METROPOLITAN VETERINARY ASSOCIATES
NEWSLETTER
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Investigating Syncope

Megan Poad, Cardiology, VMD, DACVIM (Cardiology)

It is not uncommon for veterinary patients to be presented to the hospital after a "collapse" event is witnessed. "Collapse" is a general term that is defined by a sudden loss of postural tone, of any duration. "Syncope", which is a type of collapse, is characterized by a sudden, transient loss of consciousness, caused by decreased blood flow to the brain. Syncope typically has a relatively rapid onset and a brief duration, with a spontaneous, full recovery.

For patients who present with a history of syncope or collapse but are without clinical signs at the time of presentation, identification of the underlying cause can be challenging. Diagnostic testing should be based on an understanding of the most likely causes, along with a thorough history and physical examination.

Differential diagnoses for an animal presenting for collapse can be broadly divided into causes of syncope (either cardiogenic or neurocardiogenic) and causes of non-syncopal collapse. Causes of cardiogenic syncope consist of either arrhythmias (brady- or tachyarrhythmias) that lead to systemic hypotension, or structural heart disease that reduces cardiac output, or, sometimes, a combination of the two. Neurocardiogenic syncope, also called vasovagal syncope or vasodepressor syncope, occurs due to a transient onset of systemic hypotension, as a result of withdrawal of sympathetic tone and a sudden increase in parasympathetic (vagal) tone. Causes of non-syncopal collapse are divided into:

1) neurogenic causes (including seizures and other neurologic episodes),

2) causes of hypoxemia (including transient airway obstruction and other severe respiratory disease),

3) cardiogenic causes (including cardiovascular disease that decreases cardiac output, without resulting in a loss of consciousness), and

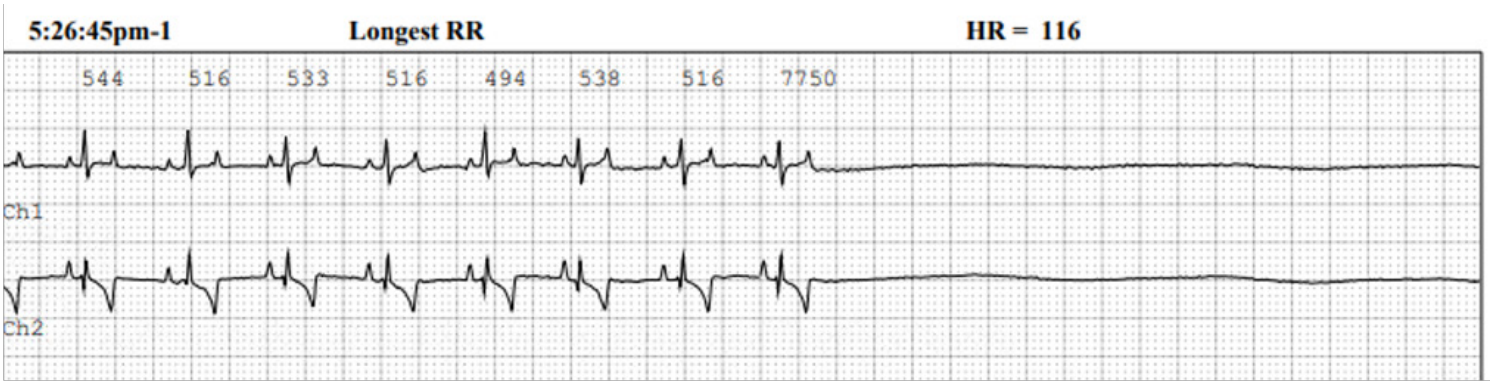
4) other systemic disorders (including metabolic disorders, hypotensive shock, and systemic inflammatory response syndrome (SIRS)/sepsis).

Neurocardiogenic Syncope

Neurocardiogenic syncope is characterized by abrupt significant hypotension caused by a marked bradyarrhythmia, vasodilation, or, most often, both. These hemodynamic changes are a result of a transient withdrawal of sympathetic tone and increase in vagal tone. In other words, this type of syncope occurs when the cardiovascular reflexes that normally control circulation are intermittently inappropriate or exaggerated. The terms "neurocardiogenic syncope" and "vasovagal syncope" are used interchangeably by some; however, others prefer to further characterize neurocardiogenic syncope in small animals into a few types, including vasovagal syncope and situational syncope.

