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PERICARDIAL DISEASE: etiology, diagnosis and therapy

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CONGENITAL DISEASES

There are several congenital diseases of the pericardium recognized in small animal species. While peritoneopericardial diaphragmatic hernias (PPDH) are the most common type of congenital abnormality encountered, sporadic reports of partial pericardial defects and intrapericardiac cysts have been published. Congenital complete absence of the pericardium is quite rare.

ACQUIRED PERICARDIAL DISEASES

Diseases causing pericardial effusion are the most common causes of clinically significant pericardial disease in the dog. Idiopathic intrapericardial hemorrhage (Golden retrievers are overrepresented) with or without pericardial reaction and neoplasia of the heart, heart base, or pericardium are the most common causes of hemorrhagic effusion in dogs. Clinically important tumor types in dogs include hemangiosarcoma of the right atrium (especially common in German Shepherds and Golden Retrievers). Aortic body tumors (chemodectoma, nonchromaffin paraganglioma) with invasion of the heart base is most commonly seen in aged brachycephalic breed dogs, ectopic (heart base) thyroid carcinoma, mesothelioma of the pericardium, and metastatic carcinoma. A well recognized but uncommon cause of intrapericardial hemorrhage in small breed dogs is left atrial tear secondary to severe chronic endocardiosis of the mitral valve.

Diagnosis

Thoracic radiography usually demonstrates abnormalities when there is significant accumulation of pericardial fluid. The cardiac silhouette loses its angles and waists and becomes globe-shaped. Most cases are not "classic" and require integration with the other data. Pulmonary vascularity is often reduced from low cardiac output in contrast to CHF from cardiomyopathy or valvular disease in which the pulmonary vascularity may be increased (especially the pulmonary veins). If CHF has developed, distension of the caudal vena cava hepatomegaly and pleural effusion are usually evident. Less commonly, distension of the pulmonary veins and increased pulmonary interstitial densities (edema) may be detected. Heart base tumors may deviate the trachea and produce a mass effect.

Although there are no pathognomonic electrocardiographic findings for pericardial disease, there are several electrocardiographic abnormalities that are commonly seen. Electrical alternans is a beat-to-beat voltage variation of the QRS or ST-T complexes. It may be recorded in as many as 50% of patients with pericardial effusion. Elevation of the ST segment is commonly recorded in patients with pericardial disease. This represents an epicardial injury current. Reductions in QRS voltage (R < 1 mV in Lead II) are commonly recorded in dogs with pericardial effusion.

Echocardiography is the most sensitive and specific non-invasive method of detecting pericardial effusion currently available. The hemodynamic consequences of pericardial effusion depend not only on the amount of pericardial effusion present, but also on the rapidity with which the effusion has accumulated. A small or moderate amount of fluid accumulating rapidly (left atrial rupture) may produce significant hemodynamic compromise, while a large amount of effusion accumulating over months may have little hemodynamic effect. These principles should be remembered when assessing the significance of an echocardiographically-detected pericardial effusion. Echocardiography can detect as little as 15 ml of intrapericardial fluid. An anechoic space between the epicardium and pericardium is the classic echocardiographic finding in pericardial effusion. Cardiac motion is commonly abnormal often with dramatic side-to-side movement and diastolic compression. Overall cardiac chamber size is usually diminished due to impaired cardiac filling. Intrapericardiac or cardiac mass lesions may be visualized.
THERAPY AND PROGNOSIS

Pericardiocentesis

Pericardiocentesis is the treatment of choice for initial stabilization of dogs and cats with pericardial effusion and cardiac tamponade. When performed properly, pericardiocentesis is associated with minimal complications. Prior to performing pericardiocentesis, it is necessary to shave and surgically prepare a large area of the right hemithorax (sternum to mid thorax, third to eighth rib). Local anesthesia is usually adequate; however, mild sedation is sometimes necessary. It is important to insure that the pleura has been infiltrated, as pleural penetration seems to cause significant discomfort. The patient is placed in sternal or lateral recumbency, depending on demeanor. Occasionally, pericardiocentesis can be accomplished in the standing animal, but adequate restraint is essential to prevent cardiac puncture or pulmonary laceration. Electrocardiographic monitoring during the procedure is helpful since epicardial contact often causes ventricular arrhythmias.

