

Intravenous Indwelling Catheters: Use & Care

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Overview

Intravenous (IV) indwelling catheters are commonly used in dogs and cats for ease of various drug and fluid administration. They are placed in either peripheral or central veins and may be maintained for days if the site has been sterilely prepared and is inspected daily.

Uses

- Routine fluid administration
- Drug administration, including emergency drugs
- Administering blood products and colloids
- Measurement of central venous pressure
- Facilitation of blood draws in patients requiring multiple tests or with very poor vein access
- Total parenteral nutrition administration

Placement of an intravenous catheter ensures that the drug will be administered intravascularly. This is of particular importance when the intended drug is very irritating to tissues if administered perivascularly (eg, thiopental and chemotherapeutic agents).

Treatments that include frequent administration of drugs or those that involve large volumes can be facilitated by using an intravenous indwelling catheter. For drugs or fluids (like plasma or blood) that must be administered intravenously, IV catheter placement may be the only option for administration.

Types of Catheters

Peripheral—Through-the-needle catheter

Various sizes ranging from 18 gauge to 24 gauge are commonly used in small animal practice.

Central—Central catheters placed via Seldinger technique (or wire-guided)

Central catheters include through-the-needle catheters such as intracaths and wire-guided catheters. Wire-guided catheters allow multiple uses and administrations from a single device.

- Single lumen
- Double lumen
- Triple lumen

Various sizes ranging from 16 gauge to 22 gauge are commonly used in small animal practice. Central venous catheters are normally cleaner because they are less likely to be urinated or vomited on by the patient. They stay in place longer because they are less likely to be chewed out. Also, because they tend to be made of softer, more flexible materials (especially multiple lumen devices), they are less likely to cause phlebitis during long-term use.

Sites for Placement

Peripheral indwelling intravenous catheters are usually placed in the cephalic vein in the forelimbs of dogs and cats. In the hindlimb, they are most commonly placed in the lateral saphenous vein in the dog and the medial femoral vein in the cat. Peripheral catheter placement is not technically difficult and the device may be placed using physical or chemical restraint of the patient. Aseptic techniques should be used.

New Article Series

Patient Support is a new column that outlines optimum strategy and intervention for providing the best patient-centered veterinary care while pursuing curative medicine and surgery.

Central indwelling venous catheters are usually placed in the internal and external jugular veins. Insertion of central catheters is technically demanding. A sedative or general anesthetic may be required for placement in a healthy patient; chemical restraint is not necessary for ill or debilitated patients. A small volume of local anesthetic placed at the device site is very useful for maintaining patient comfort during the procedure. Aseptic techniques should be used.

Central catheters may be placed in peripheral veins for long-term use and improved security of device placement. In cats, the medial saphenous vein is frequently used for this purpose. The lateral saphenous vein is typically used in dogs and may also be used in cats.

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Placement & Security of Indwelling Catheters

Central

1. Place animal in lateral recumbency.
2. Clip area, being careful to avoid clipper burn.
3. Scrub the area using sterile technique.
4. Have another person restrain the animal and occlude the vein.
5. Scrub hands and put on sterile gloves.
6. Have another person flush the needle and the lumen of the central catheter while the sterile-gloved person holds the ports. The unsterile person may not touch anything inside the Arrow catheter packaging.
7. Drape the patient's neck to prevent inadvertent contamination of the catheter. *Draping is recommended but is not done in this series to allow for better visualization.*
8. Palpate the vein.
9. Tent the skin over the vein and use a surgical blade to make a small nick in the skin for insertion of the needle. A small amount of local anesthetic (2% lidocaine) may be placed prior to the skin nick.
10. Insert the needle, bevel up, with the needle going toward the heart.
11. When blood is observed flashing back into the needle catheter, feed the wire from the wire guide forward into the lumen of the needle catheter, while still holding the device. **Do not move the needle catheter!**
12. Once the wire is advanced sufficiently into the vein, remove the plastic wire guide; then carefully pull the needle catheter back out over the wire. Be sure to hold the wire at all times.
13. *An alternative way of doing this is to place a through-the-needle catheter (a peripheral catheter), instead of using the needle catheter that comes with the jugular catheter package.* Using a peripheral through-the-needle catheter (after removing the stylette) may be easier and less likely to pierce the vessel wall while



Introducing a jugular needle catheter into an anesthetized dog



Introducing a wire guide through the lumen of the needle with sterile technique

14. Place a dilator over the wire and dilate through the skin and into the vein. The skin may need to be held and the dilator wedged through. When the dilator is pulled out, a small amount of blood should be observed from the hole. Pull the dilator completely off while still holding the wire in place. Apply pressure to the site to prevent blood loss.
15. Remove the cap from the brown port of the catheter and ensure it is not clamped off.
16. Measure how far you want to place your catheter (from insertion point to the heart). Alternatively, measuring the length of the catheter before the procedure is started will minimize the amount of time it takes to place the catheter and prevent



Threading a double-lumen jugular catheter through the wire guide and into the jugular vein



A jugular catheter in situ, sutured but not wrapped

blood loss during placement.

17. At this point, the wire should be coming out of the brown port and can be held while the catheter is fed over the wire into the vein to the desired length. Catheters are marked for ease of measurement. While holding the catheter in place, remove the wire.
18. Attach syringe of heparinized saline to the catheter and aspirate blood to ensure proper placement and to remove any air bubbles. Flush and clamp catheter, and place infusion cap on the end.
19. Suture to the skin through the plastic clamps. A "butterfly" of tape may be placed higher up and sutured as well.
20. Cover the site where the catheter enters the skin with betadine ointment and gauze.
21. Wrap the neck with soft padding, Kling, then Vet Wrap. The bandage should be firm, but never tight.

