

Placing a Central Sampling Catheter Through a Peripheral Vein

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Critically ill patients often require frequent laboratory analysis for monitoring purposes but repeated venipuncture can lead to hematoma development, iatrogenic anemia, infection, and patient discomfort.¹ A sampling catheter may be placed through a peripheral vein in hospitalized patients to facilitate repeated blood collection. In addition, access to the central (venous) circulation allows administration of hyperosmotic substances, parenteral nutrition, and measurement of central venous pressure.

If the catheter is used for repeated blood sample collection, this should be the catheter's sole purpose. This is important to avoid sample errors that may result from administration of IV fluids and drugs through the same catheter lumen; some studies have shown that this may cause inaccurate diagnostic results, particularly with glucose, potassium, and venous blood gas analysis.^{2,3}

A peripheral sampling catheter may be selected when frequent sampling is necessary, but a contraindication to true central venous catheterization via the jugular vein exists. Contraindications to jugular catheter placement include injury, infection, pain, or edema within the cervical region, coagulopathy, increased intracranial pressure, or cervical disk disease.

Lateral or medial saphenous veins are most commonly used for sampling catheter placement in canine and feline patients. Through-the-needle catheters are typically used, as they are small enough to pass through a peripheral vein and are longer (8–12 in) than over-the-needle catheters; this allows more central placement into the vessel and, in smaller patients, access to the caudal vena cava.

The catheters come in a variety of sizes and are appropriate for use in most patients (Table, next page). As peripheral sampling catheters obtain closer proximity to the central circulation and are intended for longer term use, maintaining aseptic technique is important to decrease the risk of contamination, phlebitis, and catheter-associated infection or sepsis.

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What You Will Need

- Clippers
- 5% chlorhexidine scrub
- Sterile drape
- Sterile gloves
- Through-the-needle catheter kit
- Injection cap or T-set
- Saline flush
- 1-inch tape
- Bandage material

Table Central Sampling Catheters Overview

<i>Catheter Type</i>	<i>Placed Through</i>	<i>Advantage</i>	<i>Disadvantage</i>
Single lumen (short)	Peripheral vein	Inexpensive, easy to place	■ No central venous access*
Single lumen (long)	Peripheral vein	Inexpensive, central venous access*	■ Catheter occlusion, may be difficult to maintain (prone to dislodgement, occlusion)
Multilumen	Peripheral vein	Central venous access*	■ Difficult to place through smaller peripheral vessels ■ Expensive
Multilumen	Jugular vein	Central venous access*	■ May be contraindicated with coagulopathies or cervical disease ■ Expensive

*Lack of central venous access implies that (1) administration of hyperosmotic solutions should not be performed as it may result in phlebitis, (2) central venous pressures cannot be performed as an indirect assessment of intravascular volume, and (3) blood samples are difficult or impossible to obtain.

Thrombosis is a potential risk associated with long-term catheter use.⁴ Other disadvantages to this type of catheter include catheter shearing by the introducer needle, need for a bulky bandage to secure it in place, and small lumen size (limited by the needle), which may cause catheter occlusion. The potential for hemolysis exists when obtaining samples via these catheters (as opposed to venipuncture); however, recent studies of blood samples obtained via venipuncture versus through a peripheral catheter have shown no significant difference between the methods.^{5,6}

Catheter Management

Management of the catheter is important, to ensure patency and minimize catheter-related complications, such as phlebitis, infection, and thrombosis.⁴ The catheter should be flushed with 0.9% NaCl (with or without heparin) every 4–6 hours to ensure it remains patent. The bandage should be evaluated every 4–6 hours as well and replaced if soiled or wet. The bandage should be removed/replaced every 24–48 hours in as sterile a manner as possible so the limb and catheter insertion site can be evaluated. Evidence of phlebitis, infection, displacement, leakage, thrombosis, or a fever may prompt the clinician to remove the catheter.

Peripheral sampling catheters are a short-term option for vascular access; previous recommendations included catheter replacement every 72–96 hours, however, because of limited peripheral venous access sites and lack of evidence to support such frequent replacements, recent recommendations suggest that as long as appropriate catheter care is performed and no complications noted, peripheral catheters need only be replaced when clinically indicated, rather than on a scheduled basis.⁷

Step-by-Step ■ Placing a Central Sampling Catheter Through a Peripheral Vein

Step 1

Place the patient in lateral recumbency and clip hair around the saphenous vein, allowing margins of at least 2 cm. Sedation may be necessary as dictated by patient needs.



Author Insight Take care when placing a through-the-needle long catheter in a coagulopathic patient, as excessive bleeding may occur. This is easily limited, however, with digital or bandage pressure.

Step 2

Perform surgical scrubbing and prepare the region for catheter insertion in a sterile fashion, wearing sterile gloves for placement. Here, a sterile drape is also used.



Step 3

Insert the needle through the skin and into the vein with the bevel side up. The site of insertion should be adjacent to the desired vessel. After the skin is punctured, the vein can be entered.



Step 4

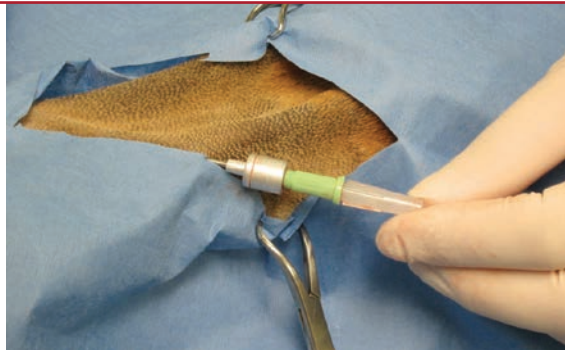
When the needle is seated in the vein, thread the catheter through the needle by grasping it through the attached plastic covering and carefully advancing the catheter.



