

Dilated Cardiomyopathy (DCM)

Extended Version

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



*Doberman Pinscher, poster dog for dilated cardiomyopathy (DCM).
Photo courtesy of pato garza*

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:

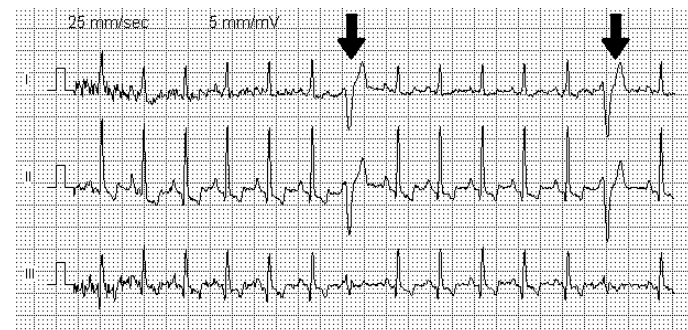
Thoracic auscultation

- 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*

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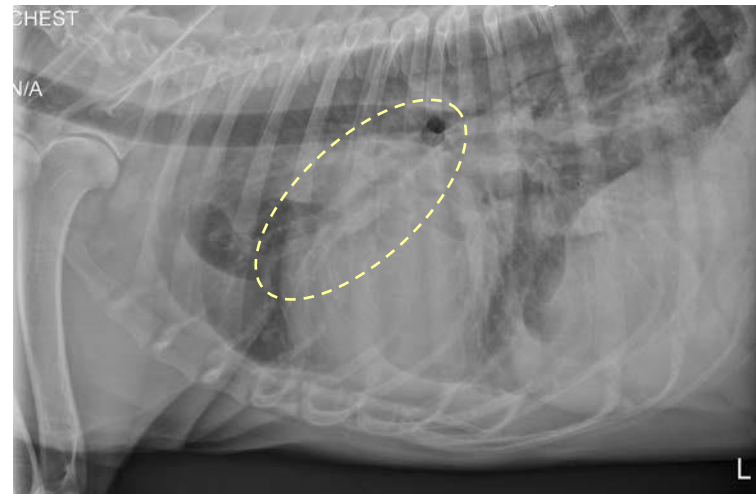
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Carnitine plasma analysis

- 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 (dt congestion)
- Ascites



Lateral thoracic radiograph of Doberman with dilated cardiomyopathy (DCM).

*Note alveolar lung pattern. (oval)
Image courtesy of Dr. Terri DeFrancesco*

ECG: Only 60% sensitive for LV enlargement

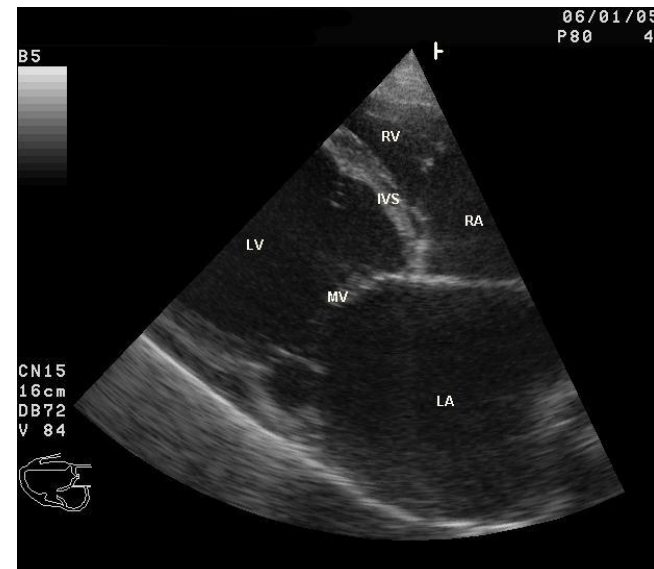
- Sinus tachycardia
- Wide and/or tall QRS complexes (LV enlargement)
- Wide P wave (P mitrale, LA enlargement)
- Left bundle branch block
- Low voltage QRS complexes (pleural or pericardial effusion)
- **Atrial or ventricular premature contractions**
- Atrial fibrillations in Giant breeds
- Ventricular 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



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

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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, Metoprolol)
 - 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

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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: