PRACTICAL FELINE CARDIOLOGY

Jess Weidman, DVM, DACVIM- Cardiology
CVCA – Cardiac Care for Pets
Dogwood Veterinary Emergency and Specialty

CVCA
Cardiac Care for Pets
www.cvca vets.com
Diagnostics

- Cardiac auscultation
- Chest Radiographs
- BNP
- Genetic testing

Case Scenarios

- Pre-anesthesia
- Cat with a murmur
- Respiratory distress / CHF treatment
Cardiac Auscultation in Cats

- Most murmurs heard mid-sternal
  - Left, right, cranial, caudal

- Dynamic murmurs are common
  - Occurs with pathologic and benign murmurs
  - Startle maneuvers

- Gallop suggests significant cardiomyopathy

- Arrhythmia: Most likely cardiomyopathy
Assessment of the prevalence of heart murmurs in overtly healthy cats; JAVMA, Vol 225, No 3, Aug 1, 2004

Healthy cats recruited for blood donor program at Angell Memorial in Boston, MA

Murmur in 22 of 103 cats (21%)
- Echo only performed on 7 cats
Prevalence of cardiomyopathy in apparently healthy cats; JAVMA, Vol 234, No 11, June 1, 2009

Healthy cats recruited for study at VA-Tech

Murmur in 16 of 103 cats (15.5%)
  - 5 of these cats had HCM (31%)

Overall, cardiomyopathy in 16 of 103 cats (15.5%)
  - 11 (69%) of these did not have a murmur!

Conclusions: Cardiomyopathy was common in healthy cats....detection of a heart murmur is not a reliable indicator of cardiomyopathy
Comparison of auscultation and echocardiographic findings in healthy adult cats; JVC, 2010, 12, 171-182

Healthy cats in 4 shelters in UK
Murmur in 67/199 cats (34%)
Echo in 61 cats with murmur
  - 18 HCM via M-mode (30%)
  - 26 HCM via 2-D (43%)
HCM prevalence of 15.5% in all cats
  - 76% had a murmur
  - 24% no murmur
Difficult to detect mild disease
LV hypertrophy not seen
LAE seen best on V/D
Should have LAE in CHF
## Chest Radiographs
### Vertebral Heart Score Cats

<table>
<thead>
<tr>
<th></th>
<th>Cat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Normal range</td>
<td>7.5 +/- 0.3 sd</td>
</tr>
<tr>
<td></td>
<td>6.8 - 8.1 v</td>
</tr>
<tr>
<td>Mild enlargement</td>
<td>8.2 - 8.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>8.6 - 8.9</td>
</tr>
<tr>
<td>Marked</td>
<td>9 - 10</td>
</tr>
<tr>
<td>Extreme</td>
<td>&gt; 10</td>
</tr>
</tbody>
</table>
Chest Radiographs
Cat Heart Width V/D

VD heart width in cats

Average: 3.4v +/- 0.25 sd
Normal range: 2.9 - 4.1v

Mild enlargement: 4.2 - 4.4v
Moderate: 4.5 - 4.9
Marked: 5+
**Natriuretic Peptides**

- ANP: stored and released from atria in response to atrial stretch
- BNP: stored and released from ventricles in response to wall stress
- Increase renal blood flow and urine production
- Increase Na loss in urine
- Vasodilation
- Inhibit effects of sympathetic nervous system, RAAS, and ADH
NT-proBNP vs. cBNP

proBNP

CLEAVAGE

NT-proBNP
(physiologically inactive)

BNP
(physiologically active)
## Diagnosis of Feline Cardiac Disease: NT-proBNP for Screening

<table>
<thead>
<tr>
<th>Study</th>
<th>HCM (n)</th>
<th>Control (n)</th>
<th>[NT-pro-BNP] cutoff</th>
<th>Sens %</th>
<th>Spec%</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connolly 2008</td>
<td>17</td>
<td>28</td>
<td>49</td>
<td>100</td>
<td>89</td>
<td>no stratification of severity and UCM patients included</td>
</tr>
<tr>
<td>Wess 2009 (Abstract)</td>
<td>68</td>
<td>33</td>
<td>100</td>
<td>94</td>
<td>81</td>
<td>Stratification of mild, mod, severe- sig difference between all affected groups vs. normal control</td>
</tr>
<tr>
<td>Hsu 2009* moderate</td>
<td>9</td>
<td>21</td>
<td>44</td>
<td>20</td>
<td>86</td>
<td>Maine Coon Colony – Stratification severe, moderate, equivocal, and normal</td>
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<tr>
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<td>10</td>
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<td>90</td>
<td>83</td>
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<tr>
<td>Fox 2011**</td>
<td>114</td>
<td>113</td>
<td>47</td>
<td>91</td>
<td>86</td>
<td>Affected population included HCM (52), HOCM (35), UCM (22), DCM (1), and ARVC (3)</td>
</tr>
</tbody>
</table>
Prevalence of 15% Sensitivity 90% Specificity 85%

PPV is 53% and NPV is 93%
- Fair number of false positives
- Low false negative

Echocardiography is the gold standard for the diagnosis of feline myocardial disease

Screening echo clinics
### NT-Pro-BNP Cats with Respiratory Distress

**Fox et al; JVC 2009, 11, S51-S61**

<table>
<thead>
<tr>
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<th>Cats with CHF</th>
<th>Cats with Respiratory</th>
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<tbody>
<tr>
<td><strong>Number</strong></td>
<td>101</td>
<td>66</td>
</tr>
<tr>
<td><strong>Murmur</strong></td>
<td>61%</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Gallop</strong></td>
<td>42%</td>
<td>8%</td>
</tr>
<tr>
<td><strong>VHS</strong></td>
<td>9.2</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>BNP: Median (IQR)</strong></td>
<td>745(437-1035)</td>
<td>76.5 (24-180)</td>
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- **NT-Pro-BNP >265 pmol/L (Sens. 90% Spec. 88%)**
SNAP® Feline proBNP

