GADGETS AND PROCEDURES YOU CAN DO!

Elizabeth Rozanski, DVM, DACVECC, DACVIM(SA-IM)
Tufts University, North Grafton, MA

Vascular access

Vascular access in pets is routine for anesthesia, and in most cases is accomplished with a minimum of difficulty. However, in some cases, it may be challenging in certain pets to gain prompt vascular access. This can be life-threatening in animals with critical illness or injury. The best options for improving the success of vascular access are 1) vein and catheter choice 2) Intraossesous (EZ-IO gun) or 3) cut downs. If possible, practice on cadavers, including neonates, will improve success.

For collapsed dogs in lateral recumbency, the DOWN cephalic vein is much more easily catheterized, due to an easier angle, and also some internal occlusion by the body weight which helps to distend the vein. The UP saphenous vein is also easier to hit. In collapsed cats, the veins of choice are the medial saphenous vein and the jugular vein.
In some primary care practices, jugular venipuncture is less commonly pursued; if it is possible to use the jugular vein more routinely, it is often easier to successfully catheterize this vein the pet with "collapsed" veins. Catheter brands may have different characteristics in tissue handling and ability to show a "flash". Recall that in pets with lower venous pressure (eg. Hypovolemia), it may be hard to get a flash, or may be relatively "slow" compared to normovolemic pets. The size of the catheter placed should be a large as you can comfortably place, but it may be required to go a size or two smaller. In most cats, a 20 or 22 gauge catheter can be placed, and in most dogs, an 18 or 20 ga catheter. In collapsed neonates or pediatric patients, a jugular catheter can often be relatively easily placed, although it should be recalled that the vein will be quite superficial. A 20 ga needle may also be placed as an IO catheter, most easily down the shaft of the femur. Intraosseous catheters may also be placed quickly in larger or adult animals, using either a bone marrow needle, or a commercially available device called an EZ-IO gun. The EZ-IO gun is quite simple to use, even with minimal training. Individual needles are expensive, but potentially may be autoclaved and re-used. The final option for vascular access is a cut down, which may be performed either as a mini-cut down, or as a full cut down. A mini-cut down is performed by nicking the skin with a scalpel blade or needle, to simply try to reduce the likelihood that the catheter will burr while a full cut down is performed by making a incision parallel to the vein, and then carefully isolating the vein and introducing a catheter. This technique can be very effective although it should be noted it is easy to go through the back of the vein.

A final technique that may be useful for long-term catheters, is placement of double lumen catheter. These longer-term catheters are placed using a guidewire exchange technique. Specifically, a catheter or needle is placed into a vessel. Next a long guidewire is placed through the needle, and the needle is removed. A vessel "dilator" is placed over the wire to stretch out the skin and tissues, and removed and replaced with the longer term catheter. These catheters are less irritating to the vein, may be used for

sample collection or for delivery of hypertonic solutions (glucose, higher concentrations or potassium or nutrition).

Thoracocentesis

The pleural space is defined as the area between the lungs and the chest wall. Normally there is no soft tissue or free air present in this space. A very small amount of fluid (undetectable on radiographs or ultrasound) may be present within the thoracic cavity. Clinical signs of pleural space disease include tachypnea or difficulty breathing with classically rapid/shallow breathing considered the most common. It is important to recall that pleural effusion is a sign rather than a specific diagnosis. Physical examination findings may include respiratory distress and muffled heart/lung sounds. Occasionally, lung sounds may appear normal. It may be possible to percuss a ventral dullness. Other findings may reflect the underlying disease process (ie gallop, murmur, fever, trauma). Diagnosis of pleural effusion may be made either through thoracocentesis, or imaging (usually radiographs, but fluid may also be visualized on ultrasound). Radiographic signs of pleural effusion include decreased detail ('white out"), scalloping of the ventral lung borders, fissure lines between lung lobes and an obscured cardiac silhouette. Chronic pleural effusions may result in the radiographic appearance of "rounded" lung margins. Therapy of pleural effusion is directed at both improving respiratory status by removing fluid/air and at identifying the underlying cause.

