CREATING CLARITY

# Why Can’t My Patient Breathe?

## A review of canine and feline thoracic radiographs

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IDEXX Telemedicine Consultants

Radiologist II

March 22, 2025

IDEXX

# Outline

1. Systematic approach to reading thoracic radiographs

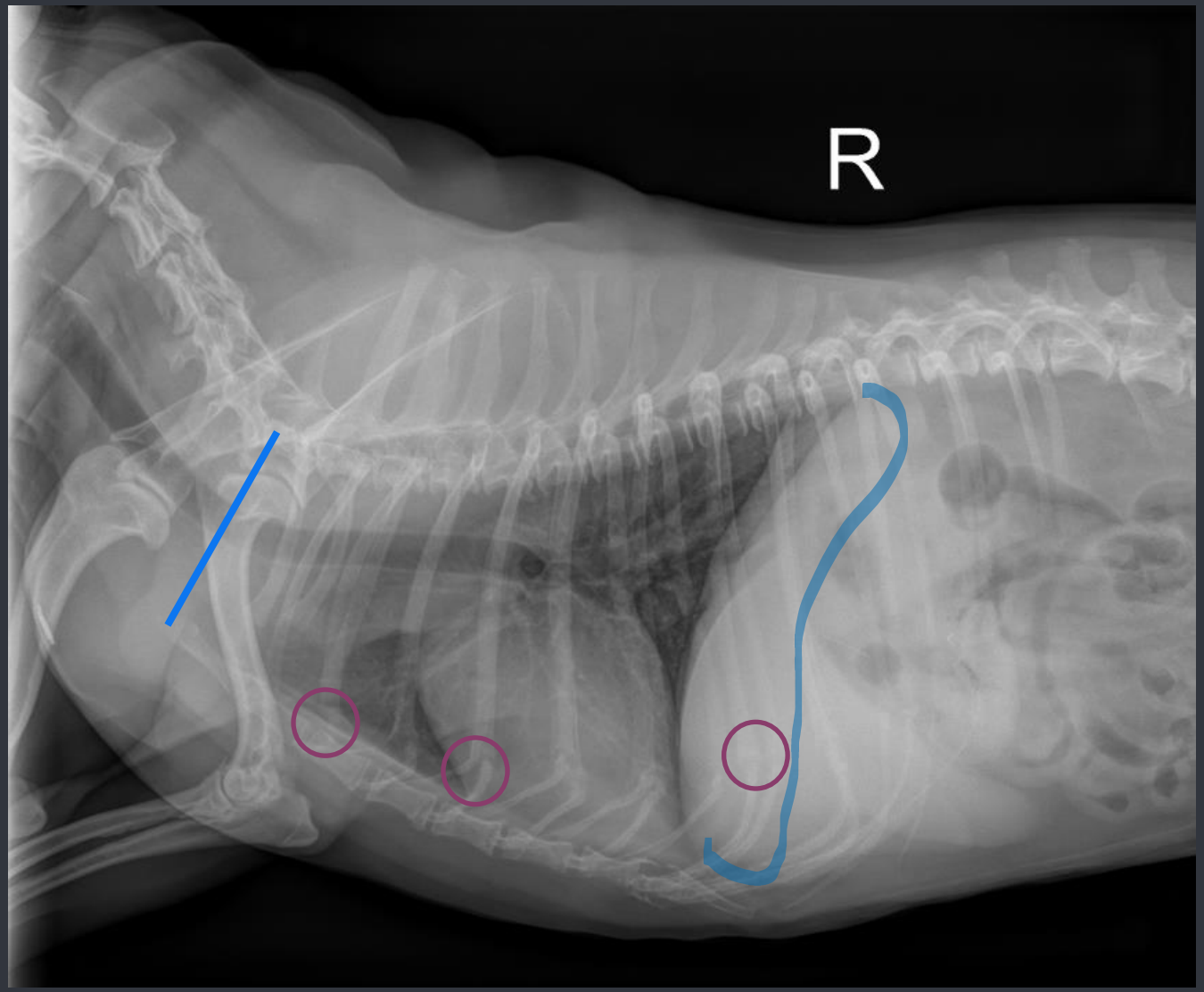
2. Case examples of common causes of respiratory clinical signs in dogs and cats

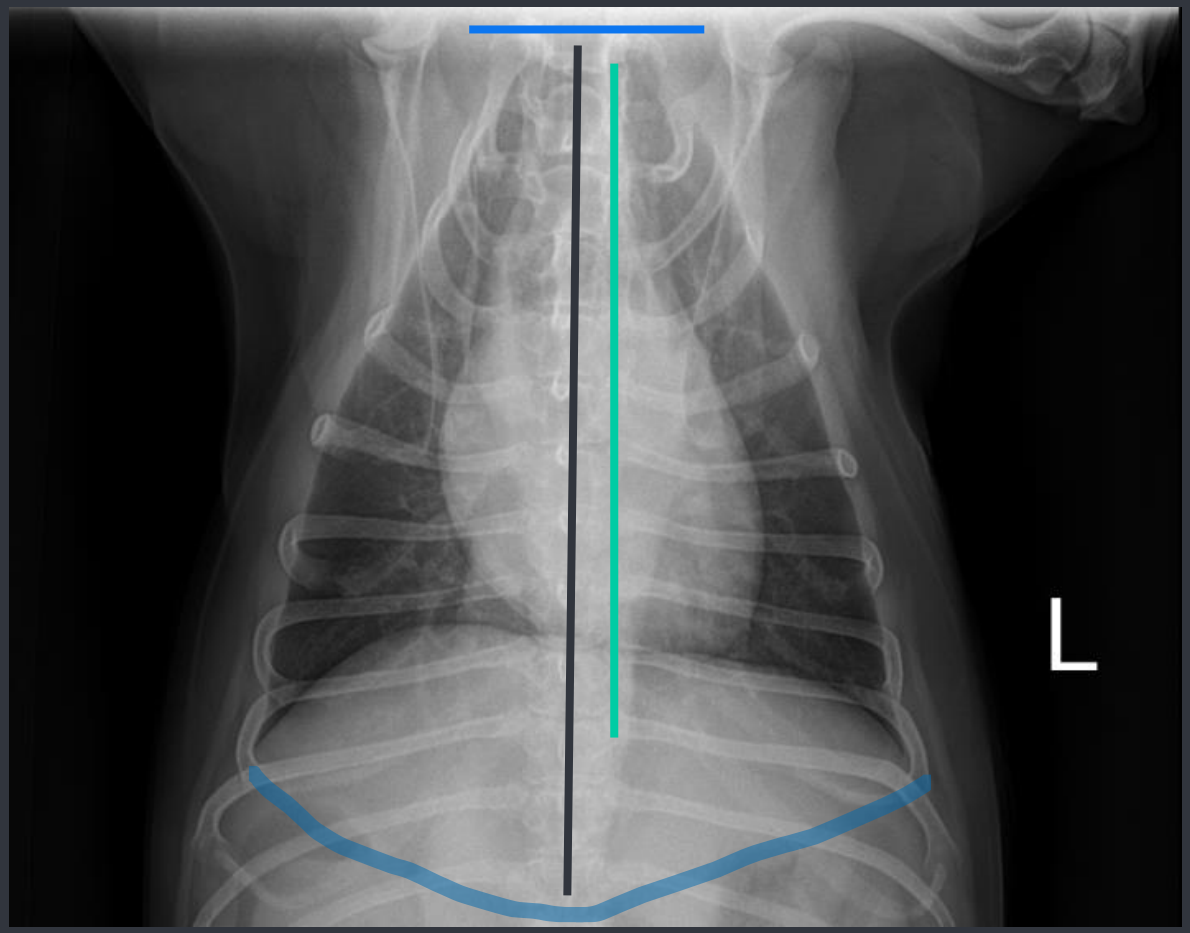
# Systematic Approach to Radiographic Interpretation

# Systematic approach to evaluating thoracic radiographs

- Technique and Positioning
- Cardiovascular structures
  - Cardiac silhouette
  - Great vessels
  - Pulmonary vessels
- Pulmonary parenchyma
- Mediastinum
  - Trachea (and major bronchi)
  - Esophagus
  - Intrathoracic lymph nodes
- Pleural space
- Thoracic borders
  - Diaphragm
  - Extra-thoracic structures

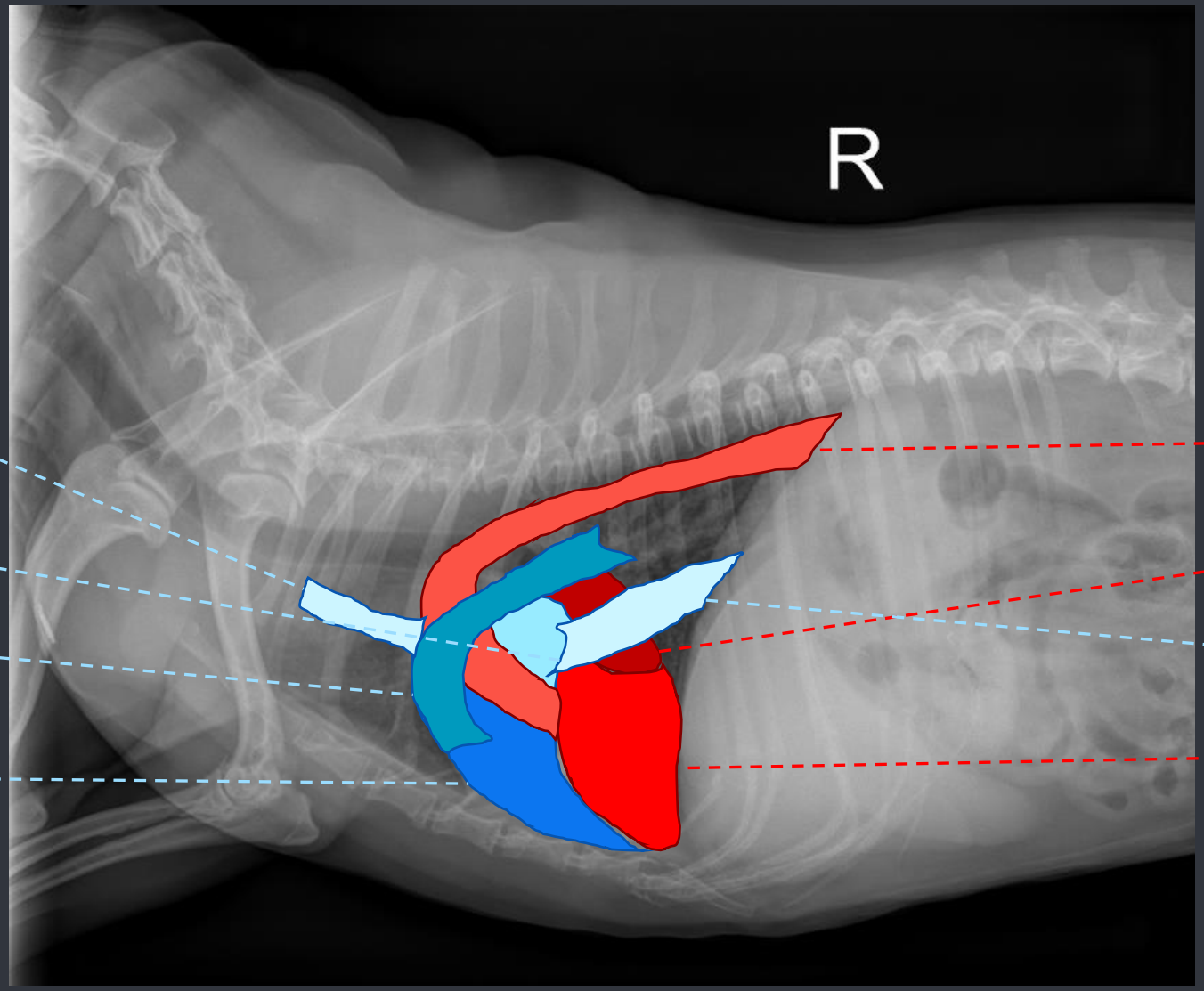
# Technique and Positioning



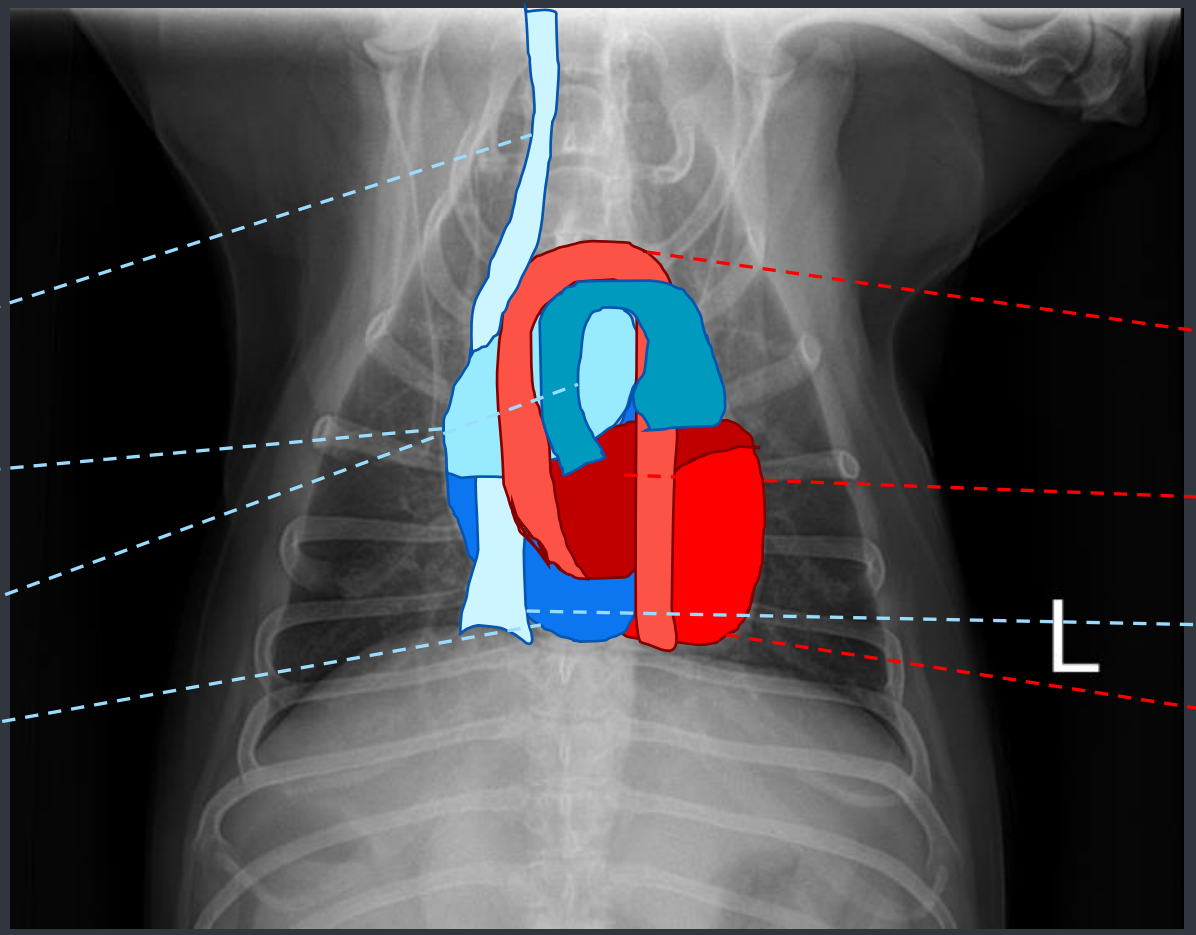
# Cardiac Silhouette and Great Vessels

## Right lateral view



# Cardiac Silhouette and Great Vessels

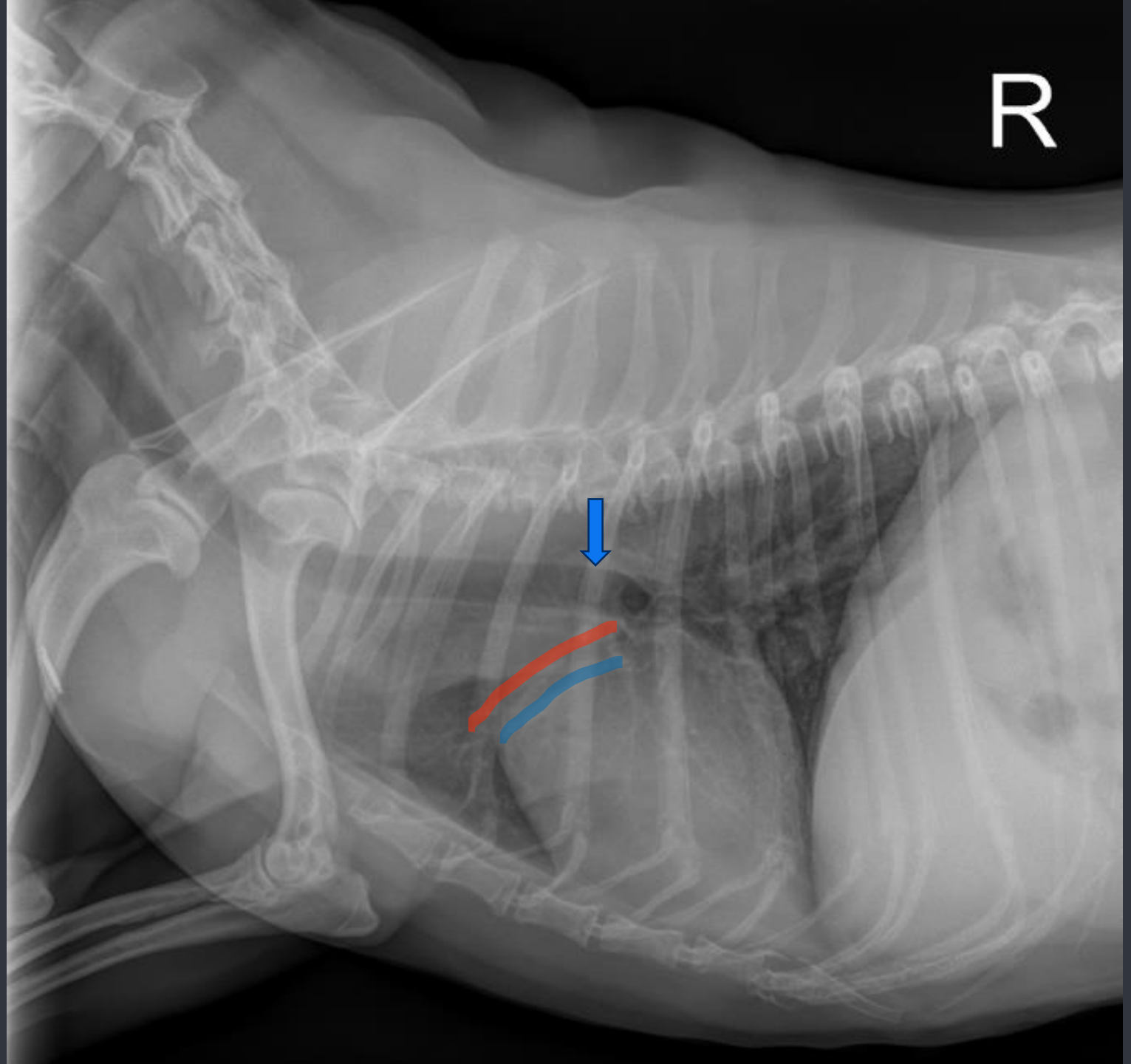
## Ventrodorsal view



# Pulmonary Vessels

## Right lateral view

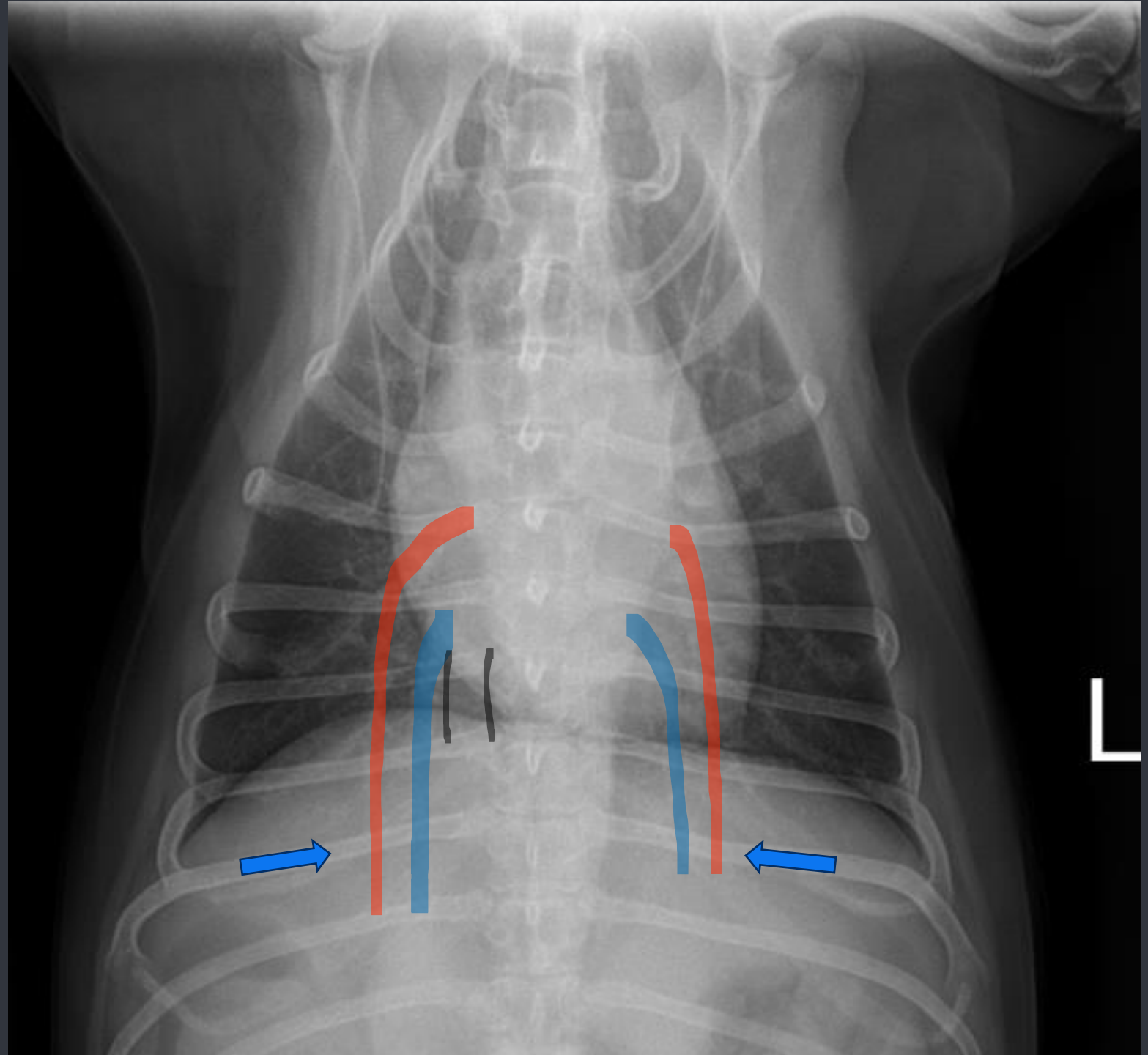
Veins are **ventral** and central



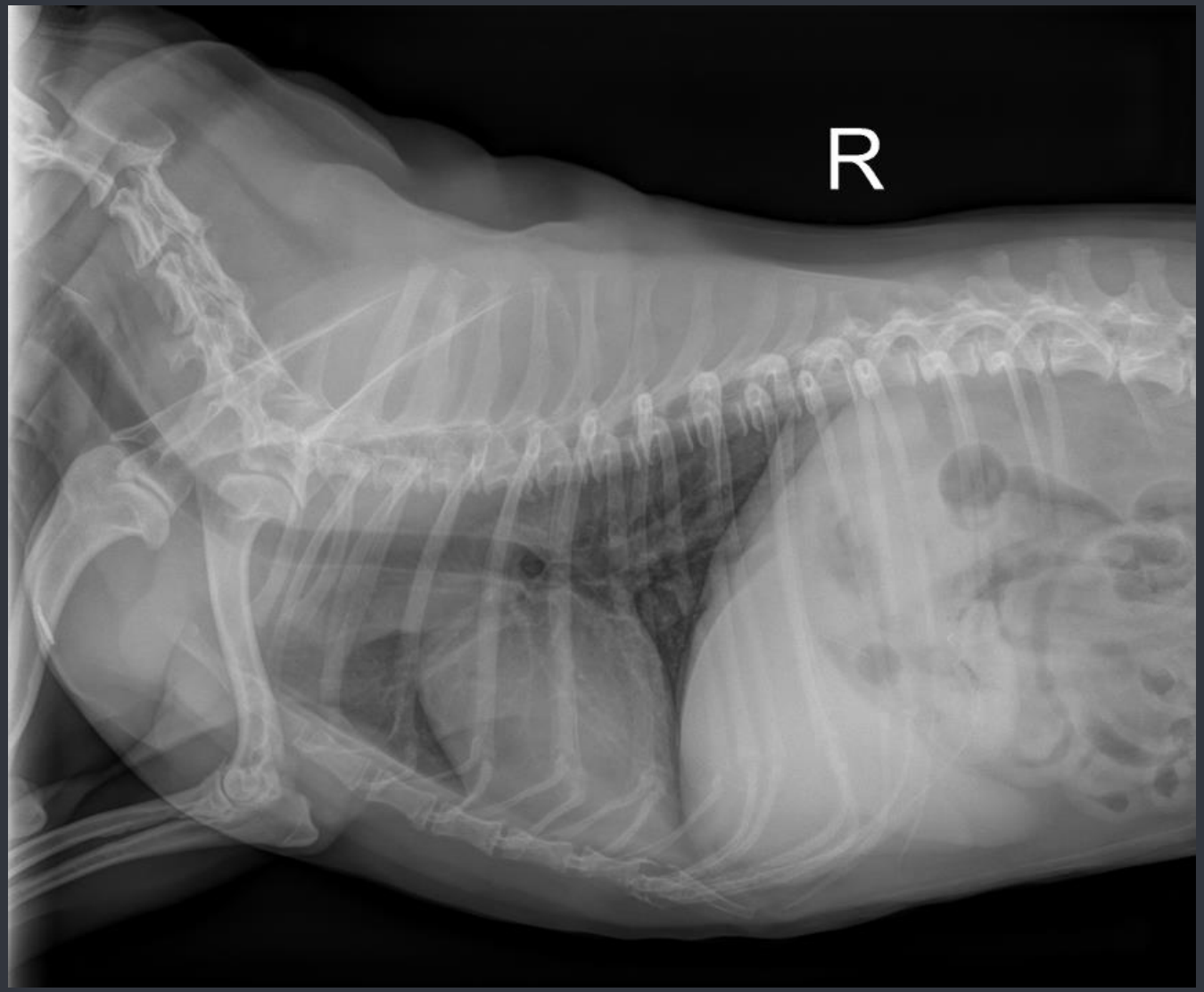
# Pulmonary Vessels

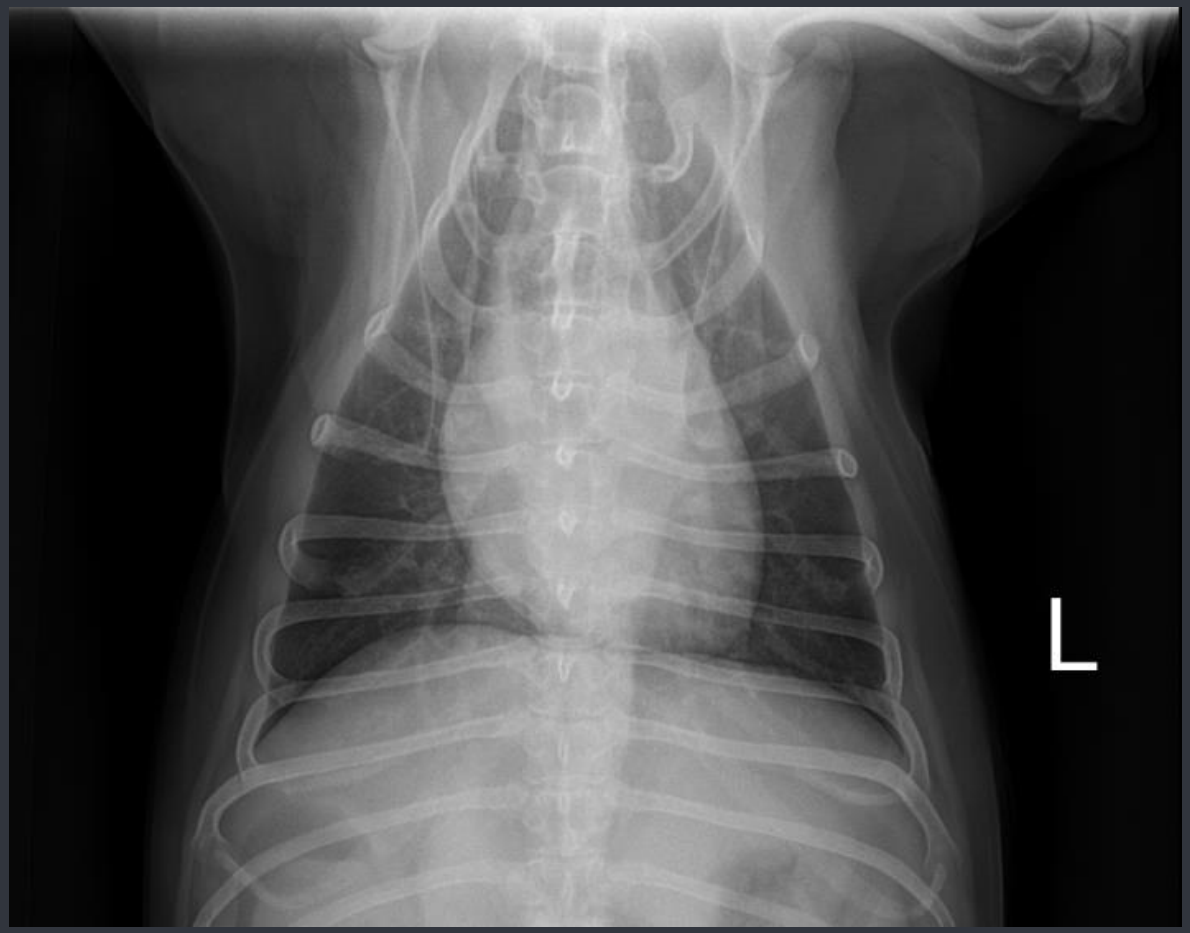
## Ventrodorsal view

Veins are ventral and **central**



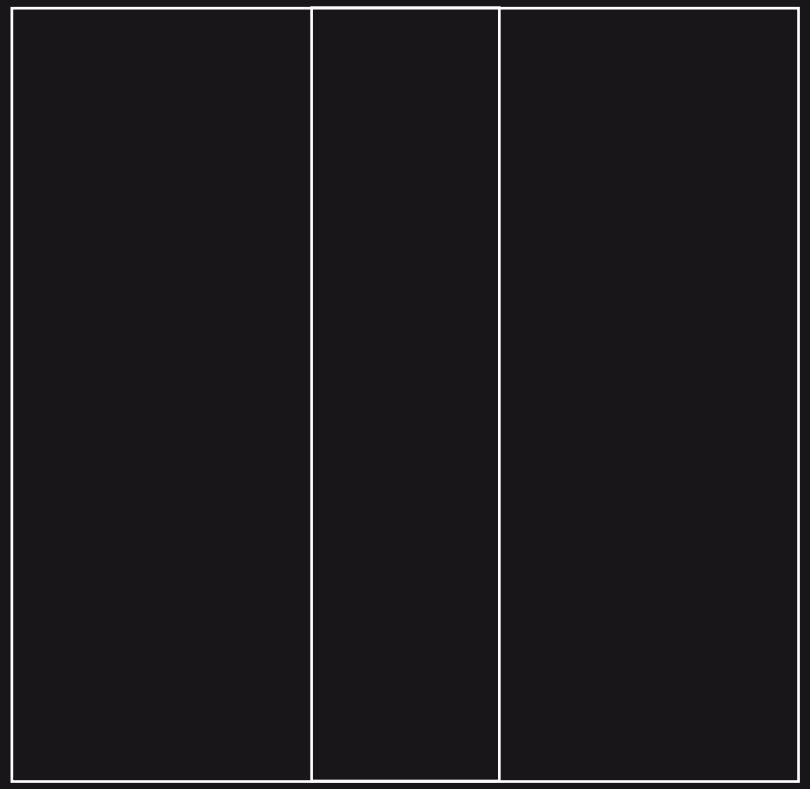
# Pulmonary Parenchyma



# Super Basic and Overly Simplified Explanation of Pulmonary Patterns

☺

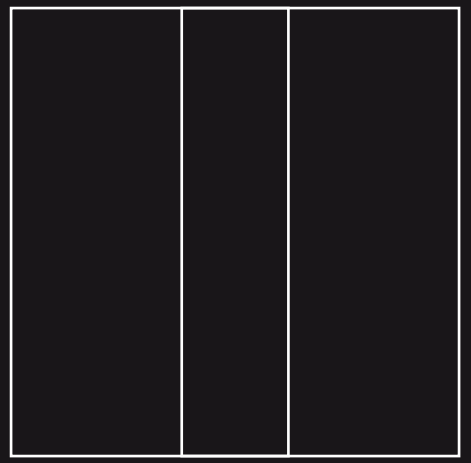


Normal

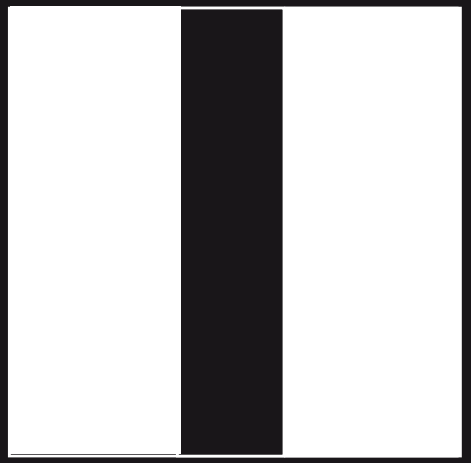
# Super Basic and Overly Simplified Explanation of Pulmonary Patterns

