

# AORTIC STENOSIS

## BASICS

### OVERVIEW

- The heart of the dog or cat is composed of four chambers; the top two chambers are the right and left atria and the bottom two chambers are the right and left ventricles; heart valves are located between the right atrium and the right ventricle (tricuspid valve); between the left atrium and the left ventricle (mitral valve); from the right ventricle to the main pulmonary (lung) artery (pulmonary valve); and from the left ventricle to the aorta (the main artery of the body; valve is the aortic valve)
- “Stenosis” is the medical term for narrowing
- “Aortic stenosis” is a narrowing at some point in the area through which blood flows out of the left ventricle and through the aortic valve and into the aorta (known as the “left ventricular outflow tract”), most commonly seen as a congenital (present at birth) or perinatal (occurring at or around birth) disease
- Defect can be at the valve itself (known as “valvular aortic stenosis”), below the valve (known as “subvalvular aortic stenosis” or “subaortic stenosis” [most common in dogs]), or above the valve, just inside the aorta (known as “supravalvular aortic stenosis” [most common in cats])
- As a congenital (present at birth) structural abnormality in dogs, the obstruction usually is caused by fibrous tissue just below the aortic valve, and the disease is referred to as subaortic stenosis (SAS)

### GENETICS

- Inherited trait in Newfoundlands—involves multiple genes and exhibits pseudodominance; a major dominant gene with modifiers may be involved
- Genetic history of affected litters from the same male dog (known as the “sire”) or female dog (known as the “bitch”)

### SIGNALMENT/DESCRIPTION of ANIMAL

#### Species

- Dogs and cats

#### Breed Predispositions

- Subaortic stenosis is most common in the Newfoundland, German shepherd dog, golden retriever, rottweiler, and boxer; the Samoyed, English bulldog, and Great Dane also are at higher risk of having subaortic stenosis than are other breeds
- Bull terriers are more likely than other breeds to have valvular aortic stenosis, typically with coexistent abnormal development of the mitral valve (known as “mitral valve dysplasia”)

#### Mean Age and Range

- Subaortic stenosis develops over the first weeks to months of life; onset of clinical signs can occur at any age, depending on the severity of blockage or obstruction to blood flow from the left ventricle into the aorta (the main artery of the body)

### SIGNS/OBSERVED CHANGES in the ANIMAL

- Related to the severity of the narrowing or blockage of blood flow; range from no signs to congestive heart failure, fainting (known as “syncope,”) and sudden death; “congestive heart failure” is a condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs
- Heart murmur; murmur may not be present in puppies less than 2 months old, becoming more prominent during the first 6 months of age
- May be able to feel vibrations caused by abnormal blood flow (known as “thrills”) when placing hand against the chest wall
- Difficulty breathing (known as “dyspnea”), rapid breathing (known as “tachypnea”), and short, rough snapping sounds (known as “crackles”) detected when listening to the lungs with a stethoscope (known as “auscultation”) with the onset of left-sided congestive heart failure
- Femoral pulses typically weakened in animals with disease severe enough to affect circulation
- Irregular heart beats (known as “arrhythmias”)

### CAUSES

- Congenital (present at birth) disease
- Secondary to bacterial inflammation/infection of the lining of the heart (known as “bacterial endocarditis”), involving the aortic valve, in some dogs
- In cats with hypertrophic cardiomyopathy (a disease characterized by inappropriate enlargement or thickening of the heart muscle of the left ventricle), functional or dynamic narrowing (stenosis) is common, but significance is unknown; a “dynamic” process in one in which the lumen of the ventricle changes with the movements of the heart (relaxation and contraction)
- “Dynamic” subaortic stenosis reported in dogs in which muscular enlargement or thickening (known as “hypertrophy”) can contribute to narrowing of the ventricular/aortic outflow tract

### RISK FACTORS

- Familial (runs in certain families or lines of animals) history of subaortic stenosis

- Inflammation/infection of the lining of the heart and aortic valve (known as “aortic endocarditis”) is more likely in animals with decreased ability to produce a normal immune response (known as “immunosuppression”); generalized (systemic) infection; presence of bacteria in the blood (known as “bacteremia”); and abnormal blood flow within the heart, including congenital (present at birth) subaortic stenosis

## TREATMENT

### HEALTH CARE

- Management recommendations for small animals are controversial and vary among experts
- Inpatient management is appropriate for complications including irregular heart beats (arrhythmias), episodes of fainting (syncope), and congestive heart failure; “congestive heart failure” is a condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs

### ACTIVITY

- Restricted in animals with more than mild disease
- Fainting (syncope), collapse, or sudden death may be brought on by exertion in animals with severe disease

### DIET

- Restricted sodium in animals in or likely to develop congestive heart failure; “congestive heart failure” is a condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs

### SURGERY

- Definitive treatment requires open-heart surgery with cardiopulmonary bypass (using a heart-lung machine) to repair or replace the valve; unfortunately, the risk-to-benefit ratio for dogs with subaortic stenosis currently does not support recommending the surgery—dogs still may die suddenly after the procedure
- Balloon dilation (procedure in which an instrument with an expandable balloon is inserted into the aorta and the balloon is expanded to open the narrowing) of the outflow tract during heart catheterization may result in improvement of clinical signs in some dogs

## MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Medical management is, at best, designed to treat the signs—it does not cure the condition
- Beta-blockers have been advocated for dogs with subaortic stenosis with a history of fainting (syncope) or collapse and for irregular heart beats (arrhythmias) that occur following exercise; potential benefits include limiting the oxygen needs of the heart muscle, protecting against irregular heart beats (arrhythmias), and slowing of the heart rate; an example of a beta blocker is atenolol; [metoprolol tartrate](#) and [cardvedilol](#) are alternative beta-blockers
- Specific treatment for irregular heart beats (such as ventricular arrhythmias and atrial fibrillation) or left-sided congestive heart failure also may be required; “congestive heart failure” is a condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs
- Affected animals are at risk of developing bacterial inflammation/infection of the lining of the heart (bacterial endocarditis); treatment of infections with antibiotics is recommended; antibiotics should be administered for animals having dental procedures or surgery of the genitourinary tract (that is, surgery involving the reproductive tract and/or urinary tract)
- Treatment of dynamic narrowing (stenosis) in cats with hypertrophic cardiomyopathy (a disease characterized by inappropriate enlargement or thickening of the heart muscle of the left ventricle) is controversial; a “dynamic” process in one in which the lumen of the ventricle changes with the movements of the heart (relaxation and contraction)
- [Diltiazem](#) (a calcium-channel blocker heart medication) may have benefits in treating aortic stenosis

## FOLLOW-UP CARE

### PATIENT MONITORING

- Monitor by electrocardiogram (“ECG,” a recording of the electrical activity of the heart), chest X-rays, and echocardiography (use of ultrasound to evaluate the heart and major blood vessels)
- Treatment of complications (such as congestive heart failure and irregular heart beats [arrhythmias]) necessitates careful monitoring to detect kidney and electrolyte disturbances and side effects of drugs

### POSSIBLE COMPLICATIONS

- Congestive heart failure (condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs)
- Irregular heart beats (arrhythmias); sudden lack of blood supply to the heart muscle that leads to death of tissues (known as “myocardial infarction”); backward flow of blood through the aortic valve (known as “aortic regurgitation”); backward flow

of blood through the mitral valve (known as “mitral regurgitation”); bacterial inflammation/infection of the lining of the heart (bacterial endocarditis); sudden death

#### **EXPECTED COURSE AND PROGNOSIS**

- Mildly affected dogs may live a normal life span without treatment
- Severe disease typically limits longevity due to congestive heart failure (condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs) or sudden death
- Congestive heart failure, collapse, or fainting (syncope) suggests severe disease and an ominous prognosis

#### **KEY POINTS**

- Affected animals should be neutered or otherwise not be permitted to breed
- Evaluate closely related dogs for evidence of clinical disease
- Mildly affected dogs may live a normal life span without treatment
- Monitor for potential complications in severely affected animals
- Severe disease typically limits longevity due to congestive heart failure (condition in which the heart cannot pump an adequate volume of blood to meet the body’s needs) or sudden death
- Affected animals have increased risk for bacterial inflammation/infection of the lining of the heart (bacterial endocarditis) and anesthetic complications

