

## Degenerative valvular disease – What’s New?

Chronic degenerative valvular disease is the most common cardiovascular disease in small animals, and is also known as endocardiosis or myxomatous valve degeneration.

It is seen more commonly in older small breed dogs, and males appear to be predisposed and develop more severe disease.

### **Anatomy:**

Mitral valve (dog) – large anterior leaflet, smaller posterior leaflet and small commissural cusps between the two leaflets. Both leaflets are semicircular and are attached to the mitral valve annulus (fibrous ring) and to the papillary muscles (through chordae tendineae).

Tricuspid valve – two primary leaflets and multiple commissural cusps. The mural leaflet is significantly larger than the septal leaflet.

Aortic valve – three semi-lunar cusps.

### **Pathology:**

- Mitral valve lesions are the most common, but the tricuspid valve and rarely the aortic valve can also be affected.

- Gross inspection reveals thickened and redundant valve leaflets. The free margins of the leaflets are the most commonly affected areas, which have nodules and are opaque.

Mitral valve prolapse – a portion of the body of the leaflet protrudes into the left atrium.

Structures involved: leaflets and chordae tendineae

Lesions:

- Redundancy of the leaflets
- Lengthening of the chordae tendineae
- Thickened and/or fenestrated leaflets

### **Histopathology:**

The atrioventricular valves have four layers:

- Atrialis (endocardial)
- Spongiosa (collagen, fibroblasts, elastic fibers and mucopolysaccharides)
- Fibrosa (collagen bundles)
- Ventricularis (endocardial)

In myxomatous AV degeneration the spongiosa increases in size and the fibrosa degenerates. A significant increase in extracellular matrix is observed and fibroblasts proliferate forming nodules.

### **Etiology:**

- Likely hereditary

- Evidence suggests that degenerative valvular disease is inherited as a polygenic threshold trait in Cavalier King Charles Spaniels.

**Pathophysiology:**

- Valvular regurgitation → increased atrial volume → atrial dilatation
- Eccentric hypertrophy → annular dilation → worsening regurgitation
- Increased atrial pressure → CHF
- Severe regurgitation → decreased forward flow
- Decreased forward flow → Renin-angiotensin-aldosterone system (RAAS) stimulation
  
- Pulmonary hypertension can develop secondary to chronic pulmonary venous hypertension.
  
- Myocardial failure usually occurs in the latter stages of the disease and is more commonly identified in large breed dogs.
  
- Atrial tears/rupture can cause cardiac tamponade secondary to acute hemopericardium.

**History/clinical signs:** coughing, labored breathing, syncope, distended abdomen

**Physical exam:** mucous membrane color and CRT, jugular veins, thoracic auscultation and peripheral pulses

Common PE findings:

- Heart murmur
- Increased intensity of the first heart sound
- Systolic click
- Third heart sound
- Arrhythmias
- Tachypnea/tachycardia
- Crackles and wheezes
- Distended jugular veins
- Brisk femoral pulses

**Diagnostic tests:**

Thoracic radiographs  
Electrocardiogram  
Echocardiogram  
Blood pressure.

**Therapy:**

Asymptomatic disease:

- ACE inhibitors?
- $\beta$ -blockers?

Heart failure:

- Diuretics
- Vasodilators
- Positive inotropes

## What's new?...

### **Etiology:**

Genomic expression patterns and possible genetic biomarkers for canine degenerative mitral valve disease.

### **Diagnosis:**

#### **Laboratory Tests**

- B-type natriuretic factor/peptide (BNP)?
- Atrial natriuretic factor peptide (ANP)?
- Cardiac troponin-I (TnI)?

### **Imaging:**

#### **Real time 3D echocardiography**

Real time three-dimensional echocardiography is a new ultrasound modality that provides comprehensive views of cardiac valves.

This technique potentially provides a more accurate echocardiographic means of evaluating cardiac chamber volumes and a more precise postoperative tool.

Other possible future applications and benefits in veterinary cardiology will also be discussed.

### **Treatment :**

Recent clinical trials concerning the use of ACE inhibitors,  $\beta$ -blockers and pimobendan in asymptomatic disease and heart failure will be reviewed.

QUEST – Pimobendan vs benazepril trial in patients with congestive heart failure secondary to degenerative mitral valve disease.

VETPROOF (follow up) – Enalapril trial in asymptomatic patients with degenerative mitral valve disease.

Benazepril study - University of Alford – Benazepril trial in asymptomatic patients with degenerative mitral valve disease.

### **References:**

- Braunwald E, Zipes D, Libby P. Heart Disease: a textbook of cardiovascular medicine. WB Saunders Co, New York. 2007.
- Kittleson MD, and Kienle, R. Small Animal Cardiovascular Medicine. St. Louis, Mosby. 1998