☺

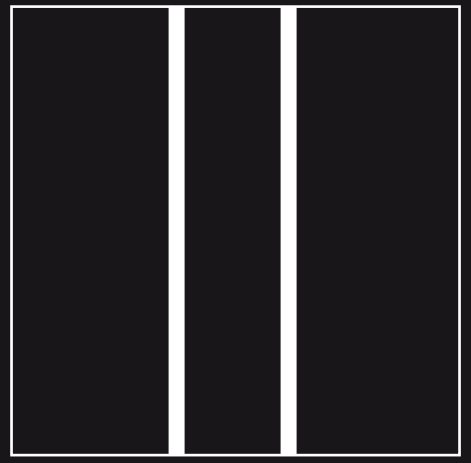
Normal



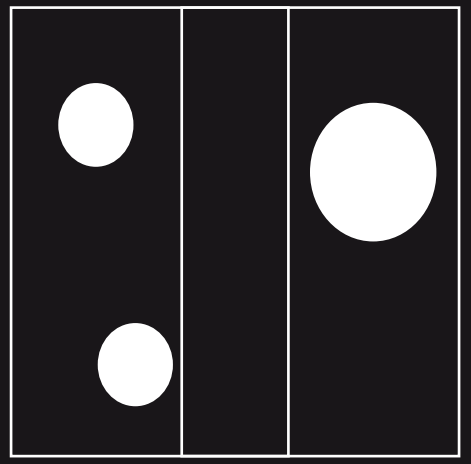
Alveolar



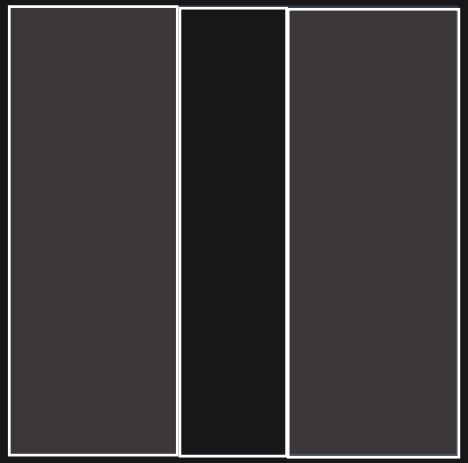
Bronchial



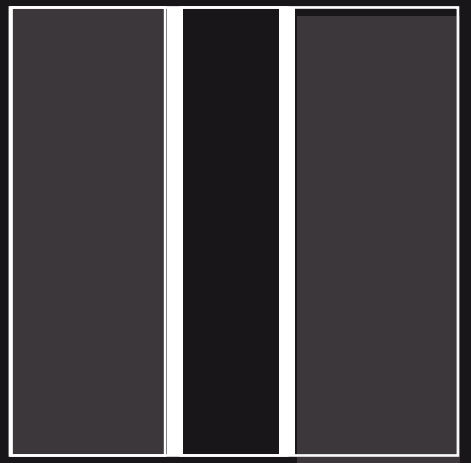
Structured Interstitial/Nodular



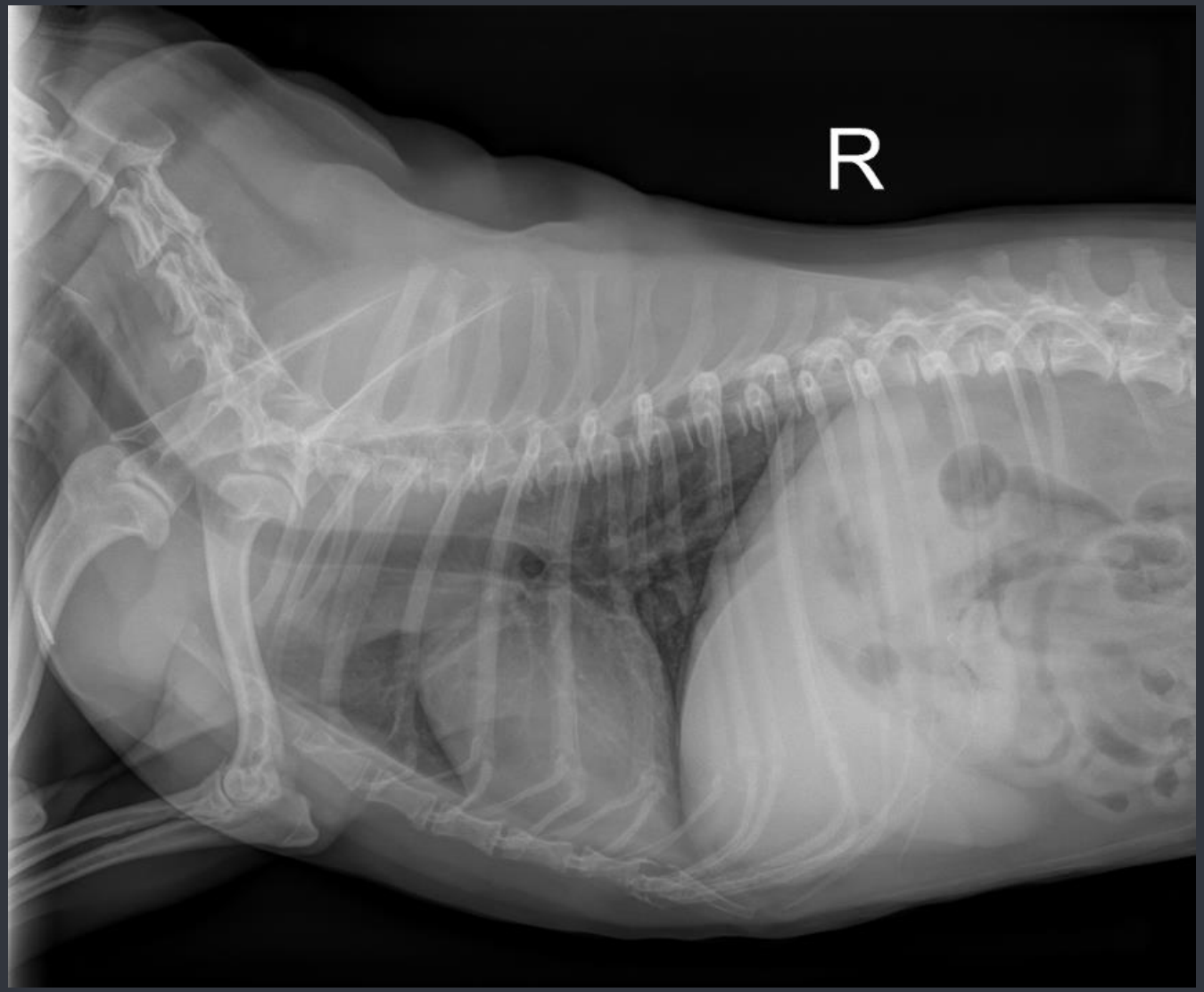
Unstructured Interstitial

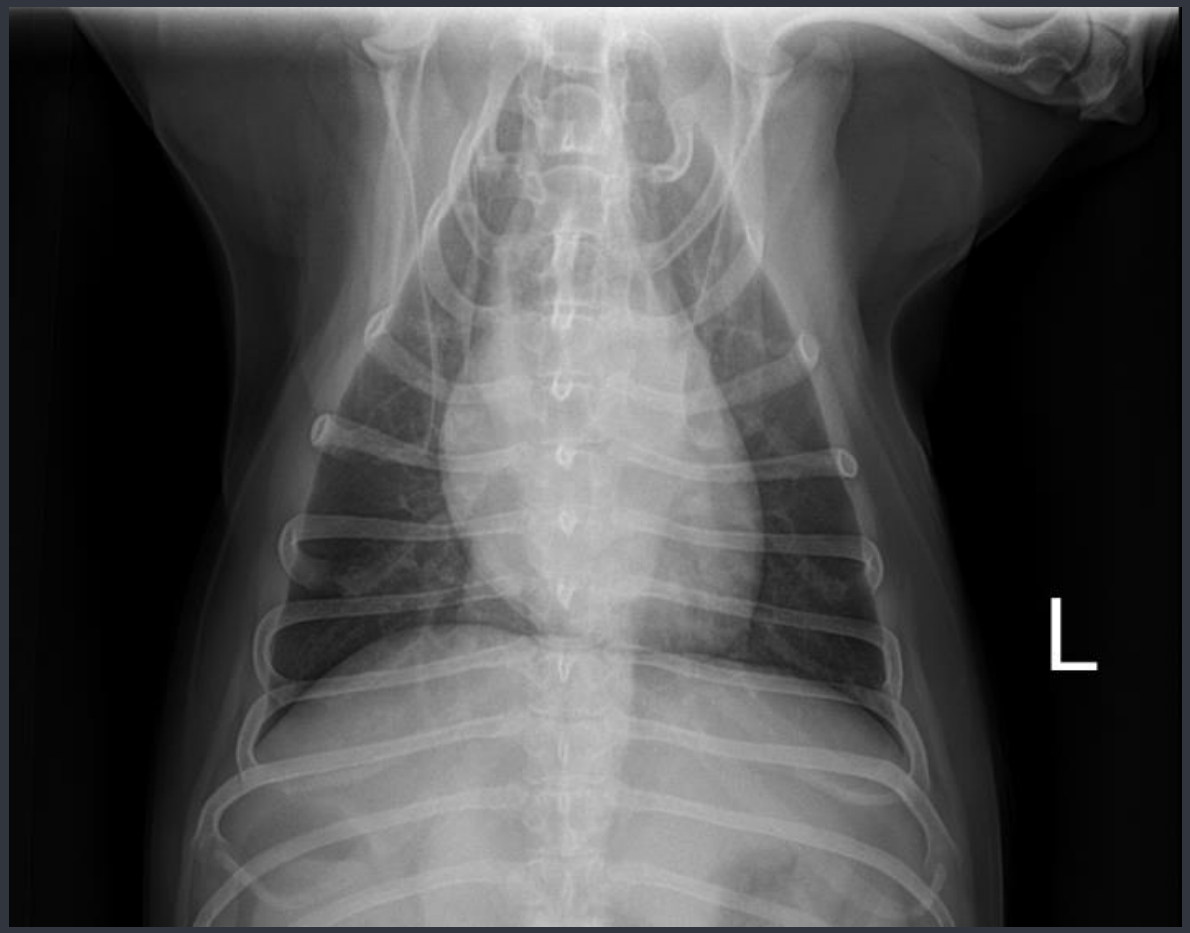


Bronchointerstitial

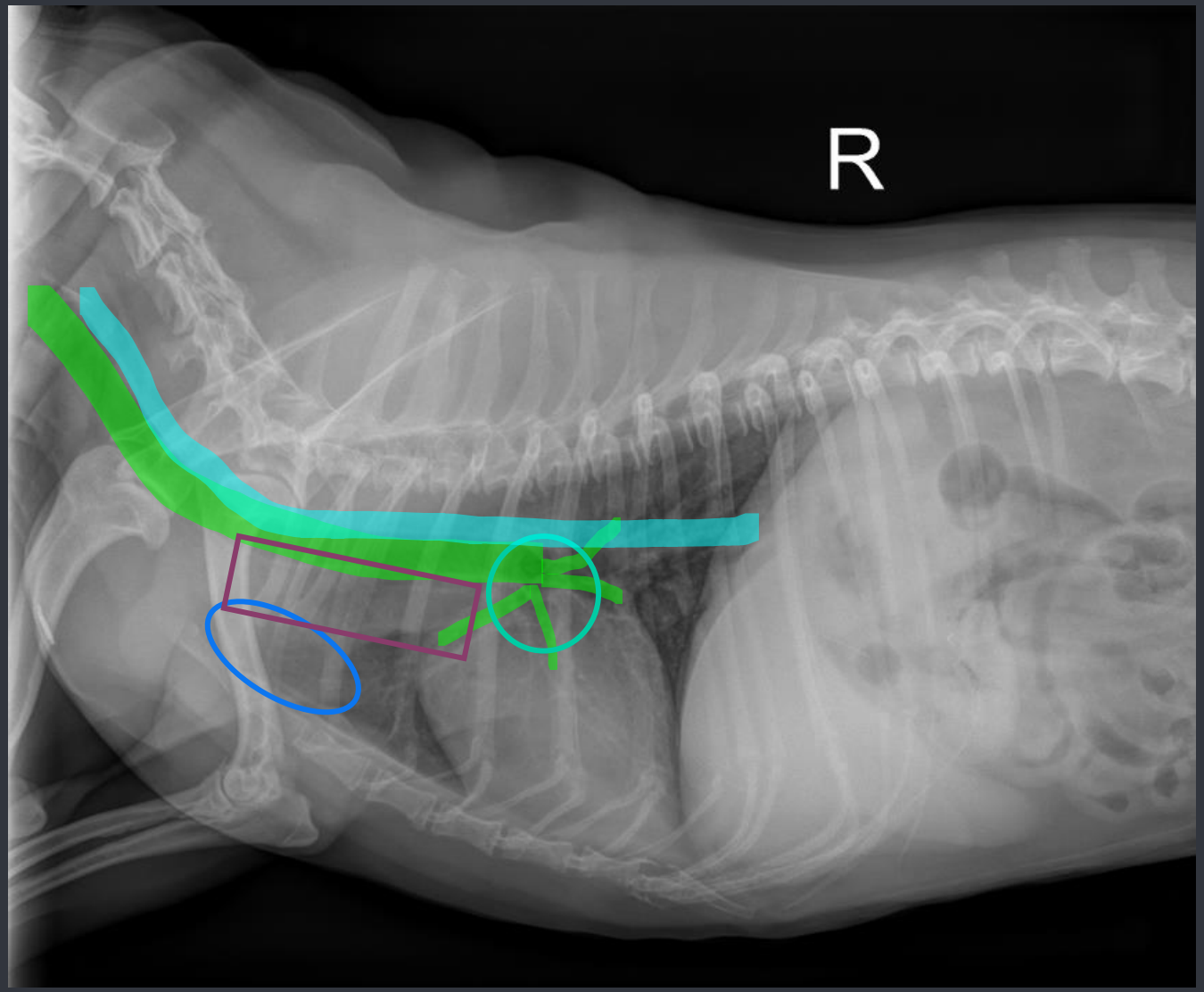


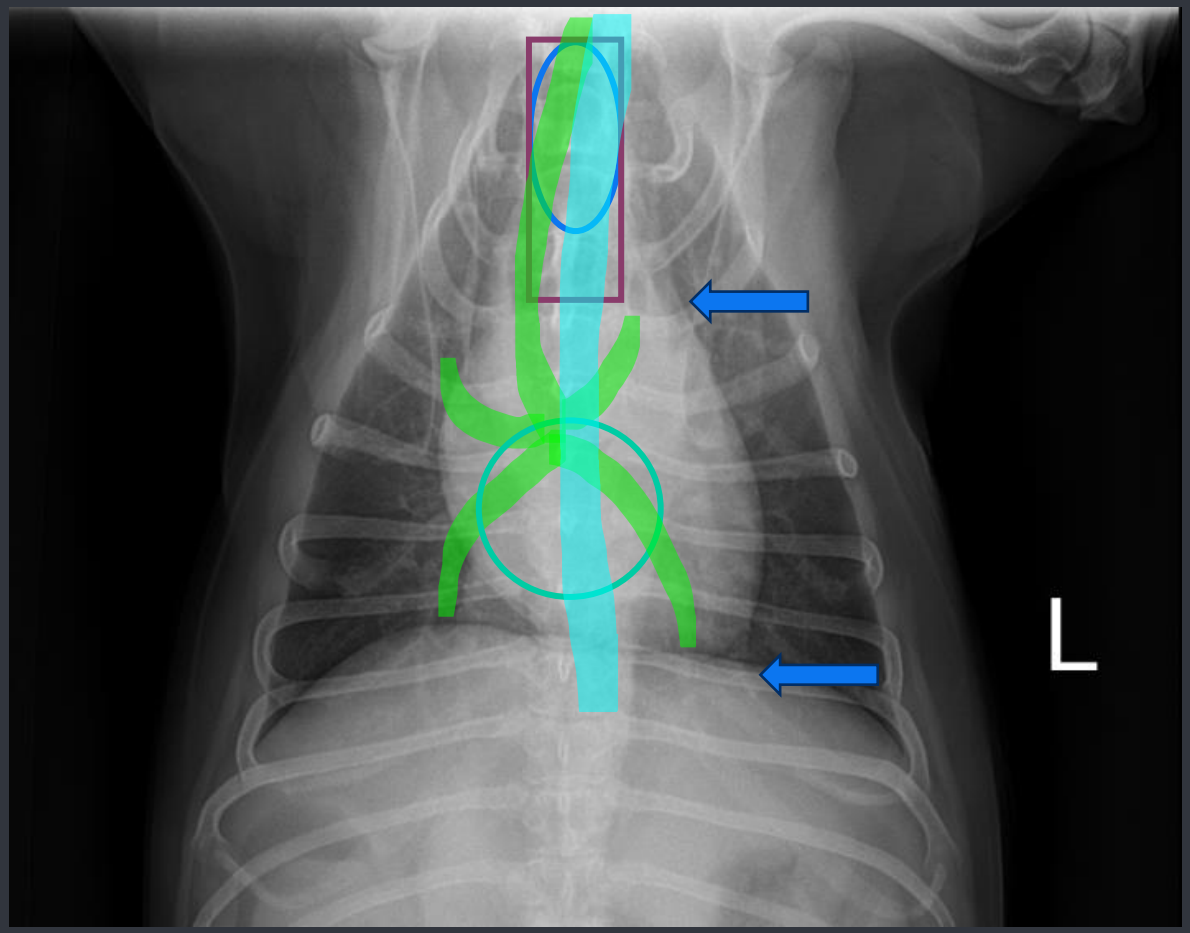
# Pulmonary Parenchyma



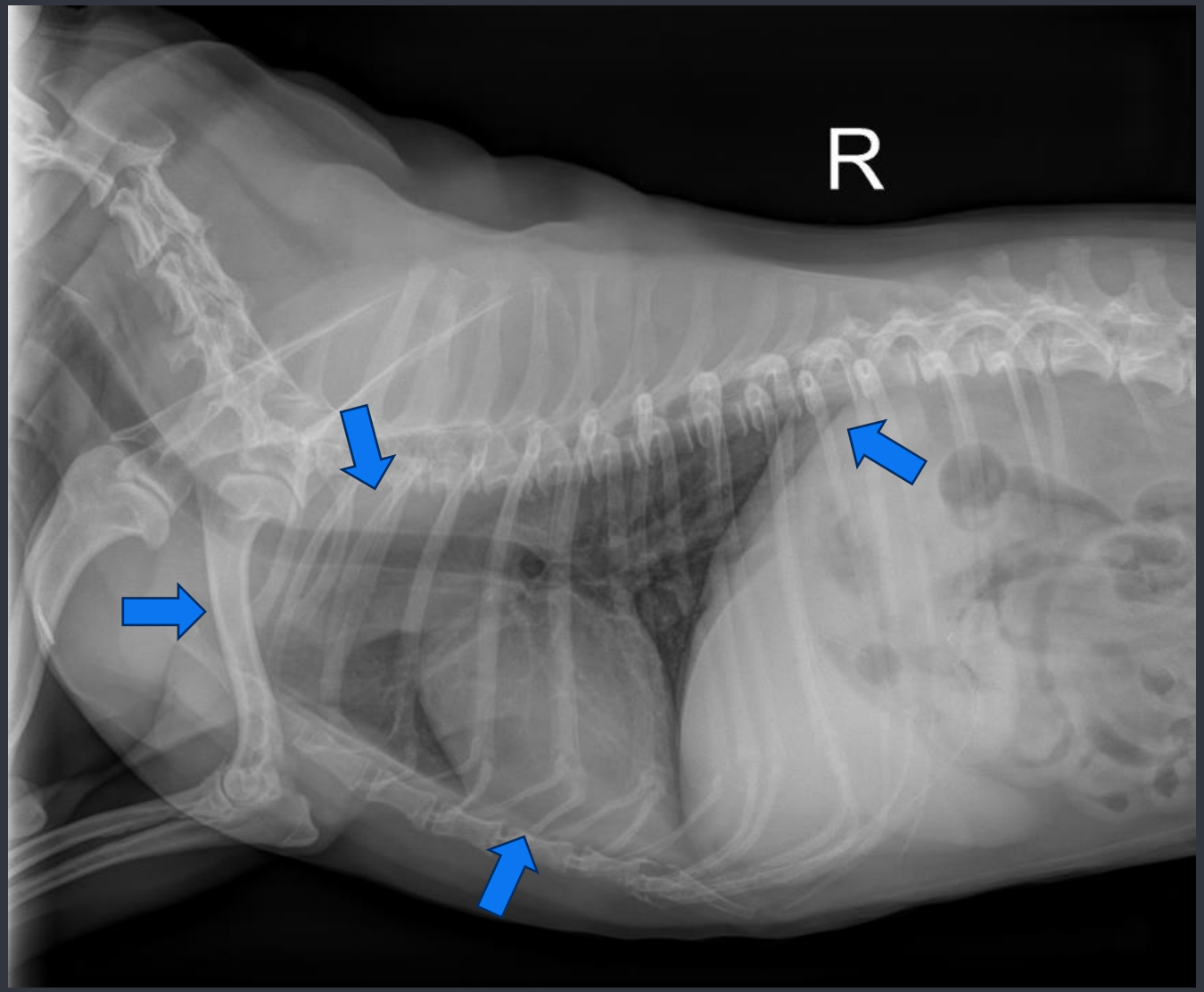



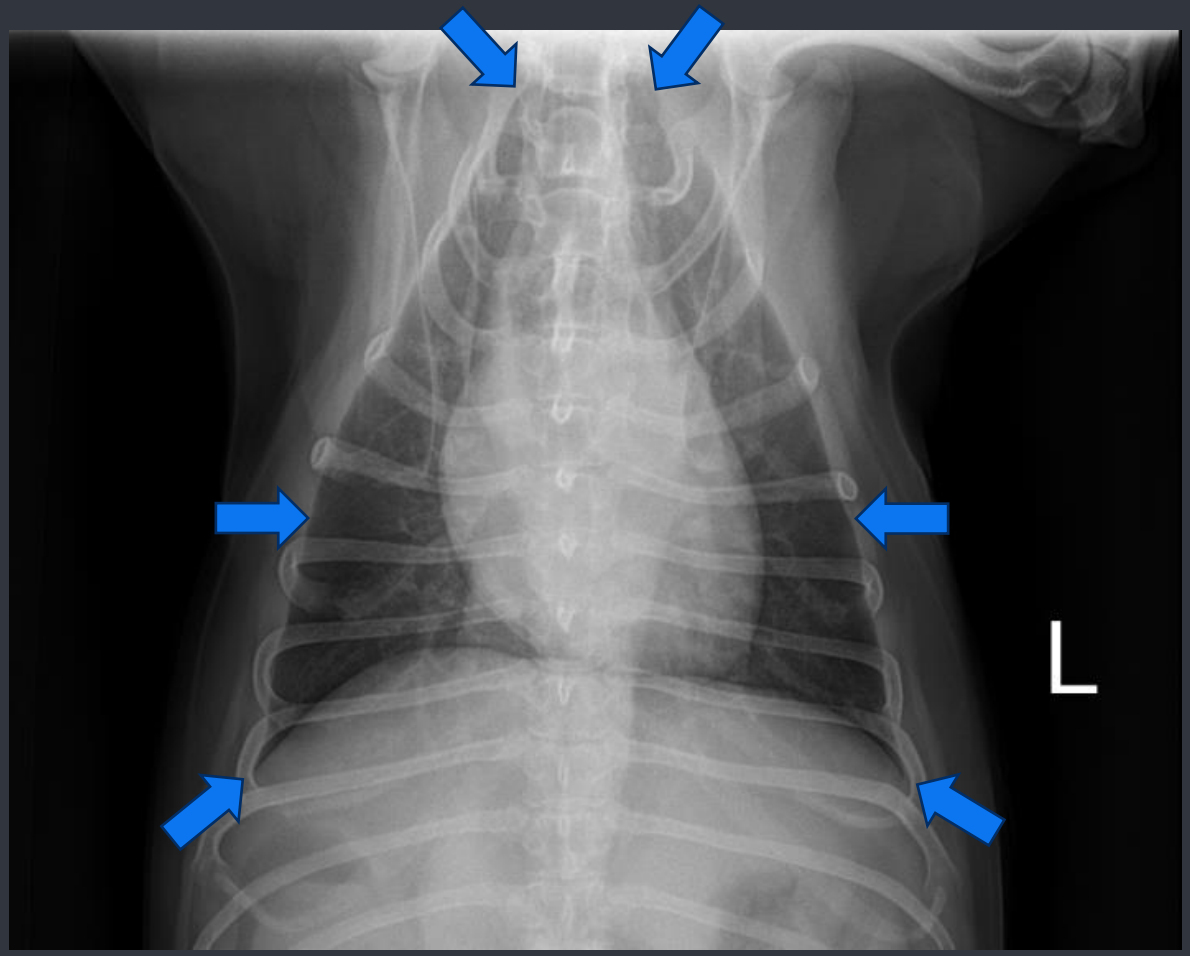
# Mediastinum



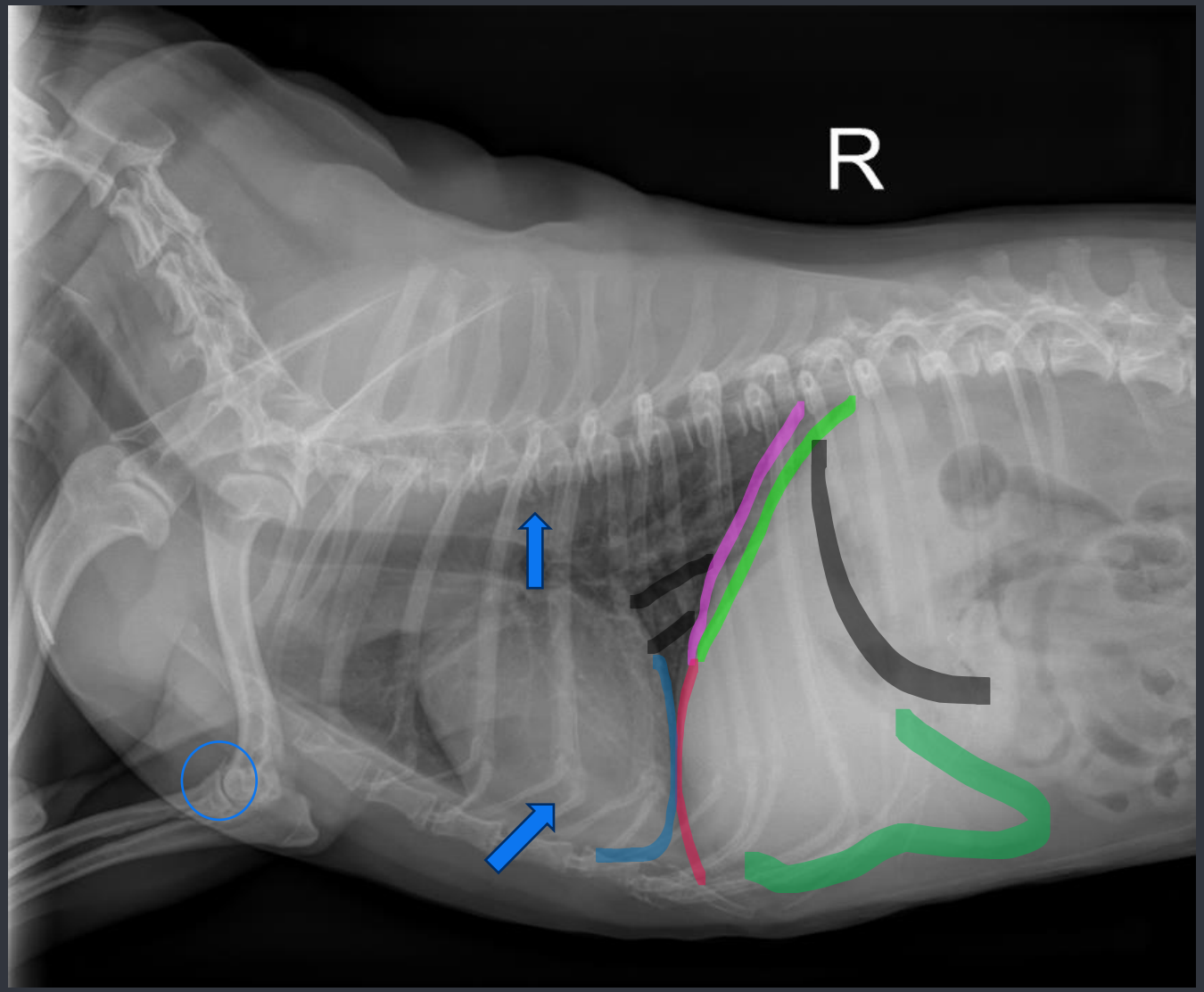



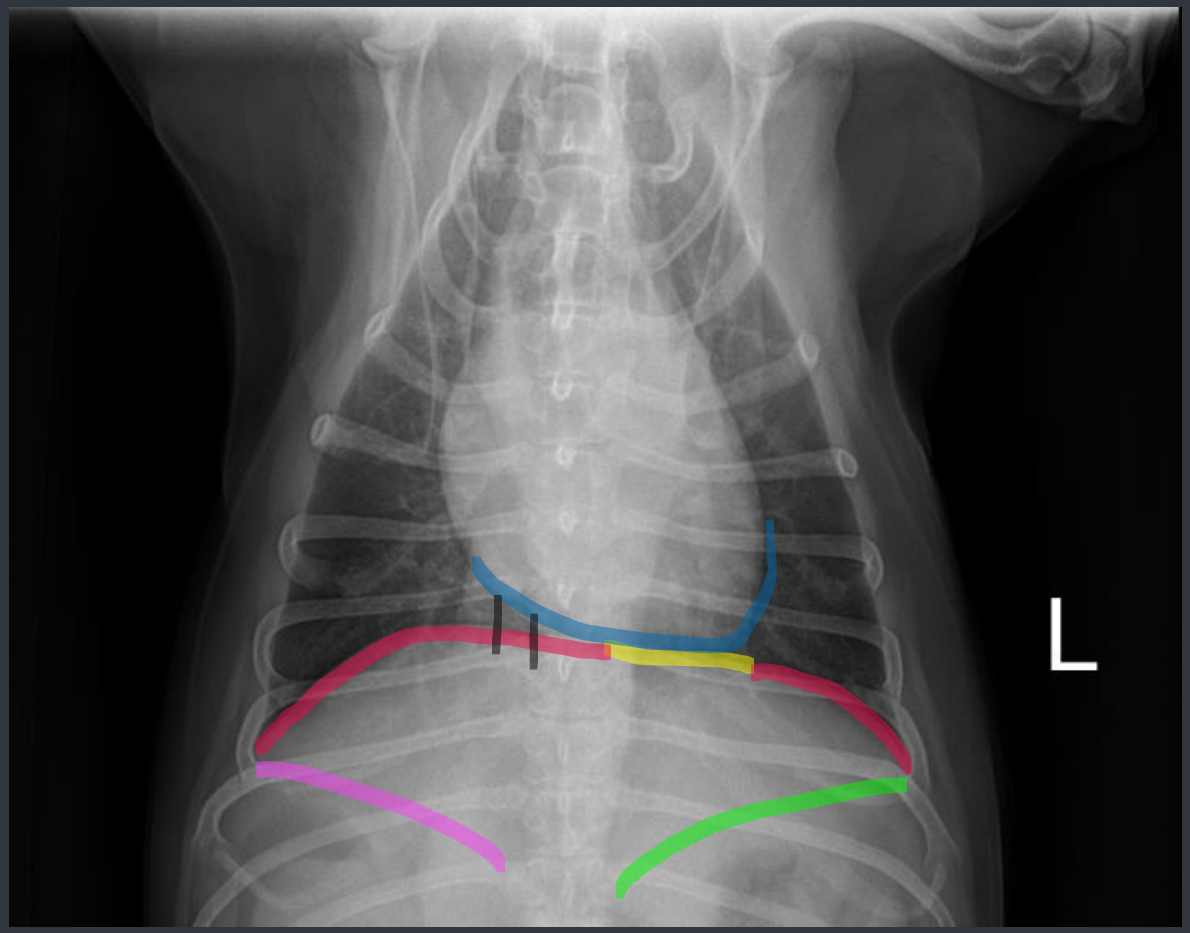
