Exercise Intolerance: How Do We Know and Test?

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Abstract
Exercise intolerance is defined as the reduced ability to perform activities involving movement of skeletal muscles due to symptoms of dyspnea or fatigue. Patients can be suffered during exercise or later. Dogs presented to veterinarians for perceived exercise intolerance may have decreased strength, speed, or stamina. Signs can sometimes be subtle, with suboptimal performance detected by the owner but it is difficult to detect by inexperienced observers. Alternatively, the signs may include profound exercise-induced weakness, episodes of collapse, or even death following exercise. Exercise intolerance can result from cardiovascular, orthopedic, respiratory, hematologic, metabolic/endocrine, neuromuscular, muscular and neurologic disorders. Therefore, a veterinarian has to utilize information received from history taking, physical examination, and some particular diagnostic tools/tests in order to find the etiology. A complete history investigating abnormalities of all body system is essential. It is important to clarify nature of clinical signs and to determine whether clinical signs are associated with physical activity. If possible, a veterinarian should observe the dog during an episode that the owner perceives as exercise intolerance directly or from a videotape. Clinical signs of coughing, dyspnea, collapse, or cyanosis may suggest cardiovascular, respiratory or neurologic dysfunction. Physical examination at rest should be performed since many dogs with exercise intolerance have abnormal physical examination findings at rest. Complete examination of respiratory, cardiovascular, musculoskeletal, and nervous system are advised. It is important to systematically rule out of each previously mentioned system.

Cardiovascular disorder: Dogs with congestive heart failure (CHF) regardless the cause will eventually have exercise intolerance due to pumping failure and poor tissue perfusion. Consequently, tissues do not receive adequate oxygen and the muscles fatigue more easily. These dogs will typically display clinical evidence of cardiac failure at rest, including tachycardia, cough, weak femoral pulses, crackles on lung auscultation from pulmonary congestion or edema, and perhaps cyanosis and a murmur. arrhythmia, pulse deficits, and prolonged capillary refill time may be observed. Standard diagnostic methods for CVS disorder including auscultation, thoracic radiographs, ECG and Echocardiography should be all performed. Abnormal serum lactate may be found in dogs with muscle fatigue. The six-minute walk test (6-MWT) has been a gold standard method in human medicine to predict morbidity and mortality of patient with heart failure. The 6-MWT directly measures a patient’s ability to carry out daily activities instead of a patient’s ability to performed laboratory exercise such as on treadmill. The 6-MWT in dogs is also evidenced and demonstrated a significant decreased in the distance walked in 6 minutes when a dog has CHF. This method is simple and may be a valuable tool when assessing quality of life in CHF dogs.

Respiratory disorder: Defects of the pharynx, larynx, trachea, airways, pulmonary parenchyma, or pleural space can impair a dog's ability to breathe normally. When these dogs exercise, they are unable to maintain tissue oxygenation resulting in weakness, exercise intolerance, or collapse. Cyanosis, abnormal lung sounds, abnormal upper airway sounds, or dyspnea may be recognized. Observation of breathing pattern and auscultation at rest, during and after exercise are helpful in identifying a problem within the respiratory tract. Thoracic radiographs should be done in all dogs with exercise intolerance. In addition, heartworm testing, laryngoscopy, tracheal wash for cytology and culture, thoracocentesis or bronchoscopy and arterial blood gas should be performed to evaluate the respiratory system as necessary to reach a diagnosis.

Hematologic disorder: Regardless of any cause resulting in bleeding, dogs usually will not exhibit exercise intolerance due to anemia unless their hematocrit fall below 20%. Dogs may exhibit a sudden collapse or profound weakness rather than repeated episodes of inability to exercise. Chronic anemia can be tolerated but, if severe, can result in classic signs of exercise intolerance. Chronic anemia is most often seen in urinary bleeding, bone marrow disease or cancer. All dogs with exercise intolerance should be tested for a complete blood count.

Abnormality of metabolic/endocrine system: Hypoglycemia is an important cause of weakness and exercise intolerance in dogs. Most often causes of hypoglycemia in dogs include tumors of pancreases, liver failure, sepsis, hypoadrenocorticism. Hypoglycemia should be documented by collecting a blood sample at the time of collapse. However, intense hypoglycemia is most likely to be verified after a 24- or 48-hour fast. If hypoglycemia is confirmed, affected dogs should be tested for hypoadrenocorticism, liver dysfunction, and neoplasia. Thoracic radiographs and abdominal
ultrasonography are recommended to confirm metastasis.

**Neuromuscular abnormalities:** Myasthenia Gravis is an immune-mediated disorder in which self-antibodies attack acetylcholine receptors of skeletal muscle. The clinical signs of affected dogs include weakness of limbs muscle that become worsen when dogs exercise. Dogs with MG usually exhibit severe exercise intolerance, developing weakness and collapse even after walking only a few steps. Response to edrophonium chloride may help to establish a clinical diagnosis of myasthenia gravis while the results of confirmative antibody against are also required. Serum antibodies to nicotinic acetylcholine receptors are detected in most dogs with MG.

**Orthopedic disorders:** Pain from abnormalities of the bones or joints causes reluctance to exercise in affected dog. Besides reluctance to walk or exercise, other clinical signs include, fever, and lethargy. Lameness, joint swelling, and joint pain can be inconsistent, so best diagnosis is to perform arthrocentesis with cytology and bacterial culture. There are many etiologies of orthopedics disorder. Therefore, a veterinarian must differential diagnosis based on history and physical examination. For instance, hypertrophic osteodystrophy, or osteochondritis dissecans often found in young dogs. Whereas, aged dogs may have problems with ligamentous injuries or degenerative joint disease. Polyarthritis is another most common causes of joint pain and reluctance to exercise in dogs. Immune-mediated nonerosive polyarthritis (IMPA) is the most common cause of polyarthritis in dogs.

In conclusion, Diagnostic evaluation of dogs with exercise intolerance will vary based on determination historical features, physical exam findings at rest and also laboratory results. If there are no abnormalities at rest, a veterinarian may let dogs to perform exercise. It is important to further investigate the underlying problem systematically to rule out metabolic, orthopedic, respiratory and/or cardiac causes of exercise intolerance as well as muscular, neuromuscular and neurologic disorders. Once the cause of exercise intolerance has been identified, plans for treatment or management can be initiated.

**References**