



# EAST COAST VETERINARY CARDIOLOGY

## Ventricular Premature Contractions

Ventricular premature contractions (VPCs) are abnormal beats which arise from the lower muscular chambers of the heart (ventricles). These VPCs interrupt the normal underlying rhythm of the heart called sinus rhythm. In the normal cardiac conduction system, each contraction of the heart is controlled by what is called electrical depolarization. Depolarization of the heart originates from a specialized collection of cells called the sino-atrial (SA) node that sets the rhythm and rate of the heart. In a normal individual, this is the only location within the conduction system that can “drive” the heart’s rhythm. In animals with VPCs, there is another focus (located in the ventricles) that develops the ability to depolarize the heart, thus interrupting the normal rhythm. VPCs are considered the most common arrhythmia noted in animals.

VPCs are diagnosed when an arrhythmia is detected on physical examination and confirmed using an electrocardiogram (ECG). ECG is the gold standard test to diagnose an arrhythmia. In animals, VPCs may represent a marker for underlying heart disease. It is estimated that upwards of 60% of animals with VPCs have underlying heart disease as a cause for their arrhythmia (and this percentage is likely higher in cats than dogs). However, non-cardiac illness can also result in VPCs. This can make the diagnostic evaluation of VPCs frustrating as many tests may be required to determine the cause. Non-cardiac illnesses can include intra-abdominal diseases (such as splenic and liver disease), endocrine conditions, pancreatitis, fever, gastrointestinal disease, electrolyte abnormalities, certain medications and pain. Occasionally normal individuals will have a low frequency of VPCs without any specific underlying cause.

VPCs are potentially life-threatening as frequent ventricular arrhythmias can compromise cardiac output leading to signs of weakness, lethargy, exercise intolerance and fainting. Significant ventricular arrhythmias can be a risk for sudden death (due to development of a fatal arrhythmia called ventricular fibrillation).

When VPCs are first diagnosed from an ECG, further diagnostic testing is indicated to help determine the underlying cause. Typically, an echocardiogram will be the first diagnostic step to screen for the presence of heart disease that may result in VPCs. An echocardiogram is a non-invasive ultrasound of the heart and can evaluate for the presence of structural cardiac disease (such as valvular disease, cardiomyopathy, cardiac cancers) which can result in VPCs. If no structural cardiac disease is found, then extra-cardiac evaluation is considered with bloodwork (complete blood count, chemistry, urinalysis, thyroid testing, biomarkers to evaluate for heart

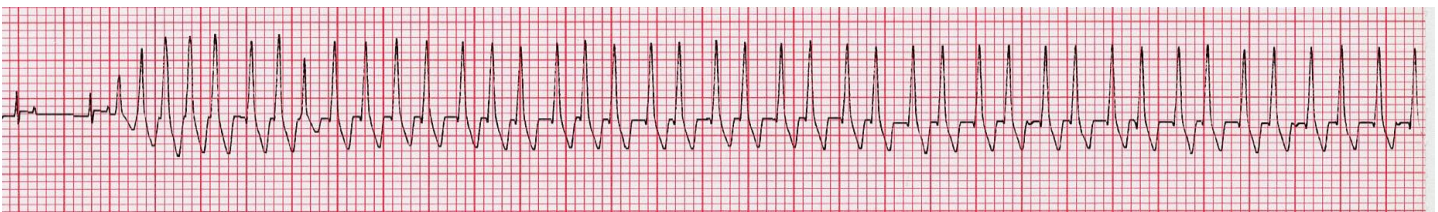
inflammation called myocarditis), thoracic radiographs and sometimes an abdominal ultrasound. In rare cases, no definitive cause for VPCs can be found, even after extensive testing.

The decision to treat VPCs is not straightforward. Single VPCs may not require specific therapy. There are features of the arrhythmia which will help veterinarians decide if treatment is necessary – treatment is indicated when malignancy of the arrhythmia is noted. Generally, what constitutes malignancy is frequent VPCs, pairs and triplets, runs of VPCs known as ventricular tachycardia (see below) or very rapid VPCs. These features of arrhythmia malignancy may suggest a risk for life-threatening ventricular fibrillation. The test to help the decision to treat is a 24-hour ambulatory ECG called a Holter monitor (pictured to the right are the small, light-weight Holters that ECVC utilizes). This is a small device that is worn to record every heart beat in a 24-hour window. The Holter can then help determine the frequency and malignancy of the arrhythmia and requirement for treatment. Holter monitors are then often used to follow response to therapy long term.



Treatment of VPCs consists of addressing any primary causes and when necessary, the addition of anti-arrhythmic medications. The most commonly prescribed class of drugs for VPCs are called beta blockers. These medications block the adrenaline receptors on the heart muscle and reduce the rate of discharge of the ectopic site in the ventricles causing the VPCs. Some beta blockers commonly prescribed include sotalol and atenolol. When animals fail to respond to beta blockers alone, a second medication called mexiletine is typically added. For some animals with serious ventricular arrhythmias, they may be hospitalized on intravenous medications to stabilize their rhythm prior to discharge to home with oral medications. It is unknown if medical therapy reduces the true risk for sudden death in animals with VPCs – in humans, an implantable cardio-defibrillator is the only intervention known to help reduce the risk for sudden arrhythmic death in at-risk patients.

Prognosis is dependent on the underlying cause of the VPCs – generally the underlying disease causing the VPCs will determine the prognosis. If they are related to extra-cardiac illness, in some cases the VPCs will be self-limiting once the illness is treated/resolves. It is important to note that animals with structural heart disease and VPCs do have a higher risk for sudden death due to ventricular fibrillation. If your pet has been diagnosed with VPCs, it is important to monitor for signs of exercise intolerance, weakness or fainting, and sudden labored breathing and contact a veterinarian if signs are noted. If your pet is receiving treatment for VPCs, it is very important to give the medication(s) as prescribed and never stop them abruptly unless directed to do so by a veterinarian.



An ECG in a patient with a run of ventricular tachycardia. The first two beats on the left of the tracing are normal (sinus beats), followed by development of a run of wide beats called VPCs. More than 3 VPCs in a row constitutes ventricular tachycardia which can be a life-threatening arrhythmia.