# Pleural Space



# Thoracic Borders



# Systematic approach and Interpretation

- After thorough review of each image
  - Summarize radiographic findings
  - Consider patient signalment and history, including physical exam findings
  - Rank differentials and determine next steps

# Case Examples

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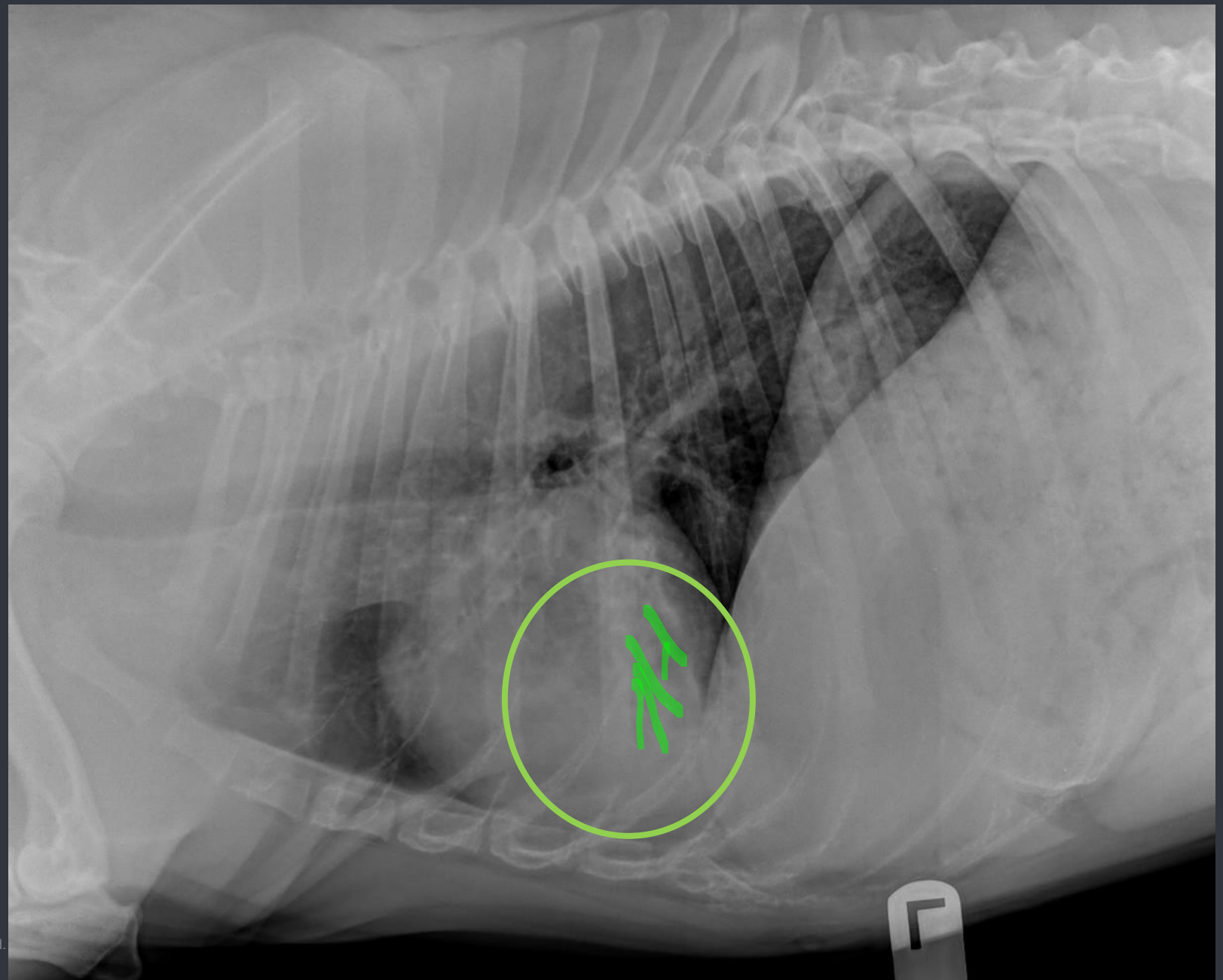
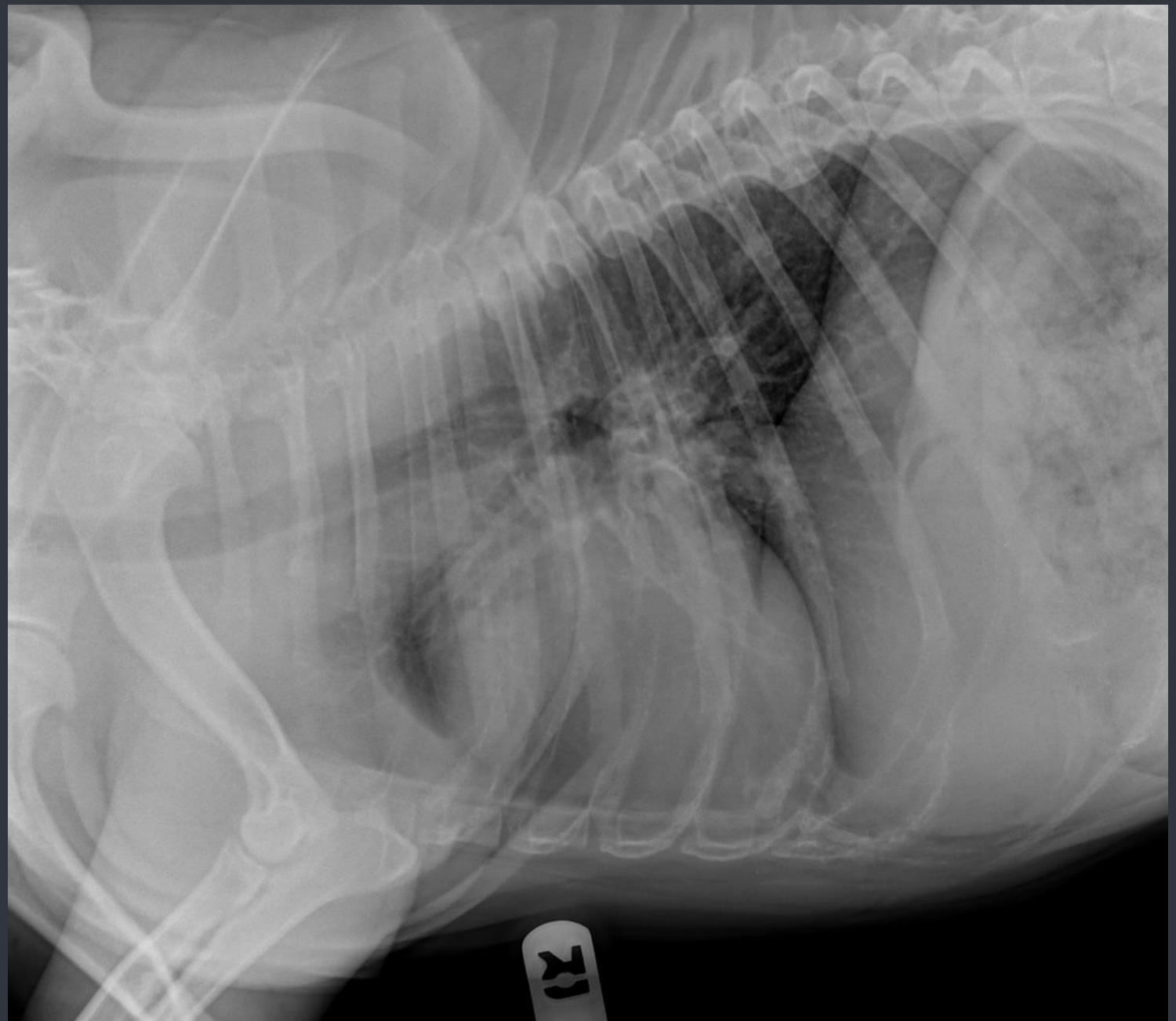
# Join at slido.com
# #2878620

ⓘ Start presenting to display the joining instructions on this slide.

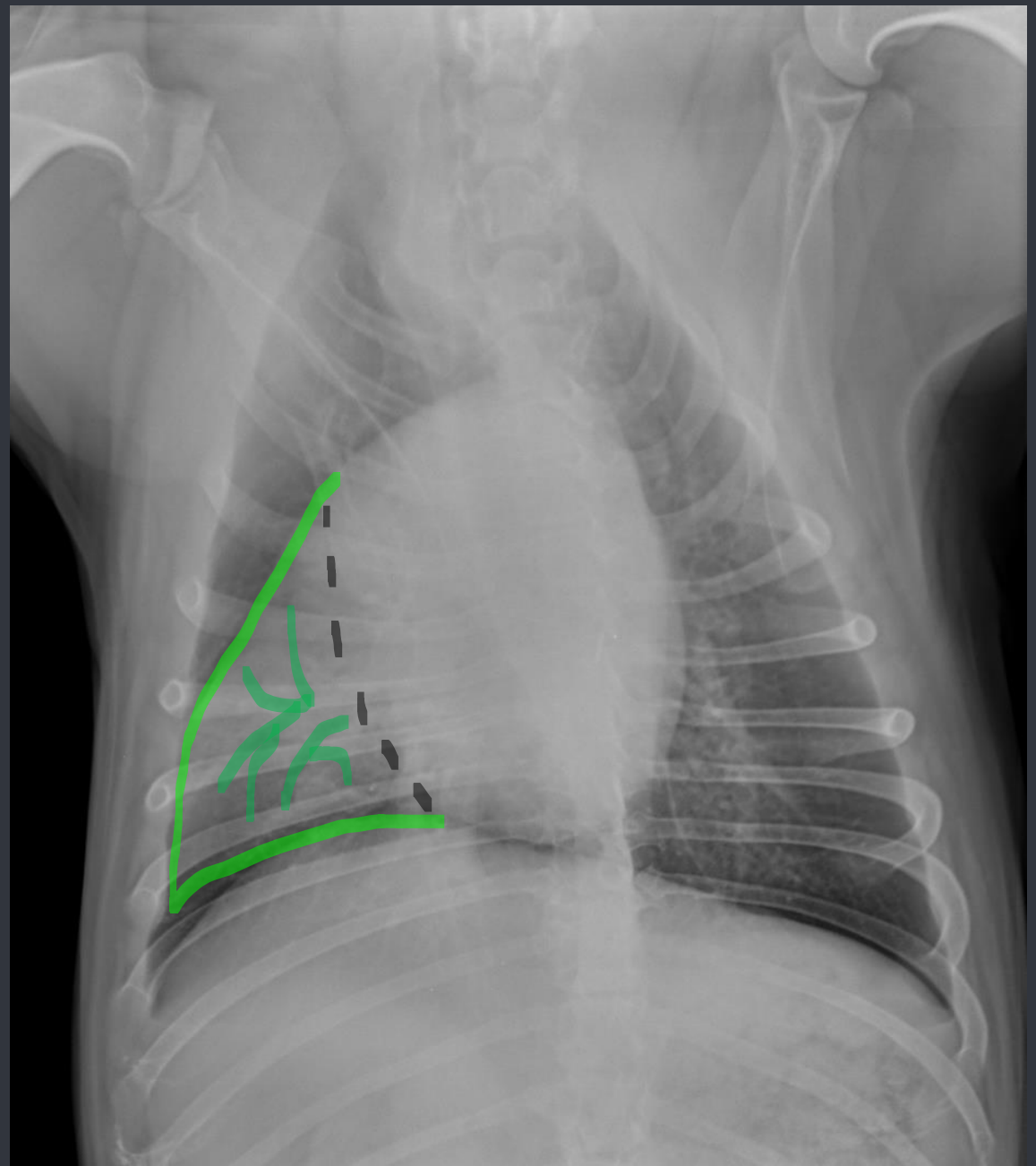
# 1 year old neutered male English Bulldog; Coughing



