

Bad Vein---Gaining Access To Naughty Veins

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Introduction

Intravenous catheters are placed to administer fluids or drugs. Depending on the illness/injury, the age of the patient, the breed/size of the patient and what is available it may prove a difficult and frustrating task to place an IV catheter.

Peripheral Venous Catheters

Peripheral catheters come in a variety of sizes and types (butterfly, over-the-needle, through-the-needle). The type and gauge of catheter should be selected based on patient size, catheter location, volume and rate of fluid to be infused, and health of veins. Rule of thumb: Any healthy pet over 9.0 kg (20 pounds) should receive at least an 18g catheter. Most pets between 2.2 - 9.0 kg (5-20 pounds) can receive a 20 gauge catheter. Small gauge catheters such as 22g and 24g should be reserved for neonates and small exotics under 2.2 kg (5 lbs). Generally most facilities use over-the-needle catheters. Winged-tip catheters should be used for a one-time administration of fluid or drug into a peripheral vein. They should not be used long term or for fluid therapy. Through-the-needle catheters (8-12") are much longer than over-the-needles and are primarily used in the jugular vein.

There are a myriad of vessels that can be used for over-the-needle catheter placement. Most commonly used are the cephalic vein, saphenous vein and medial saphenous vein. Lesser common veins are the dorsal common digital vein (over the metatarsals), the auricular vein, or the accessory cephalic vein (distal to the carpus). Generally sites with lots of motion (ears and distal to the carpus and tarsus) will require splint application to minimize motion and help preserve the catheter. The jugular, maxillary and femoral veins can also be catheterized with an over-the-needle catheter so long as the tip of the catheter terminates outside the cranial or caudal vena cava. In very young puppies/kittens or neonates the umbilical vein can be used in emergency.

Central Venous Catheters

Through-the-needle, over-the-wire or peel-away catheters are generally placed into a central vein for long-term fluid administration, blood sample collection, and parenteral nutrition. Long catheters can be anchored more securely to the skin, and are less likely to be affected by patient movement. They are also generally more difficult to place. Central catheters should not be placed in patients with severe coagulopathies due to the risk of excessive hemorrhage or thrombosis if a hypercoagulable state is present. Because they are longer they tend to cause less problems (less infections and less phlebitis) than over-the-needle catheters. They are not, however, the ideal choice for rapid fluid administration.

Through-the-needle (venocatheter) are one of the easiest types of central lines to place. They are generally packaged in a sterile plastic covering. While the entire catheter is enclosed, it is still advised to wear sterile gloves to keep the area as clean as possible. The needle is inserted into the vessel and the catheter is then pushed through the needle. Because of this, it is

impossible to remove the needle completely so a needle guard is placed around the needle and it then must be secured and wrapped into place on the skin.

Over-the-wire (Seldinger technique) tend to be one of the most time consuming types of central lines to place. The technique is a four step technique consisting of an inducing needle/catheter, a guide wire, a vasodilator and then the placement of the actual catheter. Sterility is important and unlike the through-the-needle catheter everything is open to the air so contamination is a greater risk. That being said the Seldinger technique catheters are available as multiple lumen to allow for multiple fluids/drugs to be administered at the same time.

Peel-away catheters are also usually easier to place than over-the-wire. They are not self-enclosed so sterility can be an issue. Peel-away catheters come as single or multi lumen. You start off with an over-the-needle catheter which you place into a vessel. After placing the over-the-needle catheter, you remove the stylet. You then place the permanent, long-term catheter through the shorter over-the-needle catheter. You then “peel-away” the over-the-needle catheter leaving just the long-term catheter in.

What to Choose: Ask yourself, how critical is the patient?

Life-Threatening: If the patient is critical then time is of the essence and placing a central line may not be appropriate. Not only are central lines more time consuming, but they do not offer as high of a flow as short wide peripheral catheters. Numerous studies have been done proving this, but on average increasing the diameter of the IV catheter from 3.2 to 4.4mm improved flow times for one liter of crystalloid fluids from 6min to 2.7min. Increasing the length of the tube will decrease flow rates. To ensure the best flow rate in the critical patient a short (<2”), large bore (14-18g) catheter should be placed in the jugular vein. The catheter should then be connected to the IV fluids with pressure applied to the fluid bag via a pressure cuff. While this is the most ideal for your critical patient, is not always practical. The patient may have neck wounds, clotting concerns, head trauma or the animal may simply be too fractious/wiggly to attempt placing a short catheter into the jugular vein. If that’s the case, place a short, wide over-the-needle catheter into a peripheral vein.

Critical, but Stabilized: If your patient is relatively stable, but is still considered critical, then you may want to consider a central line. This will allow for parenteral nutrition, central venous pressure monitoring and blood sample collection. Central lines are beneficial in patients that will need to be hospitalized for more than 24 hours or those that require multiple blood draws. The most common route for central line placement is the jugular vein, however, femoral and saphenous veins can alternatively be used. Central venous pressure can be measured at these other sites, but only for trends as it cannot be a true measurement of CVP because of location. Certainly you can always place a central line catheter into a peripheral vein. While not ideal because they tend to kink, this usually allows for blood draws and the administration of blood, plasma and parenteral nutrition.

Stable/Healthy: If your patient is fully stabilized and/or healthy you will likely place a peripheral catheter. While the pet may appear to be completely healthy be sure to place a short, large diameter catheter in the event you need to fluid resuscitate the pet quickly.

Getting A Catheter In

It seems so simple: prep area, bevel up, insert into vein, advance, remove needle, leave catheter in, wrap and secure into place. Then you take a look at your patient. There’s a myriad of reasons why getting a catheter in may not be so simple or why the vein may not “behave”.

