



ACVIM

Cardiology
Fact Sheet

ACVIM Fact Sheet: Cardiac Arrhythmias

Overview

In order to pump blood to the lungs and body, the heart must work in a coordinated fashion. The heart has an electrical conduction system that is responsible for controlling the heart rate. This electrical conduction system generates electrical impulses (waves), which travel throughout the heart, stimulating the heart's muscles to contract and push blood through the interior arteries and out into the body. There are two nodes (masses of tissue) present in the heart that play an important role in this conduction system. The sinus node, or sinoatrial (SA) node, is a clustered collection of similar cells located in the top of the right atrium (the first chamber that blood enters as it returns from traveling through the rest of the body), its purpose being to generate electrical impulses and to serve as the heart's pacemaker. The other node is called the atrioventricular (AV) node. Like the SA node, it is a clustered collection of similar cells situated in the bottom of the right atrium, close to the ventricle (the chamber that receives blood from the atrium). The AV node receives impulses from the SA node, and after a small delay, directs the impulses to the ventricles. This delay allows for the atrium to eject blood into the ventricle before the ventricular muscles contract. The AV node can also take the place of the SA node as the heart's pacemaker, should the SA node be affected adversely by a pathological (disease) condition of the heart.

Definition and types of cardiac arrhythmia

What we hear or feel (if you place your hand over your heart) as the “lub-dub” (heart beat) are the valves closing (hear) and the ventricular muscle contracting (feel). The “lub” consists of the left and right atrioventricular valves closing. The left cardiac valve is the mitral valve and the right cardiac valve is the tricuspid valve. The “dub” consists of the closure of the pulmonary and aortic valves after the ventricles have ejected their contents (blood) into the pulmonary artery and aorta, respectively.

Arrhythmias are abnormal heart rhythms. Some arrhythmias are normal variants (such as the respiratory sinus arrhythmia in dogs). Dangerous arrhythmias are those that result in clinical signs and/or put the animal risk of sudden cardiac death.

Sinus node disease results in too low of heart rate (bradycardia). One of the diseases affecting the sinus node is sick sinus syndrome. Geriatric miniature Schnauzers, Cocker Spaniels, and West Highland White Terriers are the most commonly affected breeds.

Atrial standstill is a condition where normal atrial muscle has been replaced with abnormal tissue and cannot propagate the electrical impulse. This results in bradycardia. English Springer Spaniel is the breed most commonly affected by this disease.

Heart block (3rd degree AV block) is a type of arrhythmia that results in bradycardia and is due to disease of the AV node (impulses cannot pass through the AV node). Commonly effected breeds include Afghan Hound, Catahoula Leopard, Chow Chow, Cocker Spaniel, German Wirehaired Pointer, and Labrador Retriever.

Ventricular premature complex (VPC, aka ventricular premature contraction) is a type of irregular heartbeat. An electrical impulse is initiated within the ventricles instead of the SA node, causing the ventricles to contract too early (thus the premature in ventricular *premature* complex). This is often referred to as a “skipped beat”. Ventricular tachycardia exhibits a rapid heart rate due to many VPCs firing rapidly. This is often referred to as palpitations.

Supraventricular premature complexes arise either from the tissue in the atrium or the tissue surrounding and in the AV node. Supraventricular tachycardia also exhibits a rapid heart rate due to supraventricular premature complexes firing rapidly.

Atrial fibrillation (Afib) is the most common supraventricular tachycardia in dogs and is often the result of an underlying cardiac condition. Irish Wolfhounds are a breed that is predisposed to “lone Afib” in which the arrhythmia is present in the absence of underlying heart muscle disease.

Causes of cardiac arrhythmia

Cardiac causes of arrhythmias include: Heart muscle disease (such as dilated cardiomyopathy, hypertrophic cardiomyopathy and arrhythmogenic right ventricular cardiomyopathy), congenital heart defects (especially subaortic stenosis), severe valve leakage and enlargement of the cardiac chambers (chronic degenerative mitral valve disease), myocarditis (inflammation of the heart muscle), trauma to the heart muscle (animal being hit by a car), age-related changes, and infiltration of the heart muscle (inflammatory cells or cancer cells)

Non-cardiac causes of arrhythmias include: Gastric dilation and volvulus (stomach turns and flips on itself), inflammation of the pancreas, low blood magnesium, severe anemia; diseases of the spleen, liver or GI tract; neurologic disease (i.e. brain tumors); endocrine disease (i.e., of the thyroid gland, adrenal glands); muscular dystrophy, anesthetic agents, medications, toxins (i.e., chocolate intoxication).

Signs & Symptoms

Symptoms of an arrhythmia include: Weakness, collapse, exercise intolerance, fainting, fluid accumulation in the abdomen, in the lungs or around the lungs (congestive heart failure), or even sudden cardiac death. However, it is not uncommon for dogs and cats to appear outwardly normal (no clinical signs) despite having a cardiac arrhythmia.

Diagnosis

Your family veterinarian will diagnose an arrhythmia when listening to the heart or on an EKG reading. An EKG (electrocardiogram or ECG) is the best diagnostic test to identify and diagnose the specific type of arrhythmia. A Holter monitor is an ambulatory EKG

(the dog can wear it home and the device records the cardiac rhythm over the next 24-48 hours) that determines the frequency (how often the arrhythmia occurs) and severity of the arrhythmia. Your family veterinarian will then recommend treatment and/or referral to the veterinary cardiologist, if the arrhythmia appears dangerous on the EKG or the Holter monitor.

Treatment & Aftercare

A pacemaker is the standard recommended treatment for sick sinus syndrome, atrial standstill and complete heart block.

Various antiarrhythmic drugs (intravenous for life threatening arrhythmias and oral for long term therapy) are utilized for supraventricular and ventricular arrhythmias. Certain supraventricular arrhythmias can be treated with radiofrequency ablation while others can be treated with electrocardioversion (i.e., lone Afib). Defibrillation is indicated immediately for life threatening ventricular arrhythmias (ventricular fibrillation).

Prognosis

The prognosis is highly variable depending on what type of arrhythmia is present and if there is a non-cardiac (treatable) cause versus underlying severe heart disease (i.e., dilated cardiomyopathy in Doberman Pinschers). Pacemaker therapy for a slow heart rate (3rd degree AV block and sick sinus syndrome) is associated with a good prognosis in the absence of severe cardiac muscle disease.

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