# 1 year old neutered male English Bulldog; Coughing



# 1 year old neutered male English Bulldog; Coughing



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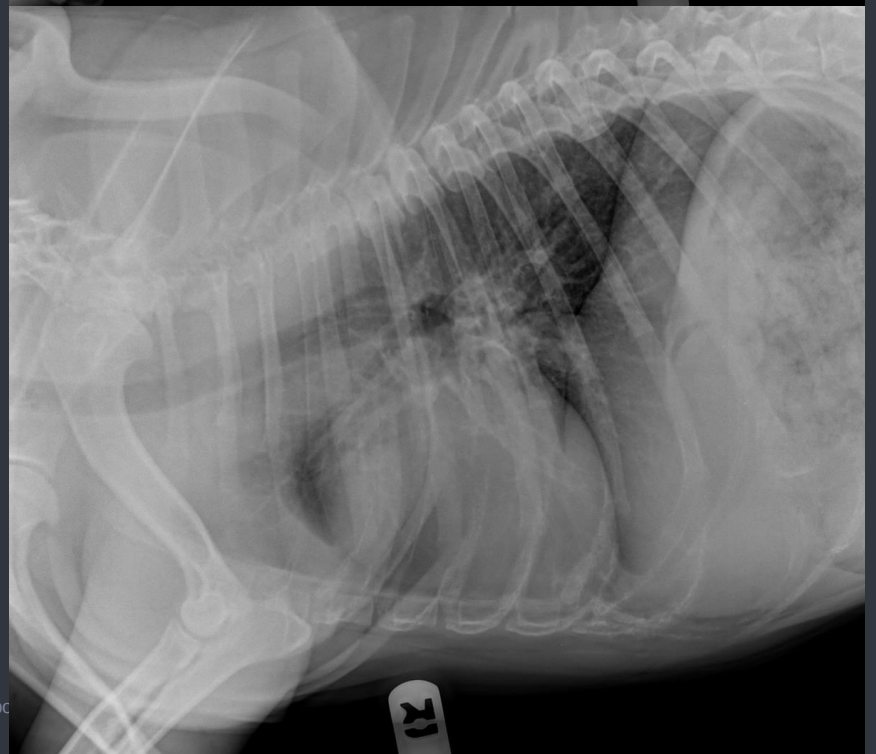
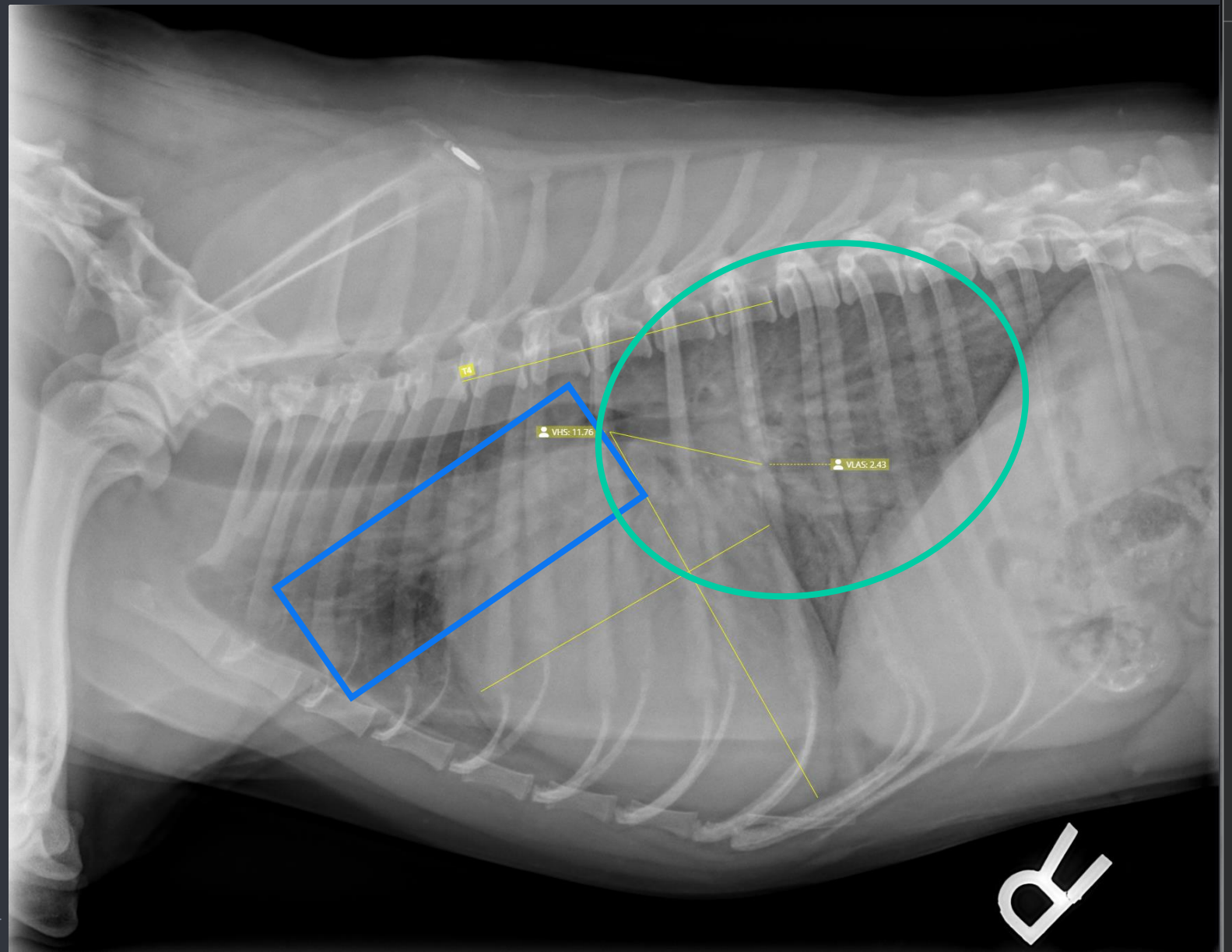
**What is your top differential for this coughing bulldog with ventral alveolar pattern in the right middle lung lobe?**

ⓘ Start presenting to display the poll results on this slide.

# Pneumonia



# 6 year old spayed female Miniature Poodle; Respiratory distress




Hide measurement lines

**VHS: 11.76**

11.8
10.4
9.1
May '19
Jun '19

Reference Range
Canine: 8.7 - 10.7
Poodle: 9.1 - 11.14

**VLAS: 2.43**

2.4
0.0
May '19
Jun '19

A score of 2.3 vertebrae or higher suggests the presence of left atrial enlargement.

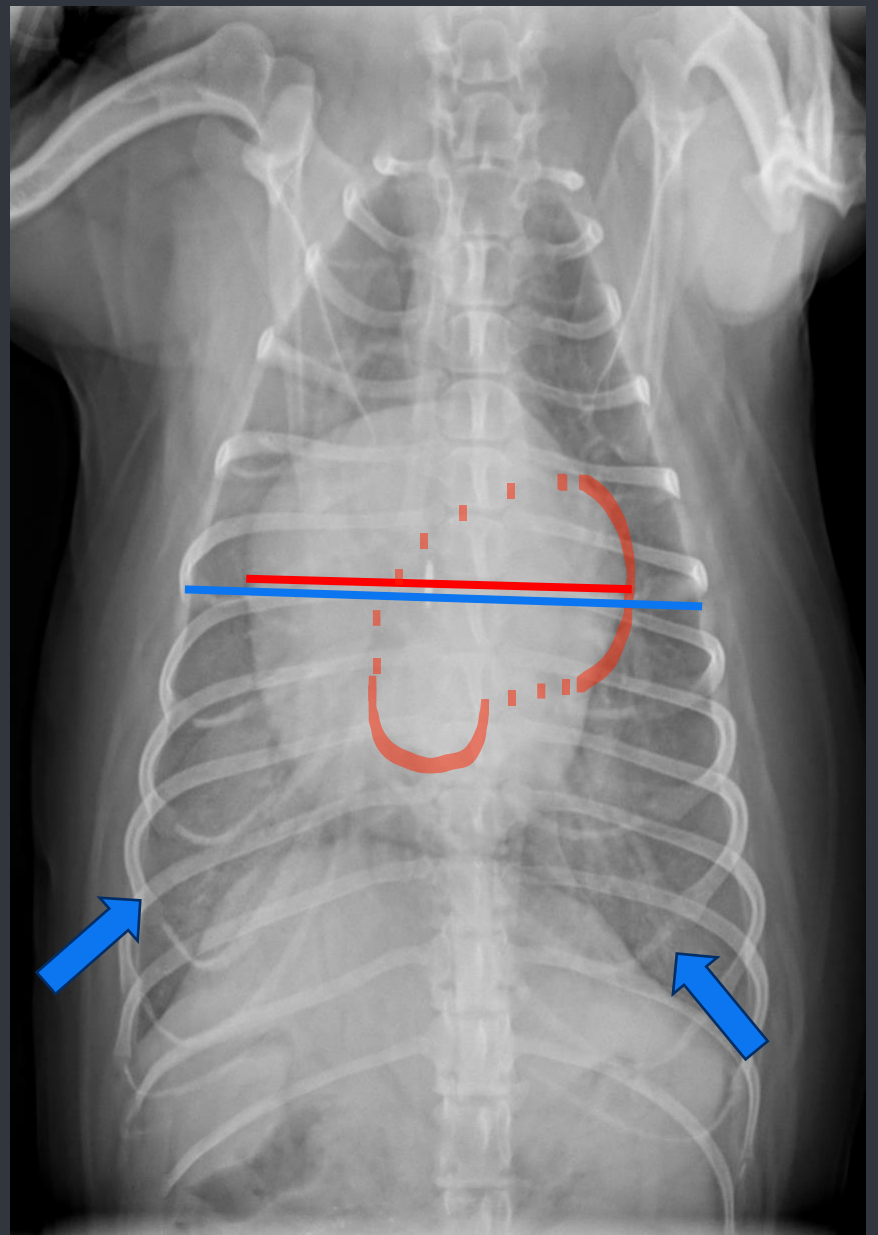
Why VLAS

Related Results

**NT-ProBNP: --**

If CardioPet proBNP Test results are available, they will appear here.

# 6 year old spayed female Miniature Poodle; Respiratory distress



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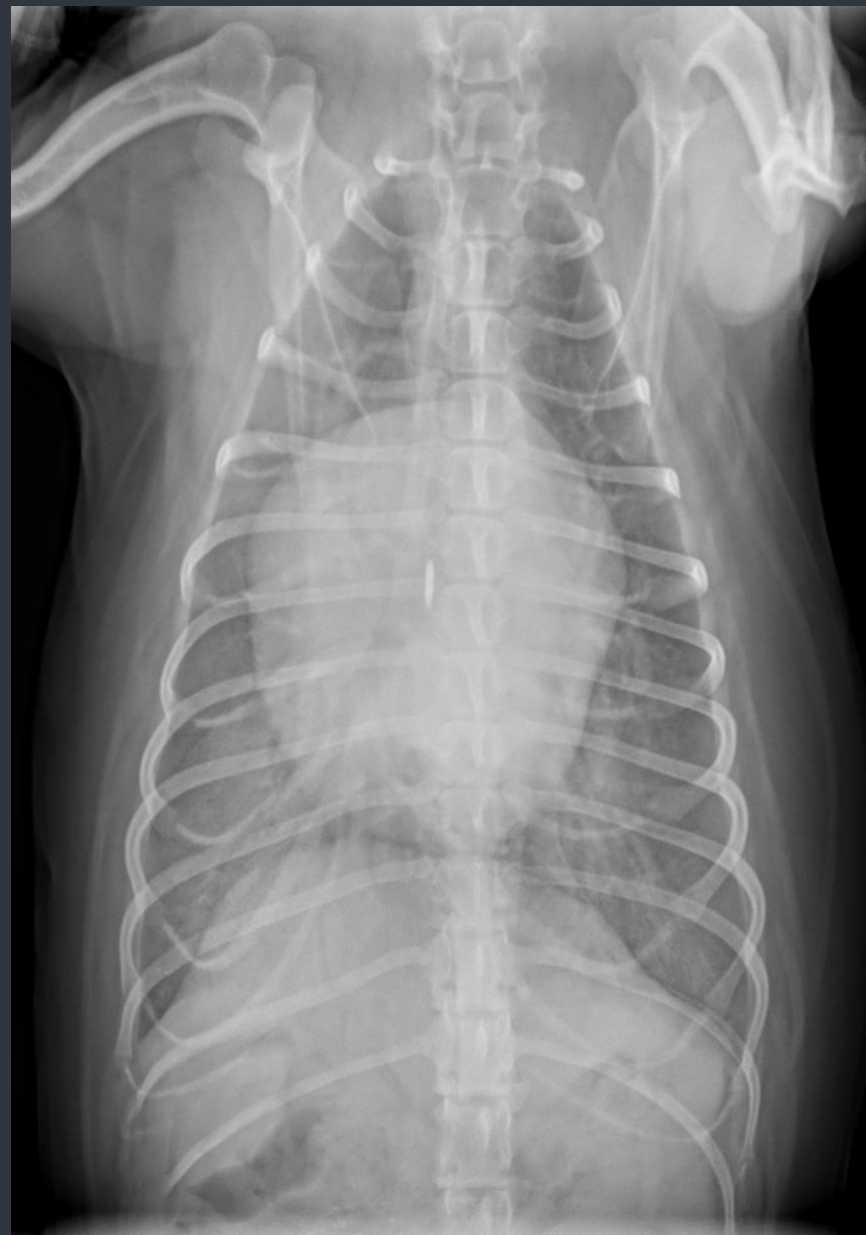
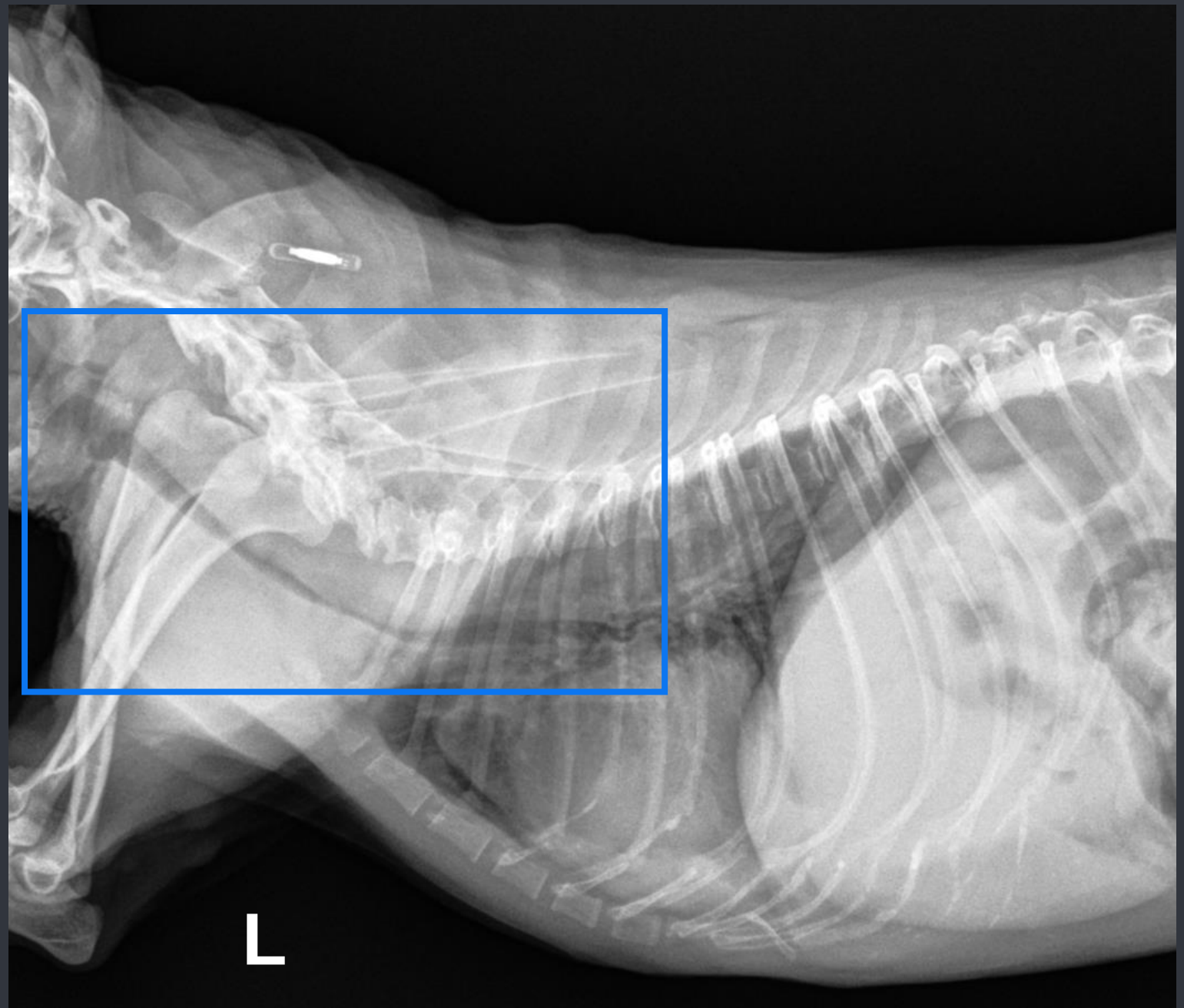
**What is your top differential for this mini poodle in respiratory distress with cardiomegaly, left atrial enlargement, left auricular enlargement, cranial lobar vascular enlargement, and caudodorsal unstructured interstitial to alveolar pattern?**

ⓘ Start presenting to display the poll results on this slide.

