

Practical Tips on Intraosseous Fluid Therapy

By Greg Martin BVSc, MACVSc, Faculty of Veterinary Science, University of Queensland, Australia

Most small animal vets have experienced it: a cat (neonate or bird) is presented in shock (often acute haemorrhagic shock as a result of trauma), and intravenous fluids are needed stat. But the peripheral veins have all collapsed, and you just can't get an I/V line in place.

An alternative to central venous access is to place an intraosseous cannula and administer fluids or other drugs. Most drugs that can be administered intravenously can be given by this route. Vessels within bone are supported by a rigid matrix, so circulation is maintained even in severe circulatory failure; therapeutics administered via this route enter the general circulation rapidly.

A variety of routes of access can be used, depending on the age, size and species of the animal. I have had most experience placing cannulae in the proximal femur of cats, so I will describe this as an example. The reader is referred to the references below for further details and suggestions for other species.

Bones used for intraosseous infusion should be intact (that is, not fractured), and the skin over the insertion site should be unbroken to avoid contamination of the bone with bacteria — infection is the most common complication of this procedure.

To place a cannula into the proximal femur of a cat, the area over the greater trochanter/hip is clipped and surgically prepped. The point of insertion into the bone is the trochanteric fossa (the exit point of a Steinmann pin).

Firstly, local anaesthetic (for example, lignocaine) is applied to the subcutis over the insertion point, then down onto the periosteum of the trochanteric fossa. The needle should be introduced down the medial side of the greater trochanter, and "walked" down the bone into the fossa, injecting small amounts of local as the needle is advanced. By introducing

the needle in this fashion, the ischiatic nerve is avoided.

Once local anaesthesia is performed, a small stab incision should be made in the skin to allow insertion of the intraosseous cannula. The cannula is advanced in a similar fashion down the medial side of the greater trochanter into the trochanteric fossa.

Once in position, the cannula is driven through the cortex into the medullary cavity by downward pressure and rotation (about a quarter turn at a time).

Once in place, the needle should be checked for proper positioning by manipulation of the femur, and flushed with heparinised saline. If correctly positioned, saline should infuse easily into the medulla of the bone. The cannula is then sutured in place, and a fluid line is attached, before being covered by a protective bandage.

Intraosseous cannulae can remain in place for up to 72 hours. Once removed, further cannulation of the same bone cannot be performed as fluids infused will leak out from the original hole in the cortex into the surrounding tissue.

Administration rates for this route are limited, so care should be taken if positive pressure infusion is to be used.

When I have used this technique, I have removed the cannula and changed to the intravenous route once the acute shock has been successfully treated (that is, after 6–12 hours). If the cannula is to remain in place for longer than this, it should be flushed with heparinised saline every 6 hours.

Before attempting this procedure, I would advise reading one or both of the below references and practising cannula placement on cadavers if possible.

REFERENCES

- Otto, C. and D.T. Crowe (1991), "Intraosseous resuscitation techniques and applications", in *Current Veterinary Therapy XI*, ed. R.W. Kirk, Philadelphia: L&B Saunders, 107–09.
- Otto, C.M., G.M. Kaufman and D.T. Crowe (1989), "Intraosseous infusion of fluids and therapeutics", *Compend Contin Educ Pract Vet* 11 (4): 421–30.

Intraosseous Infusion: Rate of Administration

The rate of delivery of fluids by the intraosseous route is limited to 11ml/min with gravity flow and 24ml/min with 300mmHg pressure. Pressure can be provided by a commercially available pressure-infusion cuff. The following recommendations are for delivering shock doses (90ml/kg/hr):

- Gravity flow through a single catheter is used for animals that weigh up to 7.3kg (16lb)
- Pressurised flow through a single catheter or gravity flow through multiple catheters is used for animals that weigh between 7.3 and 16.4kg (16 to 36lb)
- Pressurised flow through multiple catheters is used for animals that weigh more than 16.4kg (36lb)
- A separate bone must be used for each catheter.
- Restoration of peripheral pressure by rapid intraosseous fluid replacement enables routine intravenous catheter placement and continued volume fluid therapy.

REFERENCES

From Otto, C.M., G.M. Kaufman and D.T. Crowe (1989), "Intraosseous infusion of fluids and therapeutics", *Compend Contin Educ Pract Vet* 11 (4): 421–30.