Dilated Cardiomyopathy (DCM)

Classic case: 7 year old male Doberman Pinscher with tachypnea, dyspnea, and cough

Presentation:
History and Signalment
- Dogs, 4-10 yr, Males >> Females, LARGE breeds
  - Doberman Pinscher, Great Dane, Boxer, Irish Wolfhound, Newfoundland, Spaniels, Afghan, Old English Sheep dog, Scottish Deerhound, Dalmatian
- Juvenile onset
  - Portuguese Water Dog, Toy Manchester Terrier
- RARE in CATS: Abyssinian, Burmese, Siamese

Clinical signs
- Compensated early disease with no clinical signs
- Congestive heart failure (CHF)
  - Cough, tachypnea, dyspnea, exercise intolerance
  - Restlessness, abdominal distension, lethargy
  - Inappetence, weight loss (cachexia)
  - Weakness, syncope, collapse
  - Cyanosis, weak pulse quality, jugular pulse, distension
  - Pulse deficits

DDX:
Primary respiratory disease, non-cardiogenic pulmonary edema, pneumothorax, non-cardiogenic effusions, heartworm disease, myxomatous valvular heart disease, endocarditis, myocarditis, cardiac tumors, pericardial effusion, diaphragmatic hernia, pulmonary hemorrhage, laryngeal paralysis, collapsing trachea, congenital heart disease

Test(s) of choice:
Thoracic auscultation
- Tachycardia, I-III/VI systolic apical murmur (mitral regurgitation),
- Gallop sound (S3), Premature beats
- Arrhythmias
- Abnormal lung sounds
  - Dull ventral lung sounds (pleural effusion)
  - Increased bronchovesicular sounds (pulmonary edema)
  - Crackles

Urinalysis – important to perform prior to starting Rx

Taurine analysis
- ANY dog or cat with DCM
- Cocker Spaniel, Newfoundland, Golden Retriever

Electrocardiogram: ventricular premature contractions in a dog with dilated cardiomyopathy. ECG courtesy of Kalumet
Carnitine plasma analysis
- Boxer and American Cocker Spaniel
- May not always ID deficiency

Thoracic and abdominal radiographs
- Left atrial or left ventricular enlargement
  - Boxers, Doberman Pinschers
- Cardiomegaly
  - Dobermans with SEVERE DCM
- Pulmonary edema
  - Dogs – perihilar, caudodorsal lung lobes
  - Cats – location variable
- Pleural effusion
- Pulmonary venous enlargement
- Enlarged caudal vena cava
- Hepatomegaly (due to congestion)
- Ascites

ECG: Only 60% sensitive for LV enlargement
- Sinus tachycardia
- Wide and/or tall QRS complexes (LV enlargement)
- Wide P wave (P mitrale, LA enlargement)
- Left bundle branch block
- Low voltage QRS complexes (pleural or pericardial effusion)
- Atrial or ventricular premature contractions
- Atrial fibrillations in Giant breeds
- Ventricular tachyarrhythmias in Boxers, Dobermans
- Consider a 24 hr Holter monitor

Effusion analysis
- Modified transudate (dogs, cats)
- Chylous effusion (cats)

Echocardiography
- LV eccentric hypertrophy – normal wall thickness, enlarged end diastolic dimensions, decreased shortening fraction, occasional true LV dilation
- LA enlargement
  - Functional mitral regurgitation
    - Eccentric hypertrophy causes mitral annulus to stretch and displaces papillary muscles
  - Increased mitral valve E point to septal separation (EPSS)
    - Measurement of systolic function
  - ± Right heart enlargement

Lateral thoracic radiograph of Doberman with dilated cardiomyopathy (DCM).
Note alveolar lung pattern. (oval)
Image courtesy of Dr. Terri Defrancesco

Echocardiography of dilated cardiomyopathy in a dog, right parasternal, long axis, b-mode. LV - left ventricle, LA - left atrium, RV - right ventricle, RA - right atrium, IVS - interventricular septum, MV - mitral valve.
U/S image courtesy of Kalumet
**Rx of choice:**

**Acute CHF**
- Minimize stress, supplemental O₂, IV fluids contraindicated
- Treat arrhythmias
- Diuretics
  - Reduce edema, effusion
  - Furosemide (Lasix) – inhibits Na⁺ and H₂O reabsorption in Loop of Henle
- **Therapeutic thoracocentesis and paracentesis**
- 2% Nitroglycerin (topical vasodilator)
- Sodium nitroprusside (dogs only)
  - Vasodilator to treat severe cardiopulmonary edema
- Dobutamine
  - Positive inotrope, β1 adrenergic agonist
  - Use to treat severe heart failure, cardiogenic shock

**Chronic CHF**
- **SODIUM-RESTRICTED diet**
- Treat arrhythmias
- Taurine supplementation
  - Will reverse DCM in deficient patients
  - Dobermans, Great Danes are usually NOT taurine responsive
- L-carnitine supplementation – Boxers, American Cocker spaniels
- Omega-3 fatty acids
- Permanent exercise restriction
- Therapeutic thoracocentesis and paracentesis
- Diuretics
- **ACE inhibitors** (Enalapril)
  - Decrease heart rate
  - Decrease Na⁺ and H₂O retention
  - Vasodilation
- Digoxin
  - Positive inotrope and negative chronotrope
  - Useful for atrial fibrillation
- Pimobendan
  - Vasodilator, positive inotrope
  - May increase survival time in Doberman pinschers
- Beta-blockers (Atenolol, Metaprolol)
  - Decrease cardiotoxic sympathetic effects
  - Heart failure MUST be well controlled before initiating treatment

**Prognosis:**

Fair to Good: Taurine deficiency responsive DCM, Irish wolfhounds
Poor to Grave: Death usually occurs 3 mos - 2 yrs post Dx
Worst prognosis: Cats w/out taurine deficiency; Dobermans w/ atrial fibrillation, ventricular arrhythmia; Portuguese Water dogs: presented young (weeks to mos old), usually die quickly
Prevention:
Genetic testing – NC State College of Veterinary Cardiac Genetics Lab

Pearls:
- Treatment for *compensated* DCM is controversial
- DCM is autosomal dominant in Irish Wolfhounds, Newfoundlands, Doberman Pinschers, Boxers
- DCM may be autosomal recessive in Portuguese Water Dogs
- **Several etiologies** for DCM
  - Idiopathic, familial, genetic
  - Taurine deficiency – *reversible, cats*
  - Carnitine deficiency
  - Infectious
    - *Trypanosoma cruzi* – Southern USA – Chaga’s disease
    - Parvovirus – rare
  - Toxic – Adriamycin
  - Duchenne’s muscular dystrophy
  - Volume overload
    - Chronic mitral regurgitation
    - PDA
  - Endocrinopathy – hypothyroidism (uncommon)

Refs: Cote, Clin Vet Advisor, Dog and Cat. 2nd ed. pp. 309-312;
Merck Vet Manual 10th ed (online): Specific cardiac diseases; cardiomyopathy

My Notes: