HANDS OFF!
How to recognise the cardiac patient

Dr Luca Ferasin DVM PhD CertVC PGCert(HE) DipECVIM-CA (Cardiology) GP cert(B&PS) MRCVS
European and RCVS Recognised Specialist in Veterinary Cardiology

Disclaimer of CONFLICT of INTEREST

• I DO NOT have any direct or indirect financial interest in promoting, advertising or recommending any pharmaceutical products
• Companies cited in these lectures HAVE NOT provided any bibliographic or promotional material to be used in this presentation
• Companies cited in these lectures HAVE NOT previewed, suggested or influenced the scientific content of this presentation

Cardiac! Respiratory!

Step 1: Recognise the Signs

I think I’m SICK!!
Stridors

Bibo, 12y MN X-breed
6-month history of coughing
Systolic grade III/VI heart murmur with PMI=LA
Currently on furosemide and benazepril

Luna, 13y FN Chihuahua
1-year history of coughing
Systolic grade IV/VI heart murmur with PMI=LA
Currently on furosemide, benazepril, pimobendan, digoxin

Stridors

Stenotic nares

Laryngeal Paralysis
Coughing

Aaaahhh... ...my dog keeps coughing!!

Cough: What’s in the name?

Cough: Why should we bother?

When cough becomes persistent, it may interfere with:

- Breathing
- Eating/Drinking
- Sleeping (Dog)
- Sleeping (Owner)

(more rarely: syncope, incontinence, muscle ache, fatigue)
Cough: the Reflex

1. Receptors
2. Cough Centre
3. Motor Action
Voluntary Control of Cough

Placebo Effect

Sensation of Irritation

Respiratory Area of Brainstem

Exogenous Opioids

Endogenous Opioids

Cerebral Cortex

Voluntary Control of Cough

Respiratory Muscles

Cough


Motor Action

Phases (several skeletal mm involved)

- Near-maximal inspiration
- Closure for 200 ms
- Intrapleural and intra-alveolar pressure 300 mmHg
- Airflow ~ 30 m/s
- Dynamic collapse bronchial tree (↑ pressure gradients)
- Resume functional residual capacity

Plasticity of Cough
Tracheal palpation

How can I stopo coughing if this idiot is trying to strangulate me?!!

Cough Reflex  Expiratory Reflex

Explosive Cough
Cough: most common causes in people
- Cigarette Smoking
- Acute Respiratory Tract Infection
- Allergy
- Chronic Bronchitis and Bronchiectasis
- Post-nasal drip syndrome (PNDS)
- Gastro-Oesophageal Reflux
- ACE inhibitors

Chronic Bronchitis
Commonly observed in dogs, especially middle-age or old dogs of the small breeds

Post-nasal drip syndrome (PNDS)
No coughing receptors in the pharynx
Commonly observed in dogs but poorly described
Mostly associated with rhinosinusitis
Excessive swallowing, coughing and sneezing
**Gastro-oesophageal reflux**
activation of oesophageal sensory receptors responsive to acid or due to reflux of gastric contents irritating the larynx

**ACE inhibitors**
- 20% human patients on ACE inhibitors develop a dry cough, sometimes severe enough to require discontinuation of the drug. (Eur Respir J 1993; 6:576)
- Cough as a side-effect of ACEi is not recognised as being ACEi-related or is symptomatically treated with antitussive agents instead of ACEi substitution (Br J Clin Pharmacol. 2010 Feb;69:200)

**Drinking/Eating-induced coughing**
associated with swallowing impairment or, less commonly, bronchoesophageal fistula

**Cigarette Smoking**
Why do Dogs with Cardiac Disease Cough?

The Cardinal Signs of Heart Failure
(Merck's Medical Manual)
• Exercise Intolerance
• Dyspnoea

(Merck's Veterinary Manual)
• Cough
• Dyspnoea

Cough: *Cardiac causes*?
Described only in Veterinary Textbooks
Described primarily in Dogs
Attributed to:
- Pulmonary oedema
- Bronchial mucosa oedema
- Dorsal elevation and compression of the trachea
- Dorsal elevation and compression of the left main stem bronchus

Pulmonary interstitial / alveolar transudate
Pulmonary oedema in Swedish hunting dogs

In dogs, blood from the extra-pulmonary bronchi drains into the left azygos vein.
Minimally Invasive Per-Catheter Patent Ductus Arteriosus Occlusion in Dogs Using a Prototype Duct Occluder

J. A. Scafidi and A. M. Tobias

Background: Per-catheter closure of the secundum atrial septal defect (ASD), using a transcatheter device, has become a standard for treatment. However, the use of a transcatheter closure device for the treatment of patent ductus arteriosus (PDA) in dogs has not been reported. The purpose of this study is to describe our experience with the use of a prototype duct occluder in dogs with secundum ASD.

Methods: A retrospective study of dogs with ASD treated with a transcatheter device at our hospital was performed. The duct occluder was placed through a 20-gauge or 22-gauge needle into the right atrium. The device was then inflated to seal the defect.

Results: Nine dogs were included in the study. The mean age of the dogs was 3.5 months. The mean body weight was 7.2 kg. The mean time to device placement was 12 hours after the procedure. The device was successfully placed in all cases. At the time of the study, all dogs were asymptomatic.

Conclusion: Transcatheter closure of ASD is a safe and effective method for the treatment of ASD in dogs. The use of a prototype duct occluder for the treatment of PDA is safe and effective.

Key words: Patent ductus arteriosus, transcatheter closure, atrial septal defect.

Aim of this study

PULMONARY OEDEMA

CARDIOMEGALY

AIRWAY DISEASE

Risk Factors for Coughing in Dogs with Naturally Acquired Myxomatous Mitral Valve Disease

L. Parent, L. Cross, D.S. Bicker, K.E. Lamb, and M. Bergarelli

Background: Coughing is often reported as the primary clinical sign of congestive heart failure (CHF) in dogs with thoracic degenerative myxomatous mitral valve disease (MDVM). The objective of the study was to determine risk factors for coughing in dogs with MDVM.

Methods: A retrospective study of records of dogs with MDVM was performed. The data included age, sex, body weight, presence of heart murmurs, and presence of coughing.

Results: Of the 100 dogs included in the study, 60 were male and 40 were female. The mean age of the dogs was 4.5 years. The mean body weight was 12 kg. The prevalence of coughing was 70%. The risk factors for coughing were determined using logistic regression analysis.

Conclusion: Coughing is a common clinical sign in dogs with MDVM. Age, sex, and body weight were not significant risk factors for coughing in dogs with MDVM. However, the presence of heart murmurs was significantly associated with coughing in dogs with MDVM.

Key words: Myxomatous mitral valve disease, coughing, congestive heart failure.
Mitral Regurgitation and Cough

204 dogs with MR

99 dogs with MR + cough

Mitral Regurgitation and CHF

Cough

No Cough

56%

44%

100%

50%

0%

Dyspnoea

No Dyspnoea

UNIVARIATE ANALYSIS

MULTIVARIATE ANALYSIS
**Furosemide: the big confounder**

- anti-inflammatory effect (inhibition of production and release of cytokines interleukin (IL)-6, IL-8, and TNF-α, improving the sensitivity of target cells to endogenous glucocorticosteroids)

- In adults and children with asthma, furosemide exerts a protective effect against bronchoconstriction.

- Activation of stretch receptors and inhibition of irritant receptors resulting in inhibition of cough.

Self-improvement: another big confounder

“If you cough because of a cold and you take drugs you will improve in approximately 1 week”

“If you cough because of a cold and you DON’T take drugs...you will improve in approximately 7 days!”

What is dyspnoea?

- Laboured and often fast breathing
  - unpleasant or uncomfortable sensation
  - unusual position to improve breathing
- anxiety

- The experience of dyspnoea likely results from a complex interaction between:
  - chemoreceptor stimulation
  - mechanical abnormalities in breathing
  - perception of those abnormalities by the CNS
Sleeping Respiratory Rate (SRR)

Tachypnoea

Dyspnoea

Orthopnoea

Lung Fibrosis

Congestive Heart Failure
## Breathing pattern

<table>
<thead>
<tr>
<th>Breathing pattern</th>
<th>Localisation</th>
<th>Differential diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged inspiration</td>
<td>Dynamic Upper airway obstruction</td>
<td>Nasopharyngeal polyp, Inflammatory laryngitis</td>
</tr>
<tr>
<td>Stridor</td>
<td>Fixed upper airway obstruction</td>
<td>Tracheal obstruction (neoplasia, FB)</td>
</tr>
<tr>
<td>Normal resp rate with noise on inspiration and expiration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal resp rate with cough, wheezes, rhonchi</td>
<td>Intrathoracic trachea or lower airway disease.</td>
<td>Asthma, Chronic bronchitis, Mass lesion affecting intrathoracic airways</td>
</tr>
<tr>
<td>Prolonged expiration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapid resp rate with pulmonary crackles</td>
<td>Pulmonary parenchymal disease</td>
<td>Pleuritis, Pulmonary contusions, Neoplasia, Pulmonary thromboembolism, Pulmonary oedema</td>
</tr>
<tr>
<td>Rapid resp rate with quiet breath sounds</td>
<td>Pulmonary oedema</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### The Vicious Circle

- Anxiety
- Stress
- Dyspnoea
- Do not add extra stress
Do not upset them

IMHA

Cyanosis

Tetralogy Fallot

Exercise Intolerance

• Usually based on Owner’s perception
• Available tests for more objective evaluation
Syncope
• sudden, unexpected, and unprovoked loss of consciousness
• loss of postural control, unresponsiveness
• transient (seconds), spontaneous recovery

Inappetance/Weight Loss/ Growth Failure

Paresis/paralysis

Hindlimb paresis/paralysis

Arterial Thromboembolism
Reversed PDA

Arterial Thromboembolism
General Impression

Evaluation of respiratory movements

Evaluation of respiratory movements

General Impression
How to open a question (e.g. coughing=YES)

- how long coughing has been present
- whether it began suddenly
- if it has changed recently
- what factors influence it (e.g., cold air, barking, posture, eating or drinking, time of day)
- whether it is associated with sputum production (often noticed by the owner as “swallowing after coughing”) or other symptoms
**History**

**Nutritional condition**  
thin or even emaciated > cardiac cachexia  
obesity > may exacerbate coughing associated with respiratory diseases.

**Body condition/ appearance**  
enlarged abdomen and inadequate gait > ascites?

**Coat**  
dull > dehydration  
symmetrical alopecia > Hypothyroidism and hyperadrenocorticism

**Behaviour**  
dyspnoea or tachycardias > anxiety

**Mental Status**  
Chronic cardio-respiratory disease > lethargy