The puncture site is usually determined based on the location of the heart on thoracic radiographs. This is most commonly between the fourth and sixth rib spaces at the costochondral junction. Ultrasound guidance is infrequently necessary unless the volume of effusion is very small or the effusion is compartmentalized. The size of the needle or catheter used is dependent on the size of the animal. In cats, a 19 to 21 gauge butterfly catheter may be adequate, while in large dogs, a 16 gauge over-the-needle catheter (usually with additional side holes) may be needed. The needle or catheter should be attached to a 3-way stopcock, extension tubing, and a syringe, to allow constant negative pressure to be applied during insertion and drainage. Care should be taken to avoid the large vessels that run along the caudal border of the ribs. Once the catheter has been inserted through the skin, negative pressure should be applied. If pleural effusion is present, it will be obtained immediately upon entering the thoracic cavity. It is most commonly a clear to pale yellow color. As the catheter is advanced and contacts the pericardium, a scratching sensation will be noticed. Minimal advancement will result in penetration of the pericardium.

Most pericardial effusions are hemorrhagic and have a "port wine" appearance. Once effusion of this character is obtained, the catheter should be advanced over the needle, and the needle removed. The remainder of the drainage should be performed using the catheter. Advancing the needle too far will result in contact with the epicardium. This is often felt as a tapping or more intense scratching sensation and commonly results in ventricular arrhythmias. These arrhythmias are usually self-limiting following retraction of the needle or catheter.

Pericardial effusion can be differentiated from peripheral blood in that it rarely clots unless it is from very recent hemorrhage and the PCV is significantly lower than that of peripheral blood. Every attempt should be made to drain the pericardial space as completely as possible. Drainage of the pericardium is often associated with an increase in the complex size on the ECG, a reduction in heart rate, and an improvement in arterial pulse quality. Potential complications include cardiac puncture (with resultant hemorrhage or arrhythmias), coronary artery laceration, lung puncture or laceration, and dissemination of infection or neoplasia throughout the thoracic cavity. Diagnostic evaluations of fluid obtained should include PCV and cytologic evaluation. Bacterial culture and sensitivity should be performed if indicated by cytologic evaluation. Caution should be exercised when evaluating the cellular component of pericardial effusion. Clinically important neoplasia of the heart and pericardium (hemangiosarcoma, chemodectoma) commonly do not exfoliate, resulting in frequent false negative evaluations. Reactive mesothelial cells within the pericardial sac are commonly over interpreted as being neoplastic, causing false positive results.

The long-term prognosis for dogs with hemorrhagic effusion is dependent on the underlying etiology. With idiopathic hemorrhagic pericardial effusion, pericardiocentesis is curative in approximately 50% of the cases. In the remainder, repeat centesis is necessary to control clinical signs. Fluid may reaccumulate rapidly (within several days) or may not recur for months to years. In patients requiring more than 2 centeses, the author recommends subtotal pericardiectomy. Following the initial pericardial tap, administration of oral prednisolone (starting at a dose of 1 mg/kg orally every 12 hours, then gradually tapering off over a two to three week period) may be beneficial. Although antiinflammatory doses of prednisolone are commonly administered to dogs with idiopathic pericardial effusion, there are no controlled studies to confirm the efficacy of this therapy. Subtotal pericardiectomy is usually curative in dogs with idiopathic pericardial effusion.

If cardiac or pericardial neoplasia is the cause of the pericardial effusion, the recommended therapy is
subtotal pericardiectomy. The prognosis is again dependent on the nature of the underlying etiology. Aortic body
tumors are commonly associated with slow growth and are late to metastasize. Subtotal pericardiectomy may
afford palliation for up to three years. Hemangiosarcoma of the right atrium is associated with a poor long-term
prognosis. Most mass lesions involving the right atrium or right ventricle are not amenable to surgical removal. The
tumor has commonly spread to the lungs at the time of diagnosis and these patients may have neoplastic lesions in
the spleen or liver as well. In those patients, subtotal pericardiectomy should be considered palliative.

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