- New green conjugate
- 5 drops: g-r-e-e-n
- Serum or EDTA plasma
- 9 months stability refrigerated
- Warm for 30 minutes

Feline proBNP—Test cats at risk for cardiac disease (murmur, breed, age).
Interpreting SNAP Feline proBNP Results

<table>
<thead>
<tr>
<th>Cardiopet proBNP</th>
<th>SNAP Feline proBNP</th>
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</tr>
</thead>
<tbody>
<tr>
<td>&lt;100 pmol/L</td>
<td>Normal</td>
<td>200 pmol/L</td>
<td>≥300 pmol/L</td>
</tr>
<tr>
<td></td>
<td>Abnormal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample spot is lighter than reference spot.</td>
<td>Sample spot is the same color as reference spot.</td>
<td>Sample spot is darker than reference spot.</td>
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Figure 1. Examples of SNAP Feline proBNP Test interpretation and correlation with the Cardiopet proBNP Test.

<table>
<thead>
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<tr>
<td>Normal</td>
<td>57</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Abnormal</td>
<td>0</td>
<td>7</td>
<td>23</td>
</tr>
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Figure 2. Results of the validation study. Data represents two independent lots of the SNAP Feline proBNP Test.
DNA Test for Heart Disease- Cats

Maine Coon cats may have a genetic mutation in the MyBPC gene that may result in the development of Hypertrophic Cardiomyopathy (HCM), the most common form of heart disease in cats. A DNA test is available for Maine Coon HCM. Click here for test information and request forms.

Ragdoll cats may also have a genetic mutation in the MyBPC gene that can lead to a form of Hypertrophic Cardiomyopathy (HCM), the most common form of heart disease in felines. A DNA test is available for Ragdoll HCM. Click here for test information and request forms.

CVCA
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www.cvca.org
Heart weight / BW ratio is 3-4 g/kg in cats.

Most normal cats have a heart weight under 20g.

Cats with HCM typically have a heart that weighs more than 25g, and it can weigh up to 38g.
Case Scenarios
Auscultation: Sens 33% and Spec 87.4% for Dx of HCM
- Abnormal PPV 31% (probability of disease w/ murmur)
- Normal NPV 89% (probability of no disease if no murmur)

NT-Pro-BNP: Sensitivity 90% and Specificity 85% for CM
- PPV is 53%: fair number of false positive
- NPV is 93%: low chance of a false negative

* Assuming 15.5% HCM Prevalence
- VA: 31% chance of CM
- UK: 43% chance of CM

- So 2-3x the risk compared to just being a cat

- Echo recommended
  - Risk for clinical signs
  - Progression

- BNP for additional support
- Chest Radiographs?
Being a veterinarian is great!

Until this happens......
Respiratory Distress Cat

- Dx only as needed to guide Rx
- Dx in lowest stress way possible
- Sedate if needed

Questions
- Pleural effusion
- Cardiac vs. other
- Owner considerations
Pleural Effusion

- Clues on exam
  - Muffled heart and lung sounds
  - Exaggerated chest motion
  - Paradoxical abdominal breathing

- Causes
  - CHF
  - Neoplasia
  - Idiopathic Chylothorax
  - Infection, coagulopathy...
Thoracocentesis

- Sternal recumbency
- Clip and prep right thorax 5-10th ribs
- Guide with U/S or 7-8th ICS
- Sedation if needed
  - Butorphanol and Midazolam at 0.2-0.4 mg/kg IM
- 21-G butterfly, stopcock, 12ml syringe
Thoracocentesis

- Cranial to rib
- Ventral 1/3 thorax
- Slow steady negative pressure

Complications:
- Pneumothorax
- Lung laceration
- Laceration of intercostal
- Cardiac puncture
Rapid ER Echocardiogram
Congestive Heart Failure Radiographs in Cats
Congestive Heart Failure Radiographs in Cats
Use of the vertebral heart scale for differentiation of cardiac and non-cardiac causes of respiratory distress in cats: 67 cases; JAVMA, Vol 242, No 3, Feb 1, 2013

- < 8.0: Respiratory
- 8.0-9.3: Grey zone
- > 9.3: CHF
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**Figure 1.** Examples of SNAP Feline proBNP Test interpretation and correlation with the Cardiopet proBNP Test.
ER Treatment of CHF in Cats

- Thoracocentesis if needed
- Oxygen
- Lasix 2-3 mg/mg IV; Repeat every 1-2 hours until RR under 40
  - If not seeing some improvement after 2-3 doses; Need to question the Dx of CHF
- Once RR under 40, reduce Lasix to every 6-8 hours for the next 24 hours
Lasix 2 mg/kg PO TID for 2 days, then BID
+/- Cyproheptadine or Mirtazapine

Once home and eating:
- Enalapril 0.5mg/kg PO QD (1/2 dose 4 days)
- Plavix 75mg tablets at ¼ tablet once a day
- Aspirin 81mg tablets at ¼ tablet twice a WEEK
- Possibly Atenolol, Diltiazem, or Pimobendan based on echo
Pimobendan in Cats

- Not labelled for use in cats
- Contraindicated in HCM, which is the most common heart disease in cats
- No frequent side effects in reports out there
- May have survival benefit
- Occasional cat does worse: weakness, hypotension, agitation, GI upset
- Copy dog dose of 0.2-0.3 mg/kg BID, but we really have no idea
- Only use under the direction of a cardiologist