Dr. Megan Poad

In patients with vasovagal syncope, the trigger is commonly intense excitement or activity/play; however, gastrointestinal conditions and other intra-abdominal disease are considered potential triggers. Situational syncope is triggered by a specific activity,



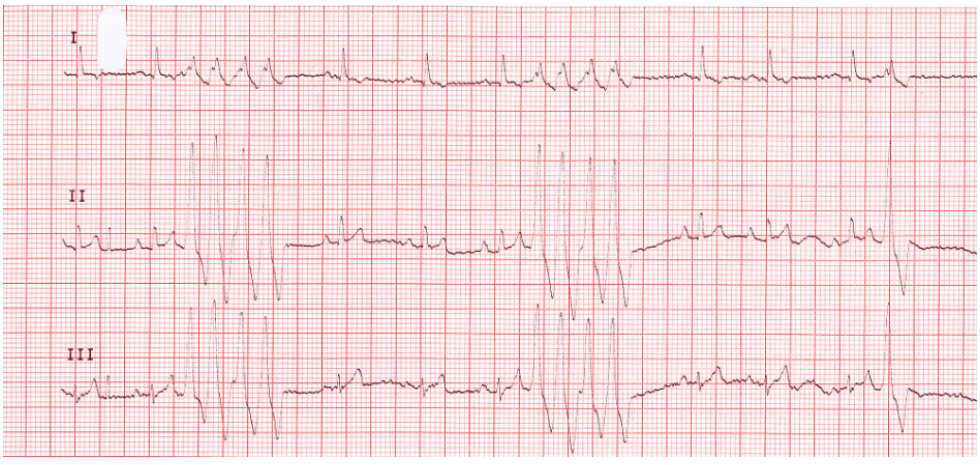
24-hour Holter monitor recording of a 10-year-old terrier mix presenting for syncope. The recording shows sinus rhythm and a period of sinus arrest/asystole (almost 8 seconds in duration), due to sick sinus syndrome.

including coughing (tussive syncope), gagging, vomiting, defecation, urination, or visceral pain. Tussive syncope is common in dogs, especially small breed dogs, with respiratory or cardiac disease.

Cardiogenic Syncope

Cardiogenic syncope develops from a transient, profound hypotension, caused by either a severe, sustained arrhythmia, or structural cardiac disease that causes an acute decrease in cardiac output or triggers a neurocardiogenic reflex. Severe arrhythmias that are sustained for at least 8-10 seconds, depending on the patient's activity level and cardiac structure, have the potential to induce syncope. Examples of such severe arrhythmias include rapid ventricular tachycardia, sinus arrest (due to sick sinus syndrome), high-grade second-degree AV block, and third-degree AV block with periods of asystole. These arrhythmias do not always lead to syncope; and, some arrhythmias, such as less-fast ventricular tachycardia, supraventricular tachycardia, or less-severe bradyarrhythmias, can cause episodes of weakness or collapse, instead of syncope. Both bradyarrhythmias and tachyarrhythmias are most likely to cause syncope when an abrupt, significant change in heart rate and rhythm occurs. It is important to keep in mind that the combination of structural heart disease or pulmonary hypertension and arrhythmias can result in development of syncope. Syncope in cats is often the result of a cardiac rhythm disturbance, including intermittent or sustained AV block, or supraventricular or ventricular tachycardia.

Other cardiogenic causes of syncope or collapse include severe pulmonary hypertension (syncope is most commonly triggered by exertion), severe subaortic or pulmonic stenosis, severe tricuspid valve dysplasia, and causes of impaired right-sided cardiac inflow, including a tumor occluding right atrial inflow, tricuspid stenosis, pericardial effusion with cardiac tamponade, and constrictive pericardial disease. Vasovagal syncope can occur in pets with hypertrophic obstructive cardiomyopathy or subaortic/aortic stenosis, conditions characterized by elevated left ventricular pressure, in which cardiac sensory receptors in the left ventricle are stimulated by an escalation in left ventricular pressure and result in reflex vasodilation and bradycardia, due to the Bezold-Jarisch reflex. It is not uncommon for small-breed dogs with chronic degenerative valve disease to present to the hospital for syncope. Although it can be difficult to elucidate the exact mechanism of syncope, potential causes of syncope in these patients include vasovagal syncope, congestive heart failure, pulmonary hypertension, or arrhythmias.



Electrocardiogram (ECG) of a 7-year-old Boxer with arrhythmogenic right ventricular cardiomyopathy (ARVC) and presenting for episodic collapse. The ECG shows sinus rhythm, two brief rapid runs of ventricular tachycardia (with R-on-T phenomenon), and one single VPC.