Thoracocentesis is performed by clipping and sterilely preparing an area between the seventh and ninth rib at approximately the costochondral junction. Occasionally, the site may be lower or higher based upon suspicion of fluid (lower) or air (higher). The animal should be gently restrained in a sternal or standing position. Typically, in cats and small dogs a butterfly catheter, stopcock and 5-30 ml syringe are used. In large cats and most dogs, a longer needle is required. Aseptic technique is recommended. A distinct "pop" is felt upon entering the pleural cavity. Volumes of fluid and air retrieved should be recorded. Animals with chronic effusions are MUCH more likely to develop a pneumothorax following thoracocentesis.

One additional technique that may be useful is to drain the effusion with the use of a catheter (16-18 ga) and suction unit, such as a surgical unit. The advantages of this method include increased speed for the clinicians and staff, and less duration of restraint for the dog. This technique may also be used for abdominal effusions such as right heart failure.

1. Determine the need for large-volume centesis; Ultrasound is ideal if available.
2. Clip, prep and block desired site. Sedation or brief anesthesia (propofol) may be used.
3. Place catheter into the chest or abdomen, remove stylet, connect to suction.

Thoracostomy (chest tubes) may be placed for ease of chest drainage, either using conventional large bore chest tubes, or smaller bore chest tubes, which may be placed using a modified Seldinger technique.

Samples of fluid should be saved for cytology and culture (if indicted). Fluid analysis is often very helpful in determining the cause. Fluid may be characterized as a transudate, modified transudate, or exudate. A transudate is defined as s clear acellular fluid with a low specific gravity. Pure transudates are relatively rare but may occur secondary to severe hypoalbuminemia or overhydration. Modified transudates are the most common type of pleural effusion and may be caused by heart failure, neoplasia (lymphoma or metastatic) or systemic inflammatory conditions (eg pancreatitis). Causes of exudates include pyothorax or feline infectious peritonitis. Other effusions include chylothorax or hemothorax.

For persistent pneumothorax, "blood patching" may be tried to speed healing. A blood patch is performed by injecting 25-50 ml of fresh whole blood directly into the chest with the hope that the clotting factors helps to speed up the healing of the tear in the lung tissue.

Pericardiocentesis

Pericardial effusion is common in large-breed dogs, such as retrievers and shepherds. Clinical signs may be vague, and include lethargy or vomiting, which may progress to collapse. Ultrasound is the easiest way to identify effusion, but clinical examination, including muffled heart sounds, jugular distension, pulsus paradoxus, and occasionally ascites. Acute tamponade will not have radiograph changes easily detectable, but more chronic effusions will have globoid hearts, or silhouette that appear particularly "crisp".

Pericardial effusion is performed from the right side to avoid the left ventricle (and coronaries). The site may be chosen by ultrasound, or if not available at the 4-5th intercostal space at the level of the costrochondral junction. In larger dogs, a 5 ¼ in catheter is used, and following lidocaine blockage, and with the dog left lateral recumbency, the catheter is slowly advanced while gentle aspiration is applied to the end of the catheter. Lidocaine (2 mg/kg) should be available in case of ventricular ectopy and EKG monitoring should be used if possible. Effusion typically is very bloody, but will not clot. Two to four hundred ml is typically retrieved from larger dogs. Most pericardial effusions are caused by neoplasia, specifically right atrial hemangiosarcoma and have a guarded prognosis, but some dogs do not have neoplastic causes, or may have a longer clinical course.

Soaker catheters

Bigger surgical procedures, such as amputation are painful post-operatively. Multi-modal pain relief, including opioids and NSAIDS are commonly used. Local control with lidocaine or bupivacaine may also be used. Catheters may be made in the clinic or commercially purchased. The catheter is placed through the surgical field and secured in place, and then the local analgesic is infused through the catheter. These can control the pain nicely without side effects and help encourage early ambulation.