Peripheral

1. Place the animal in sternal recumbency if possible.
2. Clip the area where the catheter will be placed, avoiding clipper burn.
3. Gently scrub the area 3 times (Iodine versus chlorhexidine is discussed later).
4. Flush the catheter and t-set with heparinized saline (information on recommended heparin amount is provided later).
5. Restrain the patient and occlude the vein.
6. Insert catheter, bevel up, with the point of the needle headed toward the body.
7. When blood is observed in the catheter, feed the catheter forward. **Do not advance the stylette!**
8. Remove the stylette when the catheter is threaded to the hub.
9. Attach the t-set and injection cap.
10. Wrap a long piece of 1/2-inch medical adhesive tape around the device; then around the leg.
11. Flush the catheter through the t-set to check for patency.

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12. Dry the leg.
13. Place a Band-aid coated with betadine ointment where the catheter enters the skin.
14. Place 1-inch tape under the device and around the leg.
15. Wrap a short piece of 1/2-inch tape around the t-set and catheter to secure the t-set into the catheter.
16. Using another piece of 1-inch tape and starting at the top of the catheter, loop the t-set and tape to the leg.

Maintenance

Catheters should be flushed with heparinized saline or physiologic saline every 2 to 4 hours if the patient is not receiving fluids or a constant rate infusion of drugs. Opinions regarding the use of either heparinized saline or plain saline to flush intravenous catheters intermittently are contradictory. Some studies have shown that using heparinized saline decreases the likelihood of intraluminal clot formation and therefore prevents device malfunction. Others have shown that heparinized saline provides no significant advantages over regular sodium chloride for maintaining patency and preventing blood clot formation.¹ The concentration of heparin used with saline ranges from 2 IU/ml to 100 IU/ml. Some hospitals use premixed commercial heparin/saline while others use their own mixture of heparin/saline.

In humans, the concerns of using heparin as an antithrombotic agent for intravenous catheters include heparin-induced thrombocytopenia and allergic reactions to heparin. When a catheter is flushed repeatedly with solutions containing high concentrations of heparin, bleeding complications may result. This is of particular concern in small veterinary patients such as cats, toy breed dogs, or neonates. In our hospital, we prefer to use low concentration heparinized saline (2 IU per ml) and flush every 2 to 4 hours to maintain the patency of the catheter. Care must be taken to keep the catheter site clean and dry. At least daily inspection of the catheter site is very helpful in identifying prob-

lems early. Complications can be reduced by regular and timely changes of the dressing. For catheters that need to be maintained for longer durations (longer than 3 days), disinfectants such as chlorhexidine gluconate should be applied at the time of insertion and reapplied every 48 to 72 hours to prevent bloodstream infection.²

Catheters should be secured properly. Peripheral catheters are usually secured with 1/2- to 1-inch medical tape; central venous catheters are usually secured with sutures. Bandaging peripheral or central venous catheters too tightly or too loosely may cause significant problems. Excessively tight bandaging will cause local edema, while loose bandaging leads to malposition of the catheter and possible loss. It is important to periodically check the animal for either of these occurrences and make any necessary adjustments.

Many animals will require some method of restraint (Elizabethan collars, etc) to keep them from chewing out catheters. Another challenge is the security and proper placement of the injection cap or port to the hub of the catheter. A loosely attached injection cap or port will allow back flow of the blood or leakage of fluids, clotting of the catheter lumen, and ultimately cause malfunction of the catheter. Therefore, it is important to properly select and set the injection cap and port to best fit the catheter.

Complications

Intravenous catheter placement can result in serious complications including excessive bleeding, sepsis, thrombophlebitis, and thrombosis or air emboli.³ Performing coagulation testing prior to central catheter placement is particularly warranted in critically ill patients with potential coagulation problems. Studies have compared the use of chlorhexidine gluconate or povidone iodine to disinfect the catheter insertion site and prevent bloodstream infection and sepsis. One study showed that site preparation with 2% chlorhexidine resulted in lower infection rates

Some Signs of Catheter-Related Infection

- Presence of purulence at catheter insertion site
- Elevation of body temperature over 38.5°C (101.3°F)
- Erythema or tenderness at insertion site
- Hypothermia with signs of shock
- Any elevation of body temperature associated with a positive blood culture

than did preparation with povidone-iodine or 70% alcohol.⁴

Scheduled replacement of catheters has been proposed as a method of preventing infections. Studies of peripheral catheters show increased thrombophlebitis and bacterial colonization when a catheter is left in place longer than 72 hours.⁵ Changing the device every 3 days may improve patient comfort and reduce infection rates.

It has been suggested that a fibrin sheath develops around the catheter within 24 hours, increasing bacterial attachment and replication and resulting in thrombus formation. This promotes further microbial adherence.⁵ In humans, the diagnosis of catheter-related central vein thrombosis is based on visualizing an intravascular thrombus, incompressibility of the vein by probe pressure, or absence of spontaneous flow as detected by Doppler. The diagnosis of pulmonary emboli/air embolism requires pulmonary angiography or lung scanning.

Indwelling intravenous catheters are useful tools in veterinary practice. However, proper hygiene prior to insertion combined with good technique aids in preventing infections. Vigilance in monitoring and maintenance of indwelling catheters are keys to preventing further complications associated with their use. ■

See Aids & Resources, back page, for references, contacts, and appendices.