Cardiology made easy

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• Does a patient have heart disease?

• What kind of heart disease does it have?

• What is the severity?
definitions

- Heart disease
  - Every cardiac abnormality
- Heart failure
  - Result of heart disease
  - Symptomatic syndrome
    - Can be asymptomatic with treatment
  - “congestive heart failure”
  - Edema or effusion
How to diagnose heart disease?

- Depends on the disease 😊
- But in general:

  Auscultation is a very good screening tool
# How to diagnose heart disease?

<table>
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<tr>
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<th>MVD</th>
<th>DCM</th>
<th>HCM</th>
<th>PDA/SAS/PS</th>
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Heart murmur
Localisation left side
Heart murmur
Localisation right side

VSD
Auscultation

• Does correlate with the amount of shunting blood

• Does not really correlate with disease severity

=> X-Rays or Echo
Workup dog

Auscultation

abnormal

Heart disease almost certainly present

BNP

elevated

Further diagnostic workup required

elevated

Further diagnostic workup required

BNP

normal

Heart disease unlikely

BNP

normal

If strong suspicion

Check BNP every 6 – 12 months

normal

No diagnostic workup required
Workup cat

- A heart murmur does not tell you the cat has heart disease
- BNP
- Echocardiography
How to diagnose heart failure?
Heart disease or not?
Heart disease or not?
„Radiography can be a liar“
X-rays prove the existence of pulmonary edema
but be careful not to overinterpret!
How to diagnose heart failure

By means of:
Clinical symptoms
Clinical examination
Imaging
Xrays
Echo
Biomarkers
Heart disease

Clinical course:

Insult

Preclinical or occult Phase

Symptomatic or overt heart failure
Which symptoms do typically occur in heart failure?

How to diagnose heart failure?
Clinical signs

• **Respiratory signs**
  – Cough (not in cats). Polypnea/Dyspnea
• **Exercise intolerance**  
  *Late stage*
• **Blue tongue**
• **Syncope**
• **With right heart failure**
  – Ascites
  – Thoracic effusion
• **Cachexia/anorexia (esp. cats)**
Exspiratory vs inspiratory
Anamnesis

- Paroxysmal respiratory symptoms
  - Come and go without treatment
  - Not cardio-related

- Dyspnea due to heart failure:
  - Expiratory
  - Sometimes mixed

  - Inspiratory dyspnea => upper airway
Anamnesis

• The longer the symptoms exist the less likely it is the heart

• Coughing for more then a couple of months excludes heart disease
Clinical Examination

Auscultation: heart

- Abnormality present: yes/no
- Heart frequency:
  - Dog: normal HF excludes heart failure
  - Sinusarrhythmie: positive sign!

Dogs are very rarely in heart failure without an auscultatory abnormality!
Clinical Examination

Auscultation: lungs

- Abnormalities can be present but don’t have to

- Crackles: much more common in pulmonary parenchymal disease

Never diagnose pulmonary edema based only on auscultation!
You need X-rays.
Clinical examination

• Thoracic effusion
  – Dog: right heart failure
    • modified transudat
  – Cat: left and/or right heart failure
    • modified transudat
    • Chylus

Dogs with thoracic effusion but without ascites don’t have reason for the effusion!
Clinical examination

- Prominent jugular veins
  - Suggestive of right heart failure
Clinical examination

Body temperature

- Hyperthermia
  - Virtually excludes heart failure

- Hypothermia
  - Might be due to underperfusion
Radiography

Pulmonary edema

VHS
Vertebral Heart Score

VHS = 5.1 + 5.2 = 10.3

Norm:

- dog ≤ 11.0 (grey zone 10.5 – 11.0)
- cat ≤ 8.2
VHS vs. Intercostals

4 IC
VHS vs. Intercostals

VHS: 10.1
Left atrial size

- Course of the trachea
  - Can run almost parallel to the vertebral column
    - Depends on chest configuration
Left atrial size

- Course of the main bronchi
  - Ventrally oriented
Heart disease or not?
Heart disease or not?