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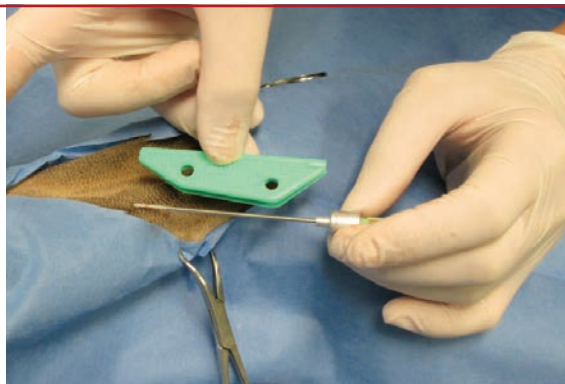
Step 5

When the catheter has been fully inserted, securely attach the green plastic end of the catheter to the hub of the needle. Remove the white plastic cap that covers the needle hub and clear plastic cover.



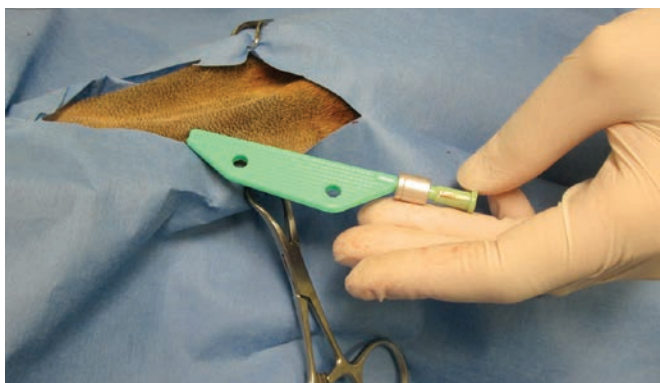
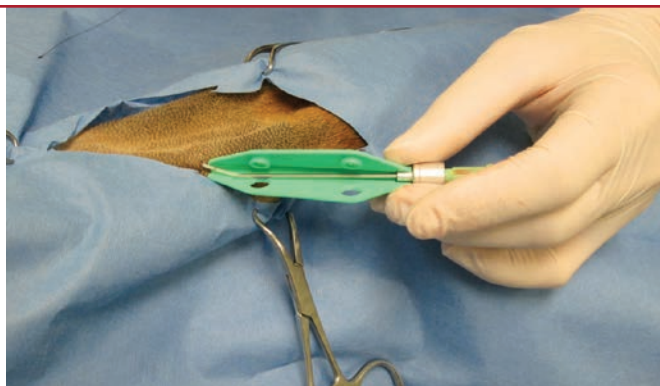
Step 6

Carefully back the needle out of the insertion site, exposing the tip. Limit any bleeding with digital pressure or a bandage.



Step 7

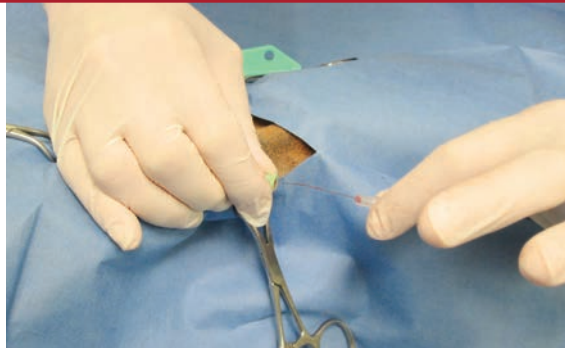
Place and close the needle guard over the needle.



Author Insight Ensure that the tip of the needle is completely covered within the needle guard so it does not lacerate the catheter.

Step 8

Carefully remove the wire stylet.



Author Insight Verify that the hub of the catheter is firmly locked into the hub of the needle as the stylet is being removed, or the catheter may be accidentally removed.

Step 9

Attach an injection cap or T-set to the hub of the catheter and flush the catheter with heparinized saline.



Author Insight The fluid should flush easily and blood should be able to be aspirated with minimal resistance.

Step 10

Secure the catheter in place with 1-in tape.



Author Insight Take care to secure the catheter in a manner that will not result in occlusion.

Step 11

Place a bandage to protect the catheter. As the needle remains attached to the catheter, it is essential to bandage the catheters to secure the weighted needle, preventing catheter migration.



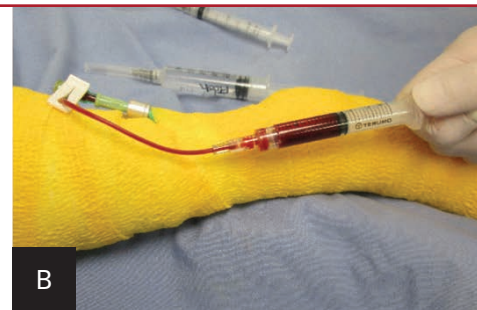
Author Insight A radiograph may be performed to confirm central placement for catheters used for central venous pressure measurements.

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Step 12

Blood samples can be collected from these catheters via the 3-syringe technique. The first syringe is used to draw a volume of 1–2 mL of blood, removing residual substances from within the catheter (A). If the blood is to be returned to the patient, the syringe should be pretreated with an anticoagulant (eg, heparin). The desired volume of blood for diagnostic evaluation can then be drawn with the second syringe (B), followed by either discarding or replacing the blood within the first syringe back with the patient (C). The catheter should then be flushed with heparinized saline with the final syringe (D).

■ cb



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