Proceeding of the SEVC
Southern European Veterinary Conference

Oct. 17-19, 2008 – Barcelona, Spain

http://www.sevc.info

Reprinted in the IVIS website with the permission of the SEVC
www.ivis.org
When to treat pneumothorax?

Small amounts of air within the pleural space are of little consequence and may resolve without treatment. If pneumothorax is causing respiratory distress, air can be removed by thoracocentesis (procedure described subsequently). If thoracocentesis fails to provide prolonged relief from respiratory distress, it is highly likely that pneumothorax is the result of continued leakage of air into the pleural space, and consideration should be given to placing a chest, or thoracostomy, tube. Some animals with chronic leakage of air into the pleural space (often associated with pulmonary blebs or bullae that rupture) may reach a point of stability that allows them to tolerate the presence of a certain volume of air within the pleural space. The mechanisms underlying tension pneumothorax (when air pressure within the pleural space exceeds atmospheric pressure) remain unknown, but failure to treat tension pneumothorax promptly is usually fatal.

Thoracocentesis.

The pleural space may be drained intermittently by thoracocentesis using a hypodermic needle, catheter, or teat cannula. Repeated placement of these devices across the thoracic wall increases the risk of damage to the lungs. In an emergency, thoracocentesis can be performed by attaching the needle, catheter, or cannula directly to a syringe; however, it is difficult to remove large quantities of air or fluid with this configuration, and the risk of damaging the underlying lungs is greater. It is preferable to attach the needle, catheter, or cannula to a length of sterile tubing (IV extension tubing works well) and a three-way stopcock that is attached to the syringe. This allows removal of a large volume of air or fluid without having to reinsert the needle or detach the syringe to empty it when it is full. This configuration also minimizes damage to the lungs by the tip of the needle, cannula, or catheter due to motion as the syringe is aspirated or emptied.

Chest (Thoracostomy) Tube Placement.

If continuous or prolonged pleural drainage for removal of fluid or air is required, a thoracostomy tube should be placed. Thoracostomy tubes are generally placed through the 7th, 8th or 9th intercostal space. The tube should be placed on the side of accumulation of air or fluid, or bilateral tubes may be placed. Although any sterile tubing can be used, commercially designed thoracostomy tubes have several advantages. These are typically made of a silicon polymer (silastic) that is less irritating to the tissues. Commercial thoracostomy tubes also have a radiopaque marker that facilitates evaluation of tube placement when making radiographs. There is typically a gap in the radiopaque marker at the most proximal opening of the tip of the thoracostomy tube, and it is essential that all the openings of the tube remain within the pleural space. Commercial tubes are also provided with a trocar that facilitates placement across the chest wall. Passage of commercial tubes with a trocar in place should be performed in a controlled manner to minimize the potential for damage to the lungs, heart, diaphragm, or liver.
If time allows, the lateral thoracic wall should be shaved, and the skin should be prepared for aseptic surgery. If the animal is not anesthetized, the path through which the thoracostomy tube will be placed, including the intercostal space through which the tube will be passed, should be infiltrated with local anesthetic. An incision is made in the skin approximately 2 intercostal spaces caudal to the intended location of passage of the tube across the chest wall. Although thoracostomy tubes are typically placed in a caudal-cranial and dorsal-ventral direction, the tube can be placed in a slightly more cranial location if air is within the pleural space or in a more ventral location if fluid is within the pleural space. Ideally, the tube is placed through a subcutaneous tunnel that extends over approximately 2 intercostal spaces to minimize the potential for air leaking around the tube or inward bacterial migration around the tube. The subcutaneous tunnel can be created by 1 of 2 methods. A forceps can be inserted through the skin incision and blunt dissection performed to create the tunnel to the intended site of passage of the tube across the chest wall. The forceps are closed and passed bluntly across the chest wall. If a commercial chest tube with trocar is used, the tube is inserted through the subcutaneous tunnel and across the chest wall. Alternatively, an assistant can pull the skin forward until the incision lies over the intercostal space through which the tube is to cross the chest wall. A forceps is passed through the skin incision, subcutaneous tissue, and chest wall to create a path for the thoracostomy tube. The tube is inserted across the chest wall, and the tip is directed in to the desired location. If a tube is to be placed without a trocar, the tip of the tube is grasped with the forceps, and the forceps and tube are passed through the subcutaneous tunnel and across the chest wall. Pressure is applied to the tube to insert it into the pleural space and pass it in the desired direction as it is released from the forceps.

The tube is secured to the skin with 2-0 or 3-0 monofilament suture using half-hitches or the Chinese finger-trap method. A percutaneous suture should be placed around the tube as it passes through the subcutaneous tunnel using the same suture material to further limit migration of air or bacteria around the tube.

**Drainage of Thoracostomy Tubes**

The thoracostomy tube may be attached to a three way valve to allow intermittent aspiration of the tube, a Heimlich valve, or to a continuous suction devise. If continuous suction is applied to the thoracostomy tube, the negative pressure must be carefully controlled and should be no less then 5 to 10 cm H2O. Alternatively, the thoracostomy tube may be attached to a Heimlich valve. If the Heimlich valve becomes cracked or the diaphragm of the valve becomes wet, the one-way function of the valve may be lost. Heimlich valves come in at least 2 sized, and animals weighing less than twenty pounds are frequently incapable of activating the valve of the larger size, resulting in continued accumulation of air within the thoracic cavity.

If fluid or air cannot be aspirated from the thoracostomy tube, the pleural space may be completely evacuated or the tube may be obstructed by a fibrin clot or the tube bending upon itself. Thoracic radiographs may be made to evaluate placement of the tube, and the tube can be flushed with sterile saline to confirm patency. The tube should be removed when no longer needed. The presence of the thoracostomy tube will result in continued production of a small volume (at least 30 60 ml/24 hr in a 25 kg dog) of fluid. It is also possible that a small volume of air may continue to accumulate within the pleural space due to migration along the external surface of the chest tube or through leaks in the tubing. Therefore, it is often not possible to wait until no air or fluid accumulates within the thorax to remove the thoracostomy tube, and the tube is usually removed when the volume of air and fluid has reached a low, steady rate. Although the tube should not be removed prematurely, it is often difficult to maintain sterility of the tube over time, and the risk of thoracostomy tube-associated infection increases with time.