Cardiac enlargement: yes
Heart failure: no
Dilated left atrium
Dilated left atrium
Interstitial pulmonary edema
Alveolar pulmonary edema
Tip

• Look at the severity of the pulmonary infiltrates

• Severe shadowing without life-threatening symptoms indicates a chronic process

Dog was only displaying mild to moderate respiratory signs despite the severe radiographic changes.
Neither sensitiv nor specific

Does not answer whether to treat or not

When to use it:

- Arhythmia
- Suspected pericardial effusion (Hypovoltage/electrical alternans)
- Syncope or exercise intolerance of unknown origin
- (differentiation of congenital heart disease)
Biomarkers

• Major cardiac biomarkers
  – cTNI
    • Marker of myocardial damage
    • Useful only for certain indications:
      – Myokarditis
      – Cardiac hemangiosarkoma
  – NT-ProBNP
    • Marker of myocardial wall stress
Indication:

- Suspected Cardiomyopathy
  - HCM and DCM
- exclude heart diseases in unclear cases
- Differentiation between cardiac and non cardiac dyspnea
  - Feline Snap-Test

- Prognosis and clinical course
Therapy: Acute Heart Failure

- Do not stress
- \( \text{O}_2 \)
- Furosemide
- Consider positive inotropic support
  - Dobutamin iv
    - Cave: Rhythm disturbances
  - Pimobendan po./iv.
- Thoracocentesis or Abdominocentesis

ACE-I are not required in acute heart failure
Therapy

MVD, DCM
MVD

- Stages according *ACVIM consensus statement*
  - Stage **A**: high risk patient without heart disease
  - Stage **B1**: asymptomatic patient *without* cardiomegaly
  - Stage **B2**: asymptomatic patient *with* cardiomegaly
  - Stage **C 1/2/3**: heart failure
    - 1: chronic (almost asymptomatic)
    - 2: mild to moderate symptoms
    - 3: severe life threatening symptoms
  - Stage **D**: refractory heart failure
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+-/-: unclear

MVD

Triple therapy
# MVD

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EPIC-Trial
MVD

• Unanswered questions:
  – Role of ace-inhibitors in B2 and C
    • B2: trials with conflicting results
    • C: no trial that compares Triple Therapy vs. Dual Therapy
  
  – Role of spironolactone in B2 and C
Refractory Cases

- Pimobendan
  - *Increase dose to TID*
- Furosemide
  - Change route of administration to sq.
- Hydrochlorothiazide
- Spironolactone
- Digoxin
- Diet (adequate caloric intake)
Guidelines on the management of valvular heart disease (version 2012)

The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

6.1.6 Medical therapy
In acute MR, reduction of filling pressures can be obtained with nitrates and diuretics. Sodium nitroprusside reduces afterload and regurgitant fraction, as does an intra-aortic balloon pump. Inotropic agents and intra-aortic balloon pump should be added in case of hypotension.

There is no evidence to support the use of vasodilators, including ACE inhibitors, in chronic MR without HF and they are therefore not recommended in this group of patients. However, when HF has developed, ACE inhibitors are beneficial and should be considered in patients with advanced MR and severe symptoms, who are not suitable for surgery or when there are still residual symptoms following surgery. Beta-blockers and spironolactone should also be considered as appropriate.13
Mitral valve repair

- YES. it is an option
- BUT: it is expensive and not widely available
Mitral valve replacement

- semi-invasiv
- Transthoracal placement
- To date: not an option
Clinical Impact

- Dog with heart murmur at left apex
  - Consider Imaging
    - Radiography or echocardiography
  If not available:
  - Consider BNP

- Do not wait for clinical symptoms
**DCM**

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<td>Patient has heart disease but <strong>no</strong> clinical symptoms</td>
<td>Patient shows overt signs of heart failure</td>
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+/-: unclear
PROTECT Study

- prospective, placebo-controlled multicenter-study
- 67 Dobermans with occult DCM
- Pimobendan vs Placebo
- Question: Does Pimobendan delay the onset of CHF or sudden death (primary endpoints) and improve survival (secondary endpoint)?
PROTECT Study

Medium time to primary endpoint:
  Pimobendan: 718 days
  Placebo: 441 days

Median survival time:
  Pimobendan: 623 days
  Placebo: 466 days
PROTECT Study

Pimobendan prolongs the time to the onset of clinical signs and extends survival in Dobermans with preclinical DCM.
Irish Wolfhound Study

- Prospective Study
- 66 IW with occult DCM and/or atrial fibrillation
- Pimobendan vs Benazepril vs Digoxin
- Primary endpoint: CHF or SD
- Medium time to primary endpoint:
  - Benazepril: 33.2 months
  - Digoxin: 42.1 months
  - Pimobendan: 66.4 months
DCM

• Unanswered questions:
  – Role of ACE-inhibitors
    • Probably more important than in MVD
  – Studies in Dobermans and Irish Wolfhounds
    • Other breeds?
Clinical Impact

• Screening for DCM should be recommended in all dogs at high risk (Dobi. Great Dane. IWH)
  – Owner education!
Algorithm

Screening for occult DCM

**DOGS AT RISK**
- Dog >3 years of age
- Dog >20 kg
- AND/OR
- At-risk breed*

If there is a high index of suspicion, proceed directly with ECHO† if available

**PERFORM PHYSICAL EXAMINATION**
- Abnormal pulse or pulse deficits
- Any arrhythmia
- Gallop sounds
- Soft systolic murmur

**NOTE SUBTLE CLINICAL SIGNS**
- History of mild exercise intolerance or syncope
- Increased resting respiratory rate (RRR) or effort (>30 at home or >40 in clinic)
- Inappropriate/unintended weight loss
†A Holter is indicated in many dogs with preclinical DCM and as a screening test in some high-risk breeds, such as the Boxer and Doberman, regardless of echocardiographic findings.
Algorithm

Screening for occult DCM

Proceed with ECHO† if available. If not, consider additional tests

CONSIDER ADDITIONAL TESTS

Electrocardiogram
(non-sinus arrhythmia or VPCs = abnormal)†

OR

Chest radiograph
(vertebral heart score >10.7 = abnormal)

OR

NT-proBNP biomarker
(>900 pmol/L = abnormal; >500 pmol/L for Dobermans)

HIGH-RISK BREEDS+++?

YES

NO

REEXAMINE IN 1 YEAR

1 YEAR
Algorithm

Screening for occult DCM
EARLY DETECTION OF HEART DISEASE IN LARGE-BREED DOGS.

Identifying dogs with dilated cardiomyopathy (DCM) that are not yet showing obvious clinical signs can be challenging. A diagnosis can be made with echocardiography, but screening every at-risk dog with an echocardiogram (ECHO) is impractical. Follow this simple screening process to determine which large-breed dogs have early evidence suggestive of DCM and are appropriate for further screening.

**DOGS AT RISK**
- Dog > 2 years of age
- Dog > 10 kg
- AND/OR
- At-risk breed
- If there is a high index of suspicion, proceed directly with ECHO if available

**PERFORM PHYSICAL EXAMINATION**
- Abnormal pulse or pulse deficits
- Any arrhythmias
- Gallop sounds
- Soft systolic murmur
- AND/OR
- History of mild exercise intolerance or syncope
- Increased resting respiratory rate (RRR) or effort
- Inappropriate weight loss
- Increased proBNP or other markers

**NOTE SUBTLE CLINICAL SIGNS**
- Proceed with ECHO if available. If not, consider additional tests

**CONSIDER ADDITIONAL TESTS**
- Electrocardiogram (ECG)
- Chest radiography
- NT-proBNP biomarker

**EXAMINE IN 1 YEAR**
- NORMAL (DCM possible but less likely)
- ABNORMAL (High probability of DCM)

**DIAGNOSIS**
- PRECLINICAL DCM

*Illustrated by Art & Design for the New England Journal of Medicine; adapted by Katherine Reilly, image by Ampersand Images® Inc. (for the New England Journal of Medicine).*
Clinical impact

- VETMEDIN® is now also licenced in Europe for preclinical dilated cardiomyopathy (DCM) in Doberman Pinschers.
- VETMEDIN® helps delay the onset of clinical signs of DCM and increase overall survival of DCM patients.
- VETMEDIN® is the first and only medication licenced for preclinical treatment in veterinary cardiology.
Take Home

- Diagnosis of heart failure is a combination of
  - Clinical signs, clinical exam, imaging and biomarkers
- MVD stage B2: start on Pimobendan
- Occult DCM: start on Pimobendan
The End

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