Non-syncopal Collapse

There are many causes of non-syncopal collapse. Neurogenic causes of collapse include epileptic seizures, paroxysmal movement disorders, neuromuscular disease, or exercise-induced collapse. Patients with hypoxia due to severe respiratory disease or intermittent upper airway obstruction can present with collapse, which tends to occur with exertion or excitement/stress. Other causes of collapse that should be considered include hypoglycemia, severe anemia, hypoadrenocorticism, causes of hypotensive shock, and inadvertent

administration of a medication that results in arrhythmias or hypotension.

Helpful Clues in the History

A complete patient history and physical examination are essential for diagnostic evaluation of syncope or collapse. Ideally, the description of the episode should be from the person who witnessed it, and, video recording of the patient before, during, and/or after the episode might be helpful. The patient history should include a thorough description of clinical signs during and after the episode, the circumstances immediately preceding the episode, if witnessed, any pre-existing conditions that could predispose the patient to syncope, and medication list. Since it can be difficult for clients to know if a pet became unconscious during an event, it might be more beneficial to ask questions about responsiveness.

Differentiation between syncope and seizure can be difficult. Assessment of the patient's signalment, pre-existing conditions, situational triggers, prodromal signs, and physical exam findings hopefully will provide some clues. Although syncope often causes flaccid limb and body tone, if the animal is partially unconscious, flailing of the limbs, as if they are trying to get up, might occur and mimic seizure activity. A state of partial consciousness and leg-flailing is more consistent with syncope; whereas, repetitive limb paddling is more consistent with a seizure. Extensor rigidity and spontaneous urination or defecation can be seen in patients with syncope or seizures. Situational syncope tends to be preceded by a specific trigger, such as coughing, gagging, excitement/stress, or strenuous exercise, among others. Cardiogenic syncope typically is short in duration, and the patient is expected to return to normal within a few seconds to up to a minute. Epileptic seizures, which usually occur at rest/during sleep and without a specific trigger, often are characterized by a pre-ictal period of abnormal behavior and episodes of repetitive limb paddling, jaw chomping or teeth chattering, and/or salivation. Following a seizure, the patient can have a post-ictal period, with signs of lethargy, neurologic deficits, confusion, or other abnormal behavior, which can last up to hours after the seizure occurred. Cats with syncope can show focal facial movements that resemble seizures, making differentiation between seizure and syncope especially challenging.

Physical Examination Considerations

In patients presenting for suspected syncope, a careful cardiovascular examination, including cardiac auscultation and pulse assessment, is important to evaluate for a paroxysmal or sustained bradyarrhythmia or tachyarrhythmia, heart murmur, gallop, muffled heart sounds, and weak pulses or pulse deficits. Any other abnormalities found on physical examination might direct further investigation of a particular body system (i.e. central nervous system, respiratory system, etc.). If no abnormality is identified on physical examination, the history becomes an even more critical part of the evaluation, and further diagnostic tests could be useful.

Initial Diagnostic Evaluation of Syncope

Diagnostic testing is guided by any clues obtained from the history and physical examination. Comprehensive blood work (including complete blood count, serum biochemistry profile, electrolytes, blood glucose, thyroid hormone testing) is often performed. Additional blood work might include heartworm testing or an ACTH stimulation test. Thoracic radiograph findings might be suggestive of cardiac disease, respiratory disease, or, possibly, hypovolemia. If intra-abdominal disease is suspected to be contributing to a patient's collapse or syncope, abdominal ultrasonography is warranted. If seizure or another neurologic cause of collapse is suspected, a thorough neurologic examination and additional diagnostic testing, which might include brain MRI, typically are pursued.

Echocardiography, performed by a board-certified veterinary cardiologist, to screen for structural cardiac disease, including conditions that predispose for arrhythmias, is often indicated. Although one study (Dutton et al., 2017) demonstrated that dogs with cardiogenic syncope have a higher cardiac

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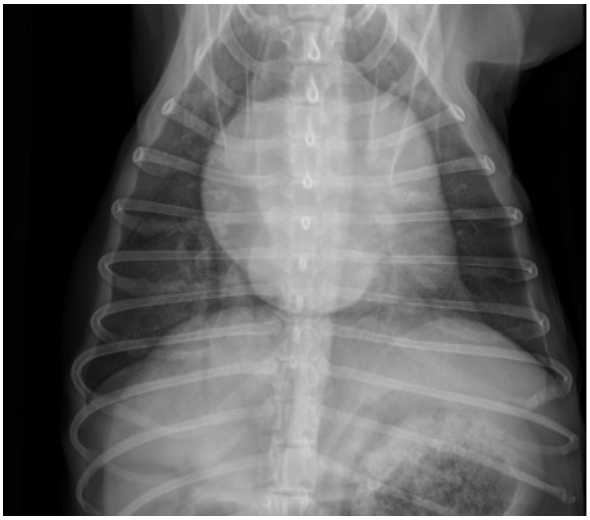

Thoracic radiographs of a 12-year-old Miniature Schnauzer presenting to the hospital for syncope, due to severe chronic degenerative valve disease and left-sided congestive heart failure.

troponin I concentration compared to dogs with seizures or other non-cardiogenic causes of collapse, due to overlap of troponin values between these two groups, this biomarker by itself is not highly discriminatory.

Electrocardiography (ECG), which can occur in the primary care or emergency hospital setting, is typically performed in patients presenting for syncope, especially if an arrhythmia is found during physical examination. For cases in which an arrhythmia is suspected but not clearly identified, extended ECG monitoring is often recommended. ECG assessment at the time when a suspected syncopal event occurs is ideal for determining whether an intermittent arrhythmia is the cause of syncope. Therefore, Holter monitoring (for ambulatory ECG recording over 24-48 hours), placement of an event recorder (for ECG recording for up to 1-2 weeks), or ECG recording via an insertable loop recorder (placed surgically and can remain in place for longer than 2 weeks), depending on frequency of syncopal events, is appropriate. It is important to remember that, even if the patient does not collapse while the monitor is recording, the ECG might reveal arrhythmias that raise suspicion for the underlying cause of syncope. For some cases, multiple Holter monitor recordings might be warranted. In addition, the owner can be instructed to try to video record a collapse event, which might provide insight on the most likely body system involved. Once the underlying cause is determined, appropriate treatment can be provided.

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ECG'S
FOR VETERINARY NURSES

RISA ROLAND, DVM, DACVIM (CARDIOLOGY)

OPEN TO DOCTORS AND TECHNICIANS

This lecture will begin with basic interpretation of ECGs. We will then move on to ECG interpretation, including ECG assessment of normal and abnormal rhythms. The lecture will use case-based examples to diagnose ECG rhythms and will touch briefly on treatment of the arrhythmias in an emergency setting.

THURSDAY SEPT 19

Registration: 6:30p
Lecture & Dinner: 7p - 9p

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RSVP BY SEPT 9

Veterinary Cardiologist Dr. Risa Roland is a native of Brooklyn, New York. She attended Cornell University and obtained her Bachelor of Science degree with honors in animal science in 1998. She continued her education at Cornell University, College of Veterinary Medicine, and was awarded her Doctor of Veterinary Medicine degree in 2003. After graduation, she completed a one-year rotating internship in small animal medicine and surgery at the University of Pennsylvania. Following her internship, she completed a three-year cardiology residency program at Texas A&M University, and became board certified by the American College of Veterinary Internal Medicine in 2007.

Dr. Roland's particular interests within the discipline of cardiology include congenital abnormalities, chronic degenerative valve disease and canine and feline cardiomyopathies.

For questions please email Sarah Spurgeon at sspurgeon@metro-vet.com

Welcome to Our New Surgery Residents

Dr. Madison Shubert

Dr. Madison Shubert was born and raised in Southern California. She received her Bachelor of Science in Animal Science at the University of California, Davis. She then went on to obtain her Doctorate in Veterinary Medicine at the University of California, Davis, in 2021. After graduation, she completed a small animal rotating internship at VCA West Los Angeles followed by her first Surgical Internship at VSC in Vienna, Virginia. She pursued a second Surgical Internship in Small Animal Minimally Invasive Orthopedic Surgery in Houston, Texas from 2023 to 2024. Dr. Shubert was ecstatic to move to the East Coast to join MVA as a Surgery Resident in July of 2024.

Dr. Shubert's professional interests include minimally invasive orthopedic and thoracoscopic surgery as well as total joint replacements. In her free time she likes to binge watch The Office, hike, go to the gym, bake, and explore coffee shops.

Dr. Jared Crofts

Dr. Jared Crofts was born and raised in Los Angeles, California. He received his Bachelor of Science in Biology at the University of California, Santa Barbara, before obtaining his veterinary degree at the University of California, Davis, in 2022. After veterinary school, he completed a Small Animal Rotating Internship at the University of Pennsylvania followed by a Surgical Internship at the Veterinary Specialty Hospital of San Diego. Dr. Crofts returned to the East Coast to join MVA as a surgery resident in July of 2024.

Dr. Crofts' professional interests include wound care, fracture reconstruction, and a variety of soft tissue and orthopedic surgical procedures. In his free time he enjoys running, traveling, attending sporting events, and exploring the local food scene.

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