# Left Sided Congestive Heart Failure



# 14 year old spayed female Pomeranian; Honking cough



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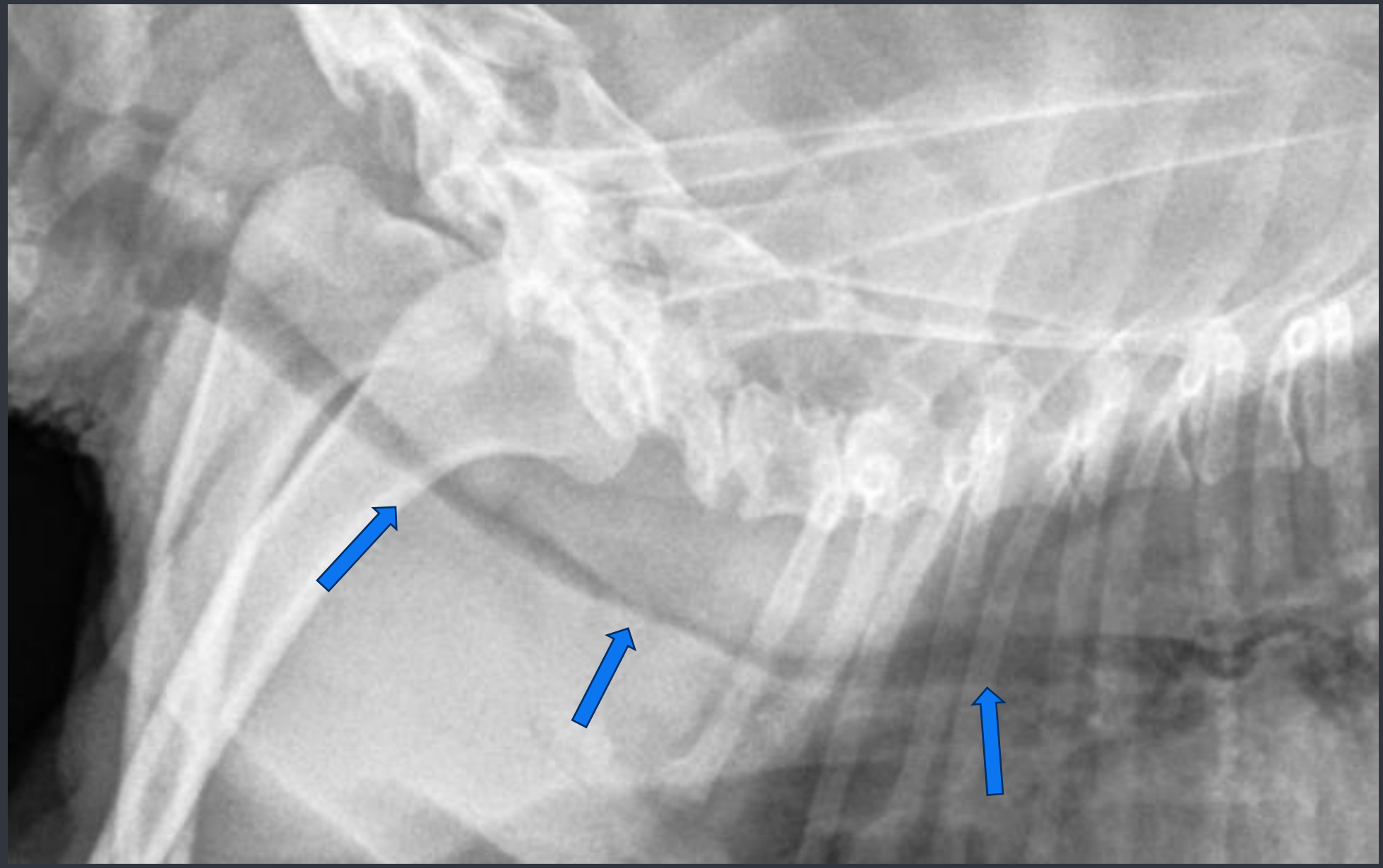

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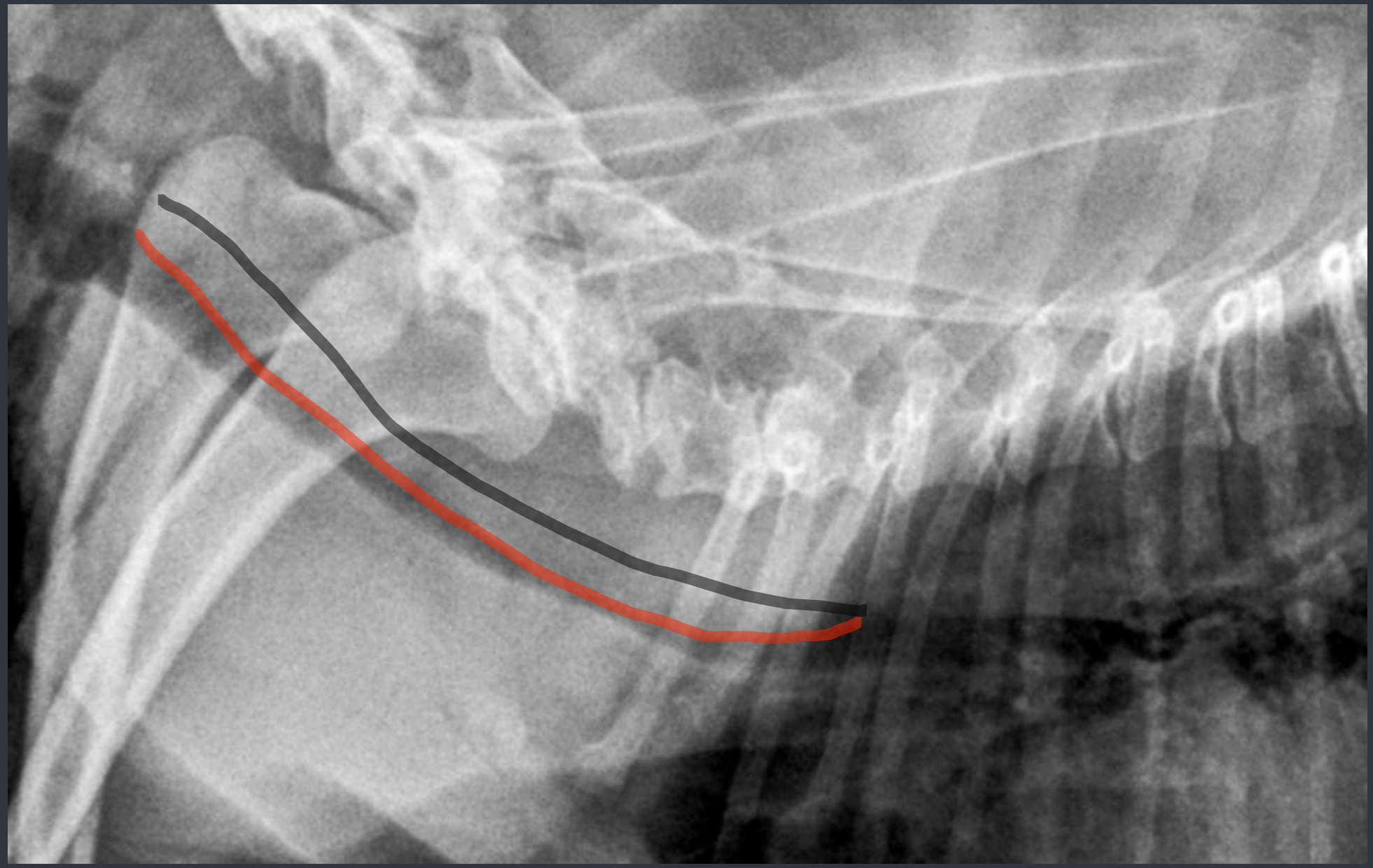

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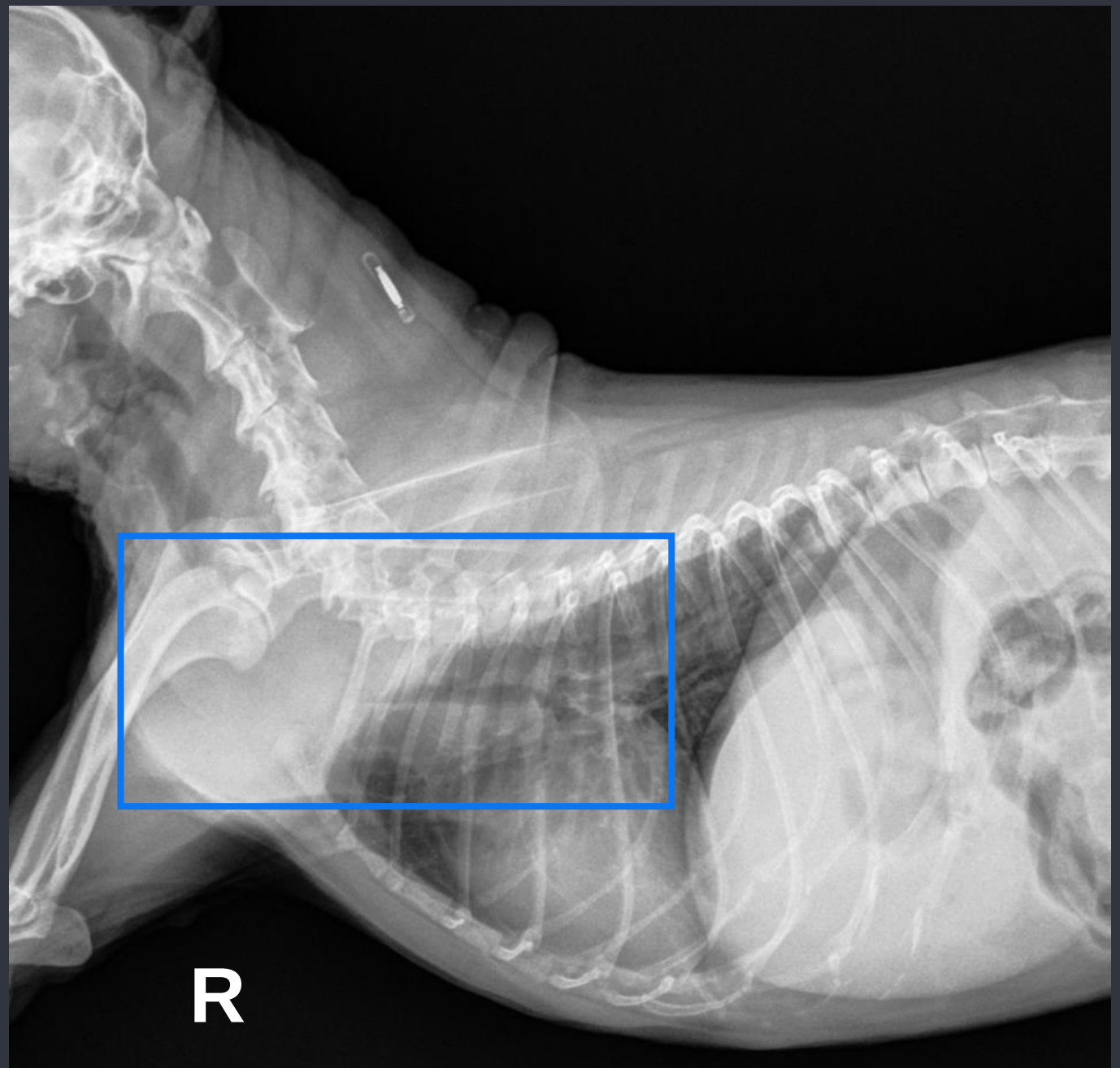

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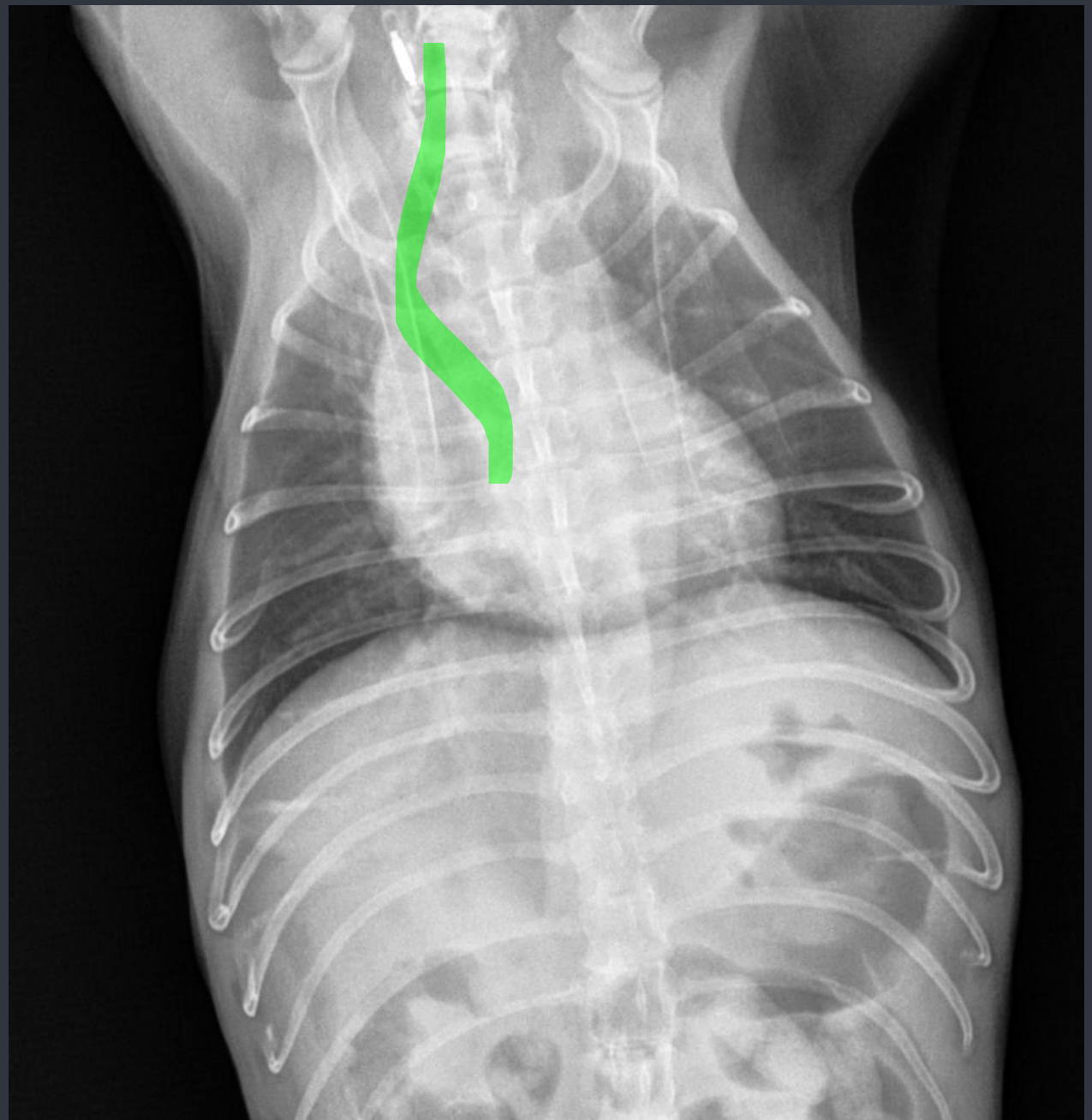

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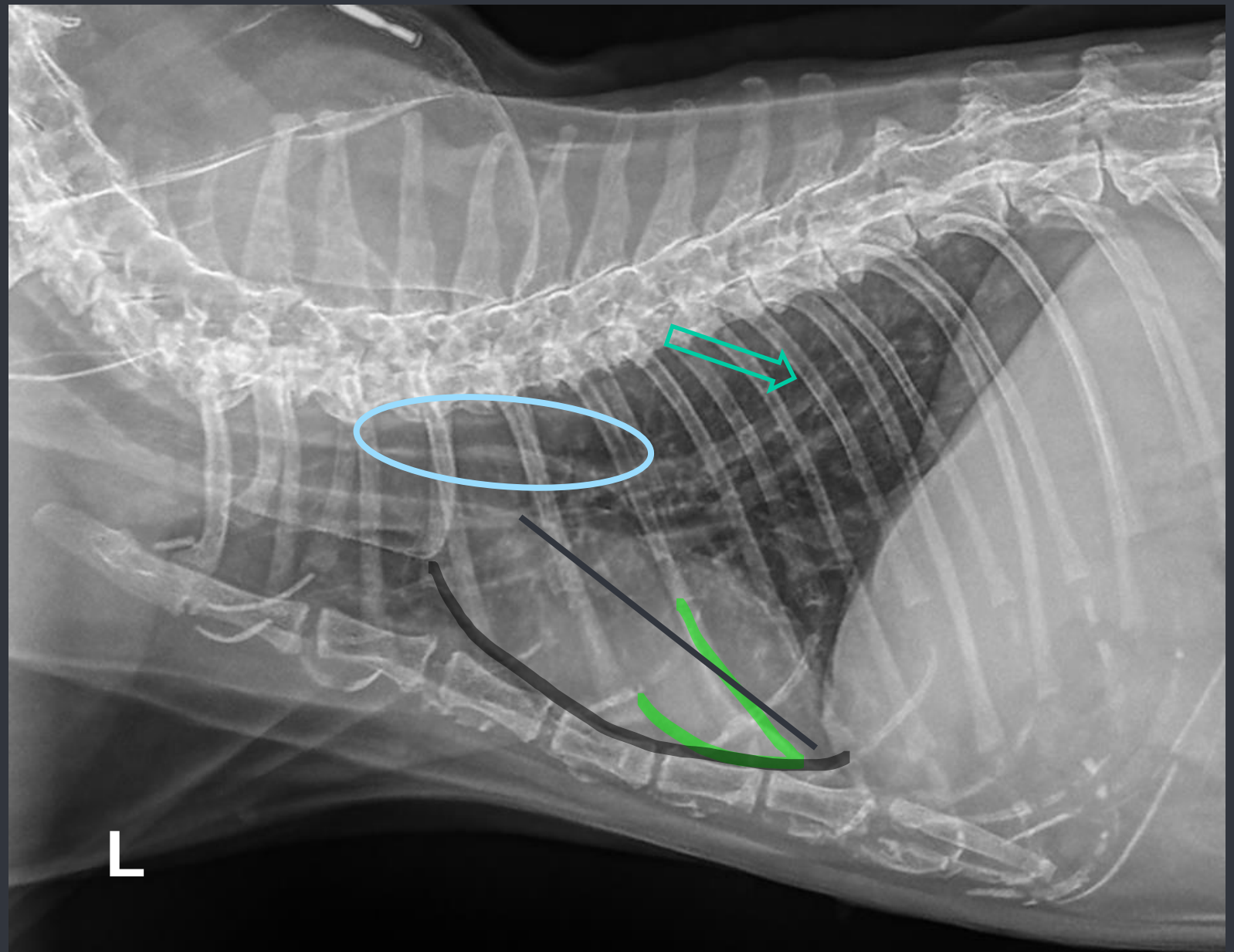
**What is your top differential for this coughing Pomeranian with dynamic tracheal narrowing and a redundant tracheal membrane?**

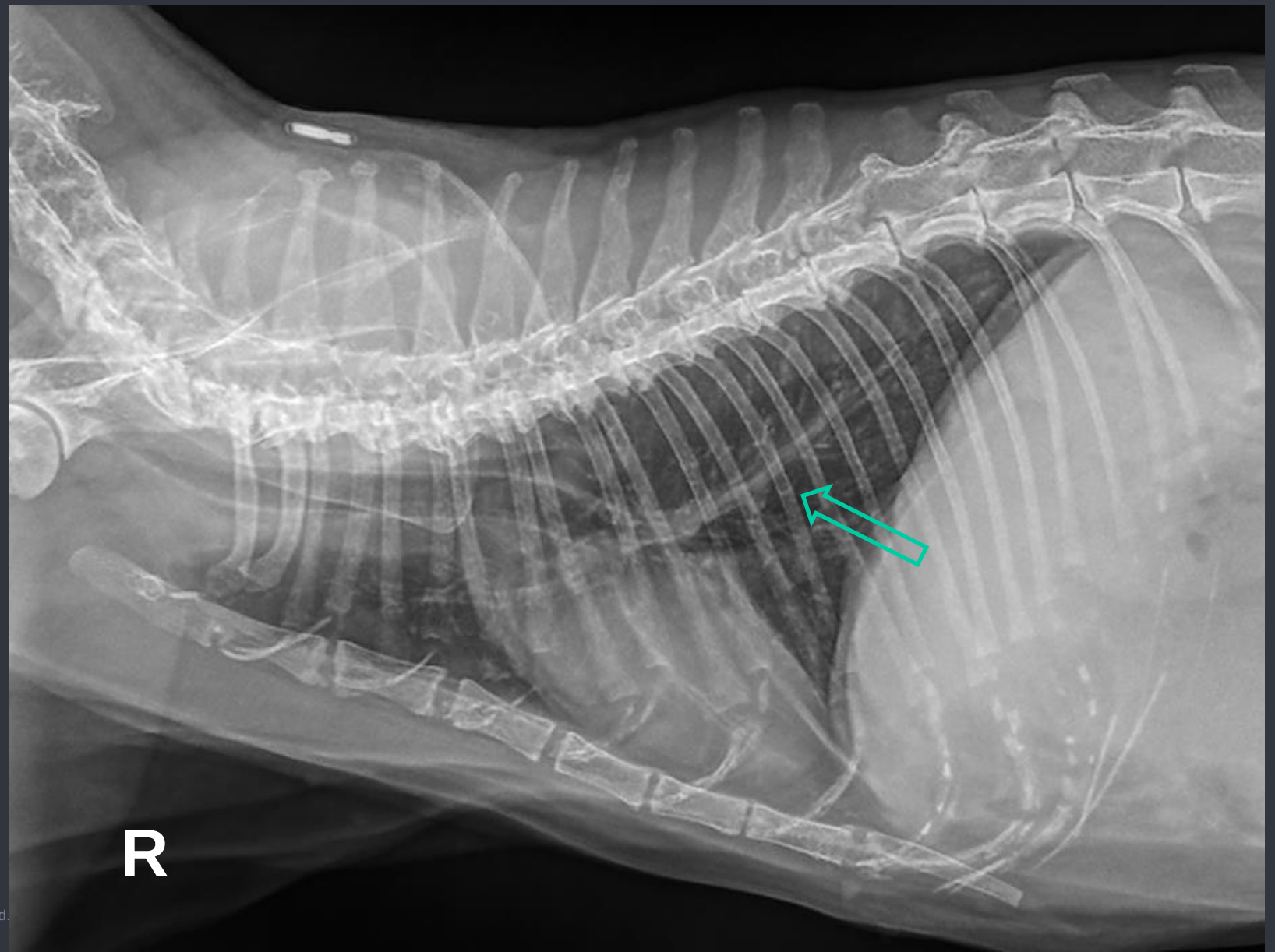
ⓘ Start presenting to display the poll results on this slide.

