin, laminin, collagen and immunoglobulins and begins to form within a few hours after catheter insertion. Although the exact mechanism of its development is not clear, most think it begins to form at the insertion site. There are reports of sheath formation within 24 hours after insertion and it is present in all catheters after one week of dwell.¹

Fibrin can form a tail or flap extending from the catheter tip and is responsible for persistent withdrawal occlusion (PWO). Upon infusion, this flap opens and allows fluid flow, while upon aspiration, this flap is pulled over the catheter lumen occluding the backflow of blood. This problem usually does not lead to extravasation. But when the complete catheter is encased in a fibrin sheath, infused or injected fluid flows between the outside catheter wall and the sheath and leaks out of the vein entry point. This phenomenon is responsible for extravasation into the venotomy end of a tunneled catheter, a port pocket, or percutaneous insertion site.

Catheter fracture results from accidental puncture from a suture during insertion, pinch-off syndrome or compression between the clavicle and first rib, and high pressure or

forceful injection against resistance in the lumen. Activities such as backpacking or golfing have even been documented to cause catheter fracture. Fluid leakage will occur into the tissue closest to the problem and may or may not be seen externally.²

Port access needles can become dislodged due to patient activity, clothing, and poor securing techniques. Separation of a port reservoir and the catheter may occur if the correct procedure was not followed to attach the two pieces during insertion. Vessel erosion leads to infused fluid escaping into the pleural cavity (hydrothorax), pericardium (cardiac tamponade), and mediastinum. Catheters inserted from the left side have a greater tendency to abut the right side of the vein wall, leading to erosion and leakage out of the vessel.

The presence or absence of a blood return is not totally diagnostic of correct catheter tip location or catheter function. But it is one significant test that must be included in your patient assessment prior to administering fluid and medications through any catheter. Careful flushing with a large size syringe (10 mL or greater) will provide an indication of catheter patency. This should be followed by a free flowing blood return on aspiration. However, be careful not to apply excessive pressure with the large syringe. Large syringes generate smaller amounts of pressure on injection but on aspiration they generate higher amounts of pressure. Rapid retraction of the large syringe plunger can cause temporary catheter collapse or retraction of the vein wall over the catheter lumen. If no blood return is obtained, complete your assessment of the catheter function including:

- * checking for pain, edema, or discomfort in any part of the chest, extremity, shoulder or neck;
- * obtaining the history of the problem (abrupt or sudden onset); and
- * verifying the type of fluid and medication that must be infused.

The greatest risk is associated with the infusion of vesicant medications. Antineoplastic medications are the obvious vesicants, however they are not the only solutions that can cause tissue destruction. Electrolytes such as potassium chloride and calcium, antibiotics such as vancomycin and nafcillin, vasopressors such as dopamine, and antiemetics such as promethazine (Phenergan) are also responsible for tissue destruction.

A cathetergram or dye injection under fluoroscopy can detect the fluid pathway through the system. Some experts recommend declotting with a fibrinolytic agent first to see if this produces a blood return. If the declotting procedure fails, proceed with the cathetergram to determine the exact problem.

A blood return will not completely answer all questions about catheter position and function, but this simple test is necessary as part of a complete assessment. Blood return must be present prior to infusing or injecting any vesicant medication.

1. Mayo, DJ. Fibrin sheath formation and chemotherapy extravasation: a case report. Supportive Care in Cancer 6: 51-56; 1998.

2. Hadaway, LC. Thrombotic and nonthrombotic complications: loss of patency. *Journal of Intravenous Nursing*, 21(5S): S143-S160; 1998.

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