

Catheter placement and maintenance

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Abstract

Intravenous catheters are an excellent option for providing short- and long-term fluid or antibiotic therapy. Multiple options for venous access exist. Selection of an access point is multifactorial, but volume to be administered and ease of access are 2 things to consider. While catheter materials and lengths vary, there is not a dramatic difference in overall performance for bovine patients. While a variety of methods exist for placing and securing an intravenous catheter, sterile preparation and regular flushing lay the pathway for longevity of catheter placement.

Key words: bovine, catheter

Résumé

Le cathéter intraveineux est une excellente option pour la thérapie antibiotique et la fluidothérapie à court ou à long terme. Il existe plusieurs options pour accéder aux veines. La sélection d'un point d'entrée est multifactorielle mais le volume à administrer et la facilité d'accès sont deux éléments à prendre en compte. Bien que le matériau et la longueur des cathéters puissent varier, il n'y a pas de différence dramatique dans la performance d'ensemble chez les patients bovins. Bien que plusieurs méthodes existent pour placer et maintenir le cathéter intraveineux en place, la préparation stérile et le rinçage fréquent vont assurer la persistance du cathéter.

Access Options

The most common access points for venous access in the bovid are the jugular and auricular veins although the saphenous vein and various intraosseous routes are also possible. When choosing an access point consider why you are placing the catheter. Larger vessels favor longer duration of catheter placement and larger, more rapid fluid volume administration. In addition, hypertonic solutions or reactive drugs will have less risk of side effects in a larger vessel. One should also consider the manner the animal will be restrained for products to be administered through the catheter. An animal that requires a halter, favors sites other than the auricular vein. Similarly, jugular catheters can be damaged or difficult to access in animals using head catches.

- Jugular vein – large-bore catheters can easily be placed in the jugular vein of cattle. In adult cattle, 10 to 16 gauge will easily provide adequate rapid

high-volume fluid flow. Neonates can handle 16 to 18 gauge. In mature cattle 5.5-inch catheters are ideal, as the length limits the risk that it may be pulled out during normal movement and handling. The 1 exception to this is bulls, where longer catheters are necessary due to the mobility of the skin. In calves, 3.25-inch catheters will typically provide adequate length. Consider proximal location in the neck away from the flexion that occurs at rest, as this will limit flow. In addition, the angle of placement when securing to the neck should be in neutral head position. This will limit skin pull on the catheter as the animal moves.

- Auricular vein – 18 to 20 gauge, 2 to 3.25-inch catheters can easily be placed in the ear vein of cattle. Fluids for rehydration can be administered this way, but speed of administration will be slower based on vessel size. The risk of thrombosis with hypertonic solutions and reactive drugs is also increased due to smaller vessel diameter.
- Saphenous vein - This can be used in situations where a jugular or auricular vein are not accessible. The uses are somewhat limited due to the risk of manure contamination or animals getting caught in fluid lines if they are ambulatory.
- Intraosseous – This is best used in profoundly dehydrated calves when peripheral vessel catheterization is deemed impossible due to hypovolemia. The femur is the easiest access.

Catheter Options

| | Silicone | Polyurethane | Polyethylene | Teflon/ PTFE |
|-------------------|---------------------|---------------------|---------------------|---------------------|
| Internal diameter | Thick wall small ID | Thin wall large ID | Thick wall small ID | Thick wall small ID |
| Stiffness | Soft | Softens when warmed | Stiff | Stiff |
| Ease of insertion | More difficult | Moderately easy | Easy | Easy |
| Flexibility | Excellent | Moderate | Rigid | Rigid |

Polyethylene and polyurethane catheter material can be purchased on a bulk reel. This can be cut to desired lengths and an adapter placed for custom catheterization. These can be placed through a large-bore catheter. These can be used in bulls or any setting that may require a long line within a vessel.

Placement

For all sites, the skin should be clipped and aseptically prepared. A local block with a small amount of lidocaine will minimize pain and possibly movement at the time of vessel puncture. Particularly for jugular catheterization and in dehydrated animals, a full-thickness cutdown through the skin will allow for smoother transition through the skin and minimize burring of the catheter tip. A cutdown long enough to seed the catheter hub into the cutdown will help minimize excessive movement and angulation where the catheter meets the hub. This decreases positional flow obstructions and lessens the risk for breakage.

There are a variety of ways to secure the catheter to the animal including suture, glue, bandage material, or a combination of these methods. No matter the method chosen, the position that the catheter wants to naturally set should be considered. In the jugular vein, catheters often want to hang slightly away from the skin. This takes into account the skin thickness and angle of catheter entry into the vessel. Tightening to the skin often creates a buckle where the catheter meets the hub, which limits flow and increases the risk of breakage.

Maintenance

Regular flushing will help maintain patency of the catheter. There are several things to consider that will also help lengthen the time a catheter will operate appropriately.

1. Limit pulling blood back through the catheter. Every time blood contacts the catheter lumen is an opportunity for sludging and clotting to occur.
2. Consider a T port or an extension line with a flow lock if the catheter is not going to be in continual use for fluid therapy or will be used regularly for drug administration. The closer to the catheter you clamp off the line, the less back flow and risk of clotting.
3. Use the shortest extension set reasonably possible.
4. If you use a T port, limit the number of needles that pass through the port close to the catheter. The more needles that pass through, the more likely the catheter is to leak or suck air which will favor clotting and limit lifespan.
5. Regularly change your injection cap, especially if using 18 gauge or larger needles.
6. If longevity is important, good skin prep and a single smooth stick go a long way in limiting trauma that may initiate thrombophlebitis and catheter failure.