# Tracheal Collapse

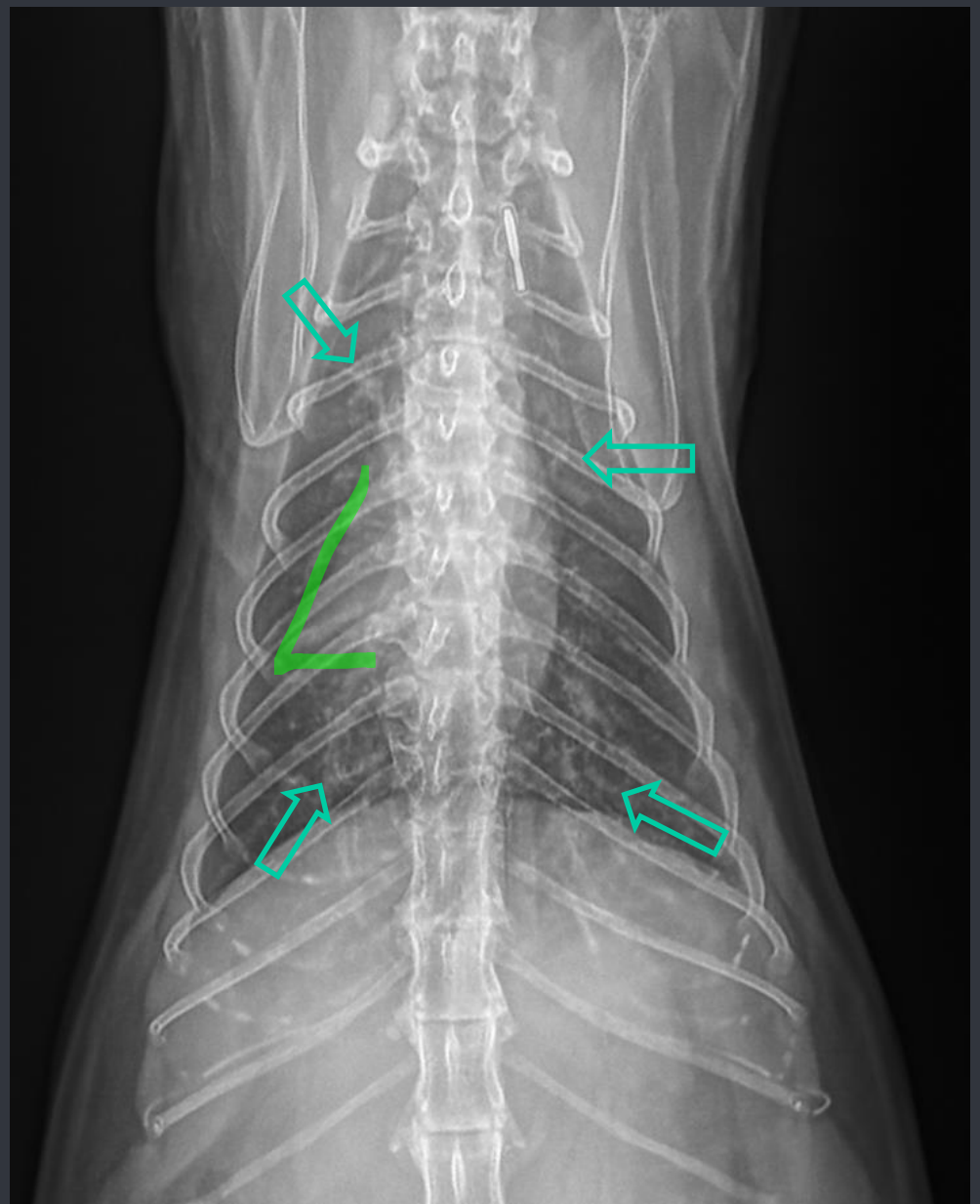
# 12 year old spayed female domestic shorthair cat; Coughing & wheezing



# 12 year old spayed female domestic shorthair cat; Coughing & wheezing



# 12 year old spayed female domestic shorthair cat; Coughing & wheezing



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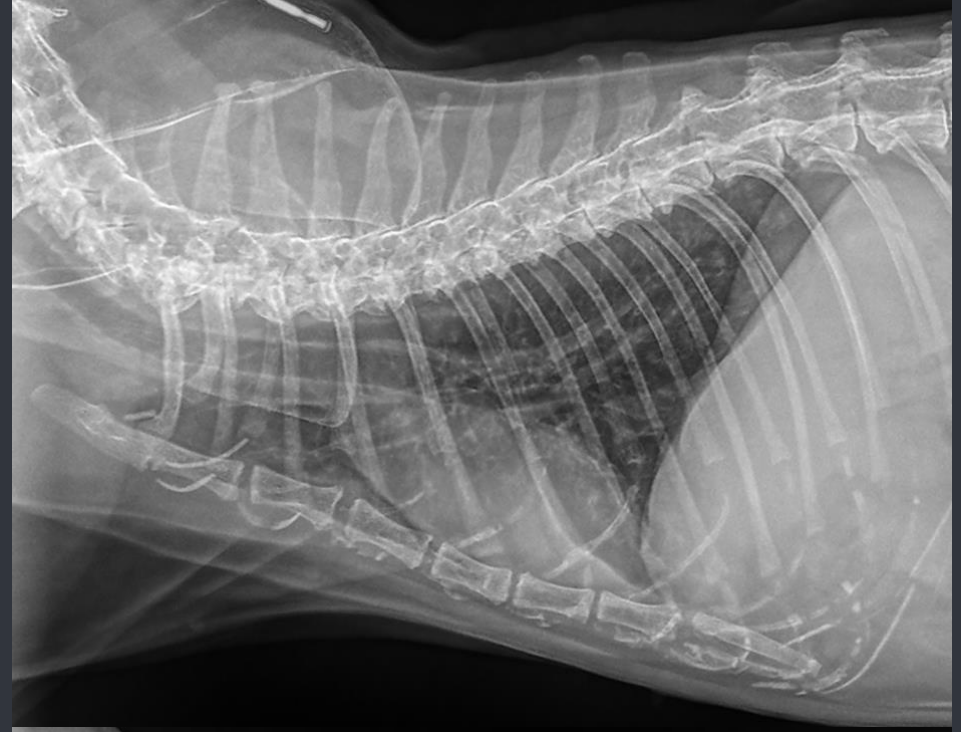
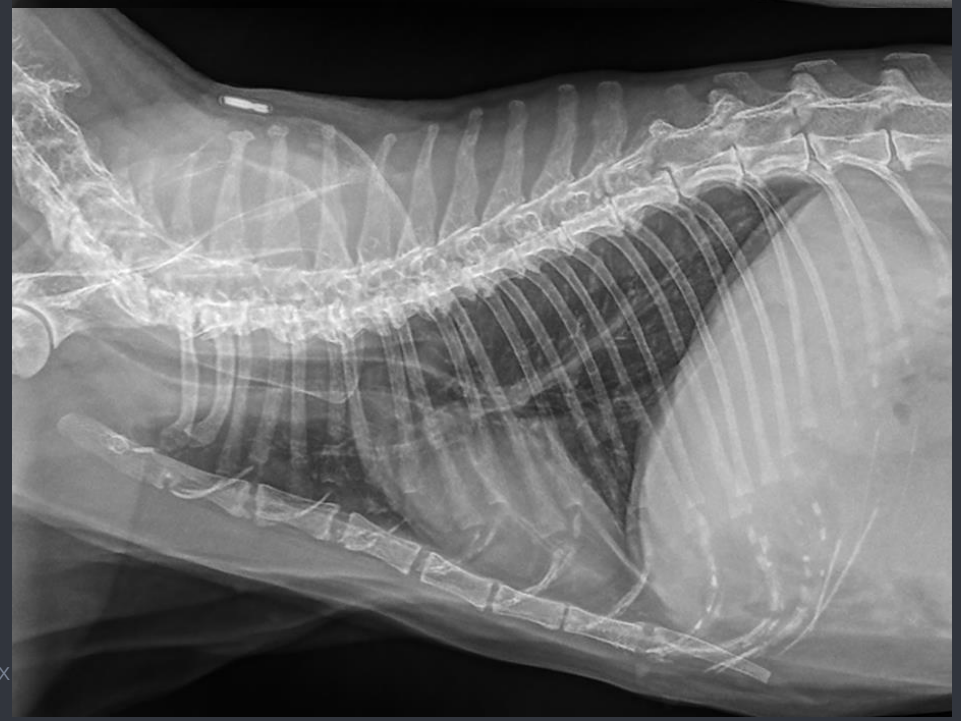
**What is your top differential for this coughing cat with a small, consolidated right middle lung lobe and a generalized bronchial pattern?**

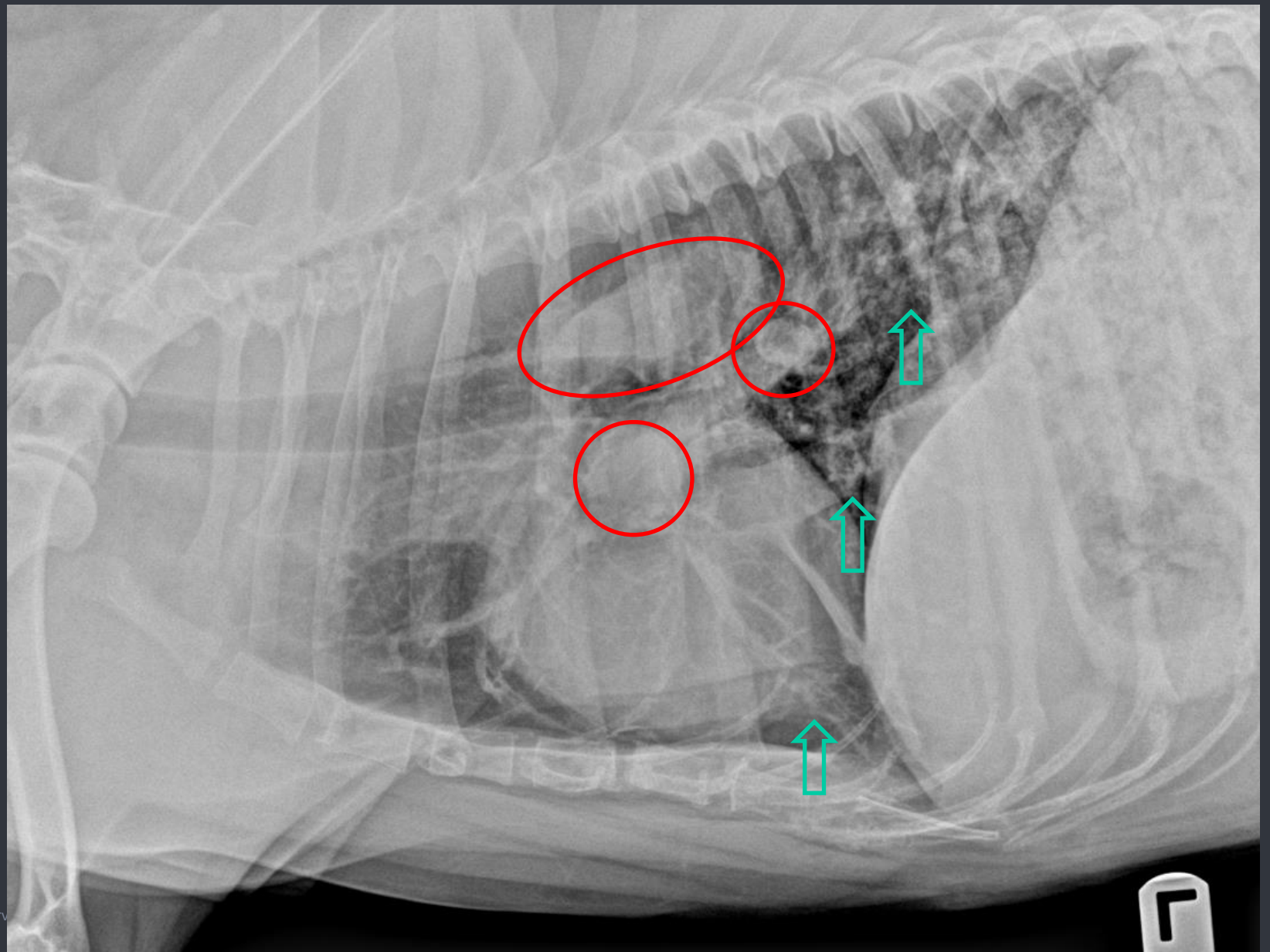
ⓘ Start presenting to display the poll results on this slide.

# Feline Asthma





# Adult neutered male mixed breed dog; Wheezing/mild cough during and after exercise



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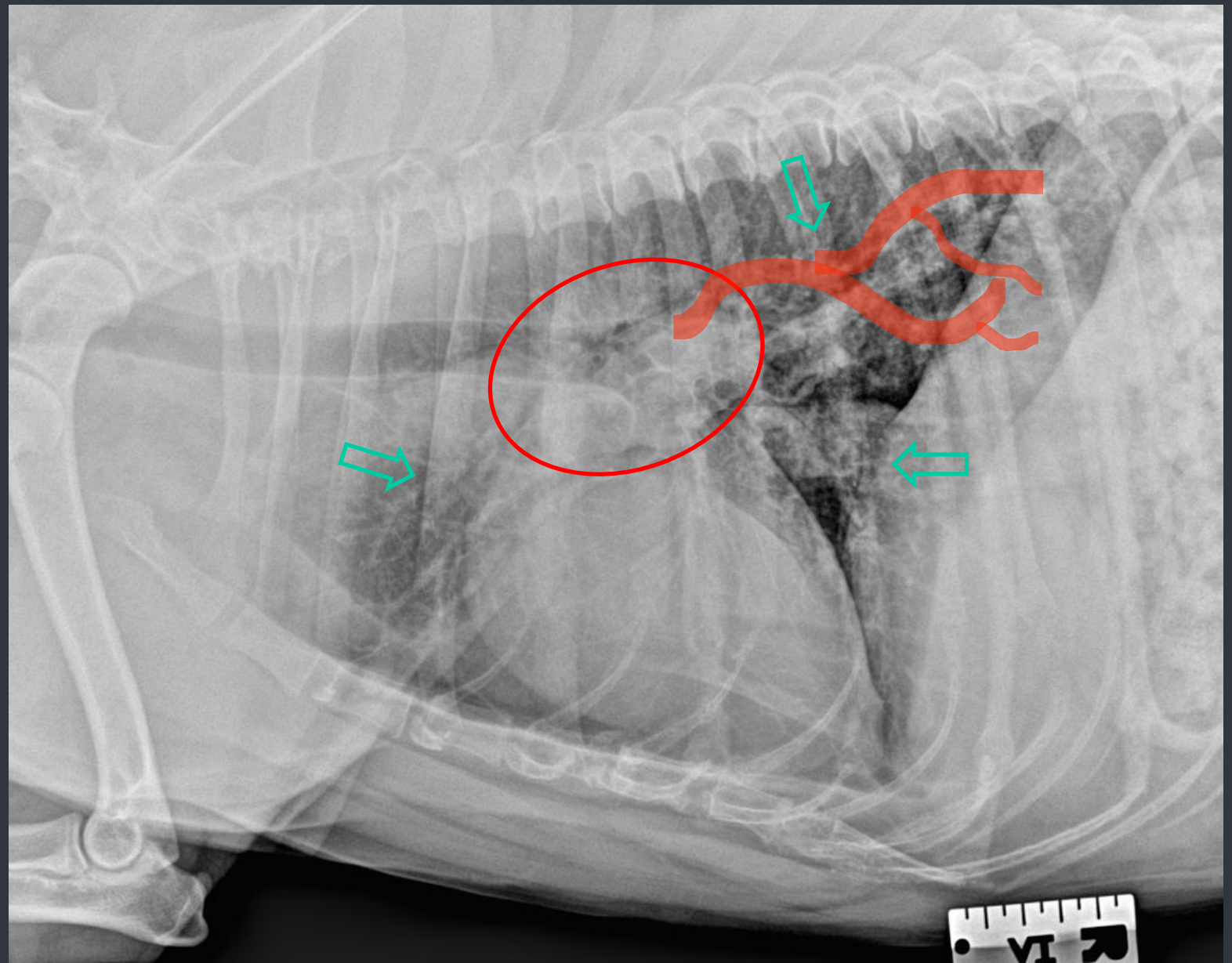

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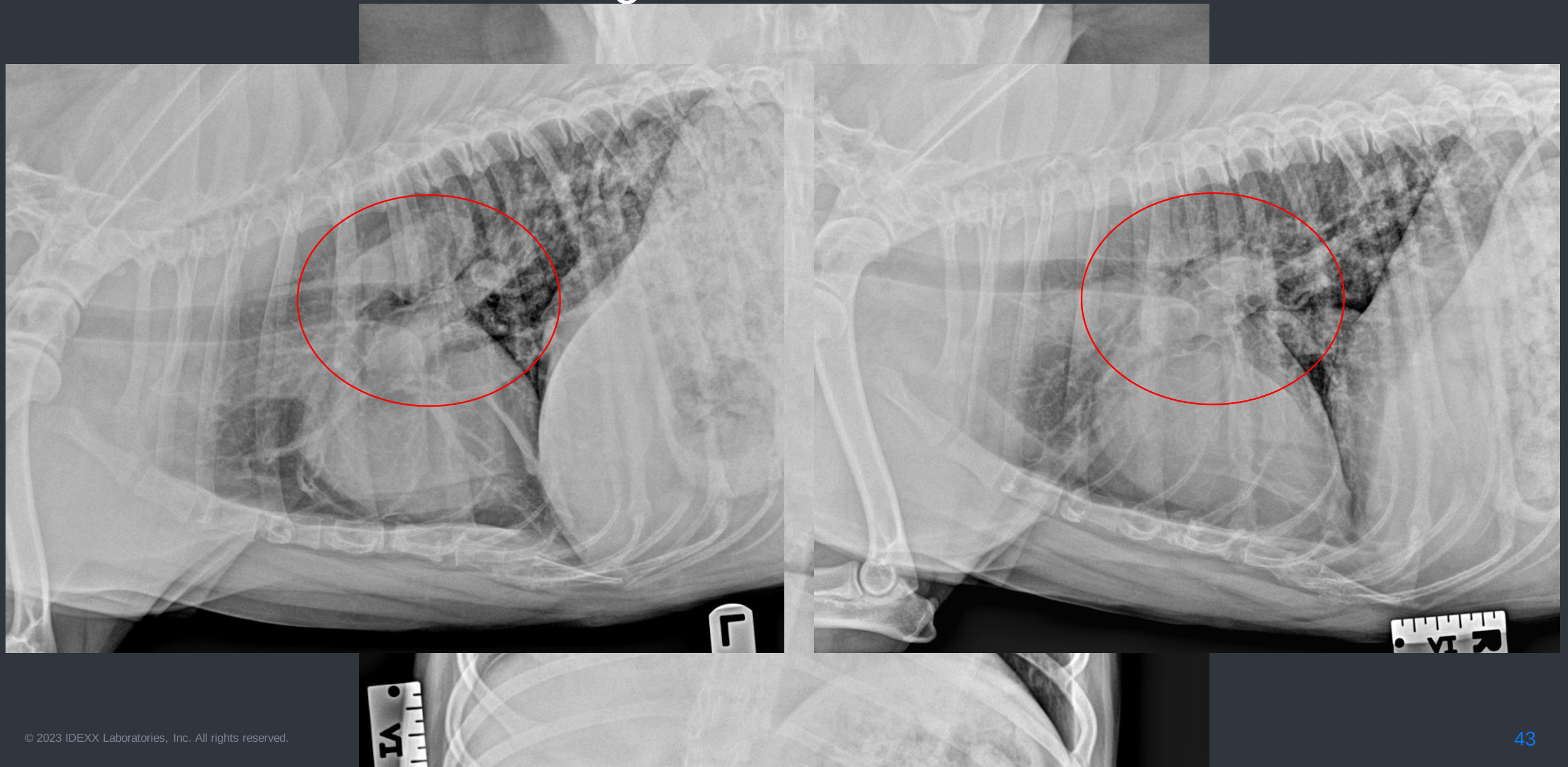