Below are a list of “tricks of the trade” that have been performed by numerous seasoned technicians throughout the years.

Tricks of the Trade:

1. *Percutaneous Approach:* This is the most common approach. Failure generally occurs because of a few simple things. The fur should be clipped away from the site wide enough to visualize the area. The first attempt should begin as distal as possible to allow subsequent proximal attempts should the first attempt fail. Ensure that the restrainer is rolling the vein appropriately and the skin should be as tense as possible. Once a flash is noted in the catheter, don't be too greedy. Ensure the catheter is traveling the correct path and that you are fully in the vessel by inserting the entire catheter and stylet in another 1mm. If you still are obtaining blood then advance the catheter over the needle and into the vessel.

2. *Percutaneous Facilitative Approach (Relief Hole):* This approach is useful in situations in which the animal has thick/severely dehydrated skin. Thick or dehydrated skin will cause the catheter tip to flail out (burr) and cause the stylet needle to dull. This will cause drag in the vessel leading to the inability to advance the catheter or the inadvertent puncturing of the vessel wall leading to a hematoma. The method is the same as a regular percutaneous approach except you will make a small incision (1-4mm) in the skin at the proposed site of insertion by tenting the skin and using a needle or scalpel blade (#11). By making a nick in the skin you will eliminate the initial force on the catheter tip and it will allow for a nice smooth entry into the vessel. This method can also be achieved by simply attempting a percutaneous approach. Once the initial approach is made and the technician realizes how “tough/dry” the skin is, the catheter tip should be removed to avoid hitting the vessel. This will leave a small hole which a second catheter can be placed through, thus decreasing tissue drag.

3. *Surgical Cut-Down (full cut-down):* In animals where percutaneous placement is difficult a surgical cut-down can be performed. A true surgical cut down should be performed by a veterinarian and generally occurs to gain access to the jugular vein. A routine surgical preparation of the area is made, pending the patient is stable enough, and an incision is made just lateral to the vein. The incision is then rolled from side to side to allow direct visualization of the vein. A brief blunt dissection will be made to allow for better access to the vein. The vein itself can then be isolated and lifted out of the skin via forceps. Suture material is then placed around the vein so that the vessel is raised up and out of the skin. A catheter is then placed into the vessel. The cut-down site should be covered with a sterile dressing. The catheter should be withdrawn within 24 hours if placement was not performed using strict aseptic technique.

4. *Modified Cut-Down (mini cut down):* Depending on the state you are in technicians may be able to perform a modified cut-down under the guidance of a veterinarian. A modified cut-down is similar to a surgical cut down except that the vessel is never isolated out of the skin. It is important to use a scalpel blade instead of a needle to ensure a smooth and fast approach. A cut-down attempt should be performed in an area where IV catheterization attempts have not been made as generally these areas are bruised and the vessel damaged. Making a 0.5-1” incision laterally to the vessel and then using blunt dissection will allow for better visualization of the vein.

5. *Floating it In:* You just hit the vein, there's a good flash, but you can't advance. Some theorize that you could be up against the wall of the vessel or be next to a valve. If you know you are in you can try administering some flush and advancing the catheter only (no needle) at the same time. The theory is that by flushing you will get past the valve or off the wall of the vessel which will allow your catheter to advance.

6. *Warm Skin = Bigger Veins:* Ever notice in the summer how your veins pop up on your hand and in the winter they tend to disappear? If you are having a difficult time visualizing the vein, try dilating it by placing a warm wash cloth on the skin for a minute or two. This will help enlarge the vein and make it pop up better. Apply the warm wash cloth for 3-5 minutes.

7. *Tourniquet + Person = Better Holding Off:* There is nothing tighter at holding off a vein than a tourniquet. The problem is a tourniquet doesn't roll the vein for you. By placing a tourniquet and having someone roll the vein you will get a tight pumped up vein. Don't forget it may take a minute or two for the vein to become enlarged, especially if the pet has perfusion issues.

8. *Twist & Turn:* Perhaps your angle isn't perfect and you land against the vessel wall or are stuck on a valve. Be sure to partially remove the stylet before trying this method to avoid lacerating the vein. Have your restrainer gently and ever-so-slightly re-twist the vein for you. It may move the catheter off the wall and give you enough room to advance without a problem.

9. *You KNOW You're In:* Remember that in some patients that are really unstable you may not get a flash at all. If you really think you are in you may need to flush 0.05-0.3 mls of saline to see if it you notice it blowing. If not, advance the catheter and recheck to ensure you are in. The restrainer should be able to feel the flush pass by their fingers if the vessel is flushed "hard" and the restrainer has their finger on top of the vessel.

10. *Pump up the Paw:* When your human nurse asks you to make a fist or to pump your hand there's a reason. It pumps up the vessel. If you are having a difficult time visualizing the vessel try pumping up the paw first to make it raise up more.

11. *First attempt Failed? Don't remove the first attempt catheter:* If you remove your first attempt catheter a large hematoma will form. If possible remove the first attempt catheter a little bit and leave it in the leg. Then, with a second catheter, go above the first catheter (0.5-1" higher). If your second attempt is successful remove the first catheter and place a pressure bandage on the first insertion site while you wrap in the second catheter. If you fail with the second attempt you will likely need to remove both catheters and try a different leg.

Conclusion: Every technician has their own special technique on how to place a catheter. Remember there are many techniques out there to try and no technique is perfect. Being open to new ideas and practice will be the best defense to the "naughty" vein.

References Available From The Author