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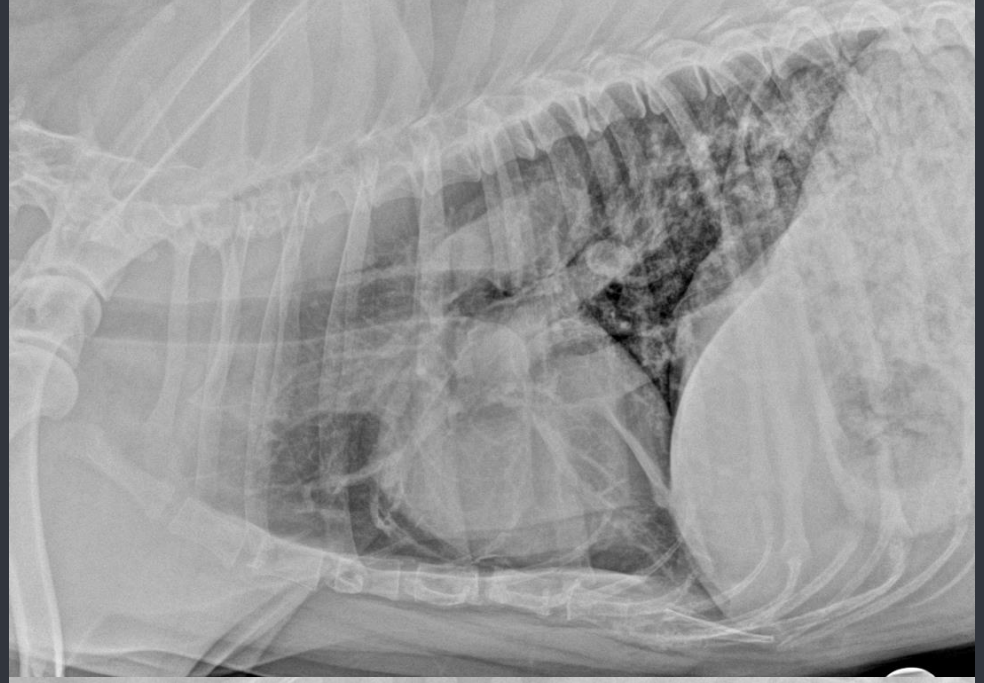
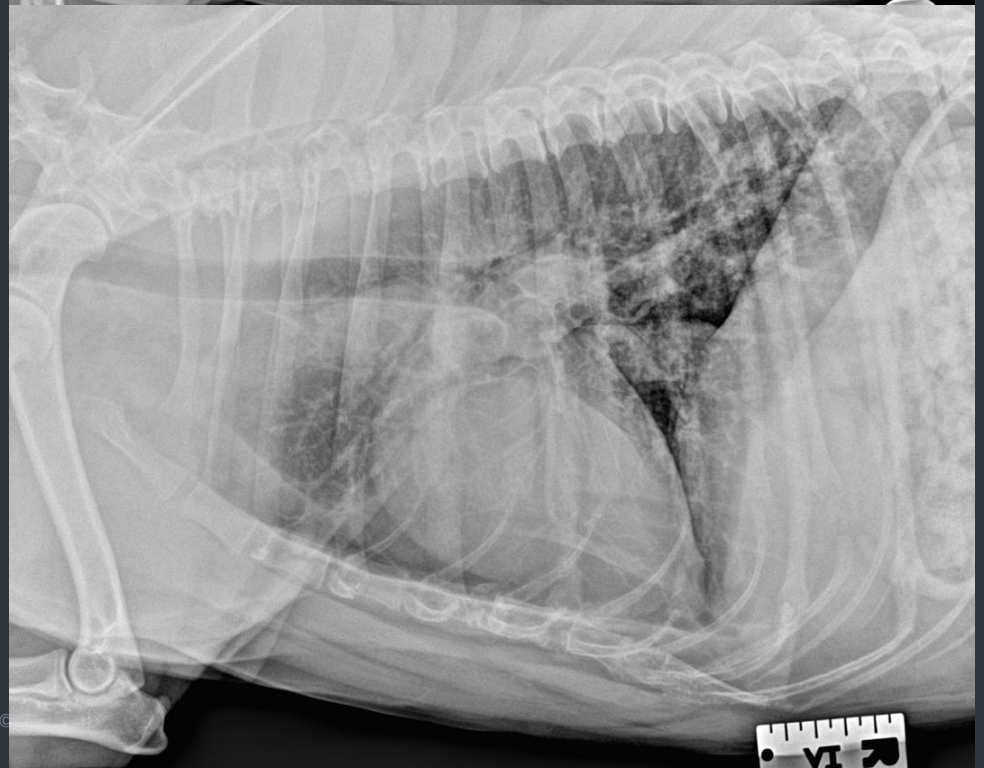
**What is your top differential for this this dog coughing and wheezing with exercise with a combination of main pulmonary artery enlargement, dilated/tortuous/blunted lobar pulmonary arteries, and a generalized bronchointerstitial pattern?**

ⓘ Start presenting to display the poll results on this slide.

# Heartworm Disease

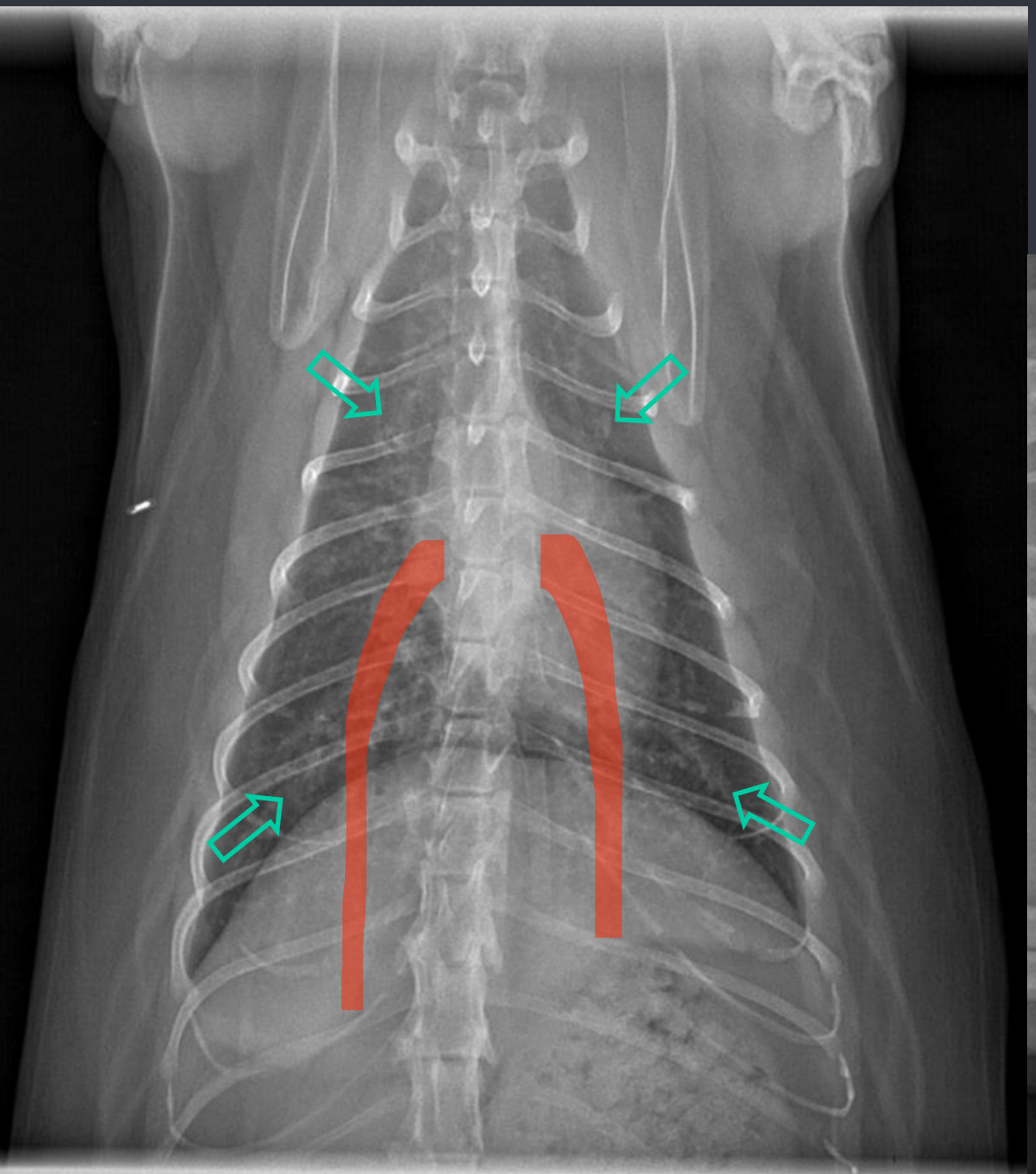
(*Dirofilaria Immitis*)

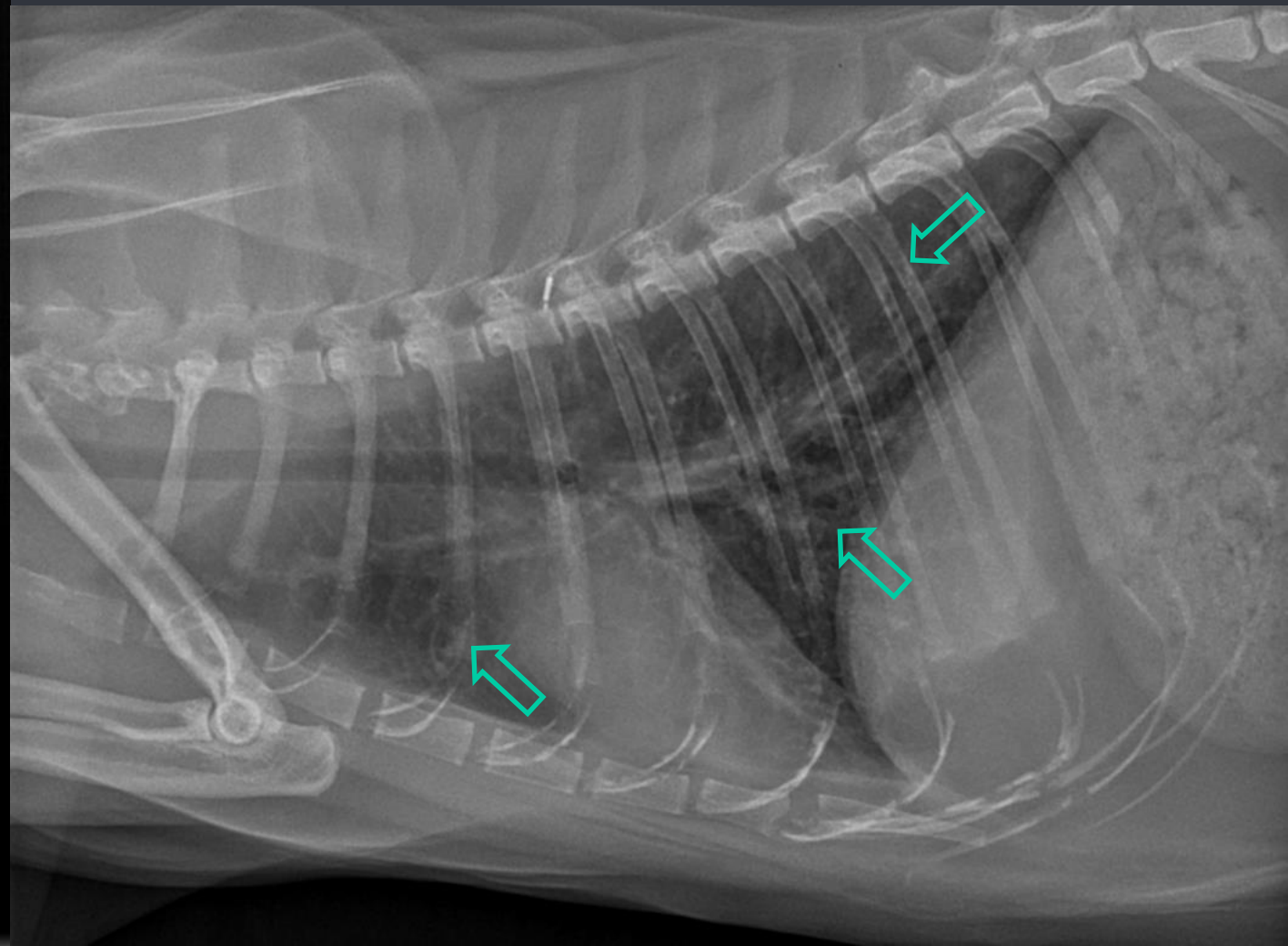




# Cats get heartworm too!!

9 year old neutered male domestic shorthair cat; Coughing





# Global Distribution of Heartworm (*Dirofilaria immitis*)

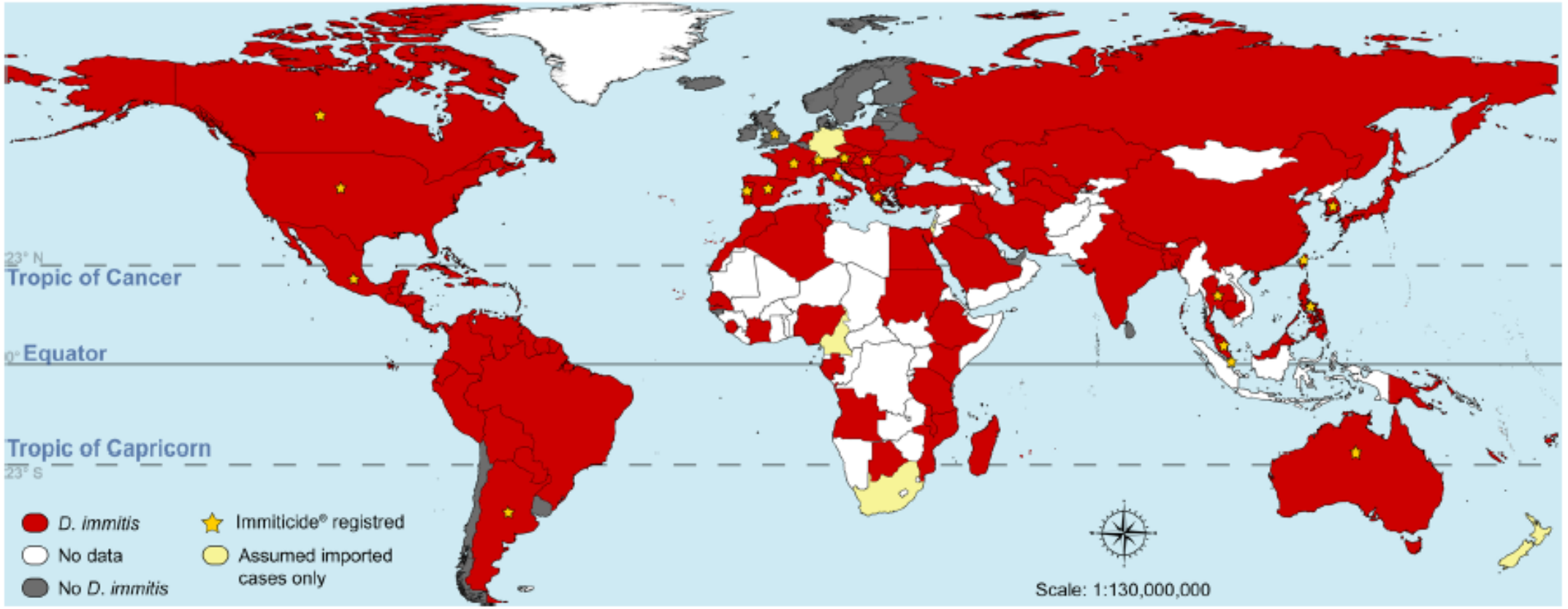



**Fig. 1** World distribution of *Dirofilaria immitis*. This map was built using QGIS and publicly available shapefiles [84]. Sources of information include several review and research papers [1, 6, 8–27, 31, 32, 34, 35]. The red colour does not mean that *D. immitis* is present in the whole country, particularly for countries lying outside the tropics. Countries where Immiticide® (Boehringer Ingelheim) is currently registered are indicated with a yellow star. In some countries (e.g. United States), melarsomine may also be available as Diroban™ (Zoetis)



Dantas-Torres et al. Heartworm adulticide treatment: a tropical perspective. *Parasites and Vectors*, (2023) 16: 148.

viruses

MDPI

*Brief Report*

# Diagnostic Accuracy of a Point-of-Care Immunoassay for Feline Immunodeficiency Virus Antibodies, Feline Leukemia Virus Antigen, and *Dirofilaria immitis* Antigen

**Seema Singh *, Kristen A. Davenport, Elizabeth Schooley, Anthony Ruggiero, Salam Nassar, Jesse Buch and Ramaswamy Chandrashekar**

IDEXX Laboratories, Inc., Westbrook, ME 04092, USA; kristen-davenport@idexx.com (K.A.D.); elizabeth-schooley@idexx.com (E.S.); anthony-ruggiero@idexx.com (A.R.); salam-nassar@idexx.com (S.N.); jesse-buch@idexx.com (J.B.)
* Correspondence: seema-singh@idexx.com

# Feline Triple Test now available globally!

*FIV, FeLV, and HW*

**Abstract:** Feline immunodeficiency virus (FIV) and feline leukemia virus (FeLV) are retroviral infections of cats worldwide whose clinical manifestations range from mild to severe disease. In both cases, infected cats can live a long life with proper care and should be managed to prevent infection of other cats. *Dirofilaria immitis*, the nematode that causes heartworm disease, can infect cats in any region where dogs are infected. Though cats are more resistant to infection, clinical diseases in the form of heartworm-associated respiratory disease can cause death. Screening for these infectious diseases enables veterinarians to manage their cases and prevent the spread to other cats. We describe the diagnostic accuracy of a point-of-care immunoassay for FIV, FeLV, and heartworm, compared to reference methods commonly available through reference laboratories to the practicing veterinarian. For FIV, we report 100% sensitivity (95% confidence limits (CL): 96.2–100%) and 97.8% specificity (95% CL: 95.4–99.4%). For FeLV, we report 100% sensitivity (95% CL: 97.7–100%) and 99.2% specificity (95% CL: 97.1–99.9%). And for heartworm, we report 90.2% sensitivity (95% CL: 76.9–97.3%) and 100% specificity (95% CL: 98.3–100%). Veterinarians may expect this performance relative to the reference methods they use for confirmatory serological testing.

**Keywords:** feline immunodeficiency virus; feline leukemia virus; Dirofilaria immitis; heartworm; serology; diagnosis; screening



Singh et al. Diagnostic Accuracy of a Point-of-Care Immunoassay for Feline Immunodeficiency Virus Antibodies, Feline Leukemia Virus Antigen, and Dirofilaria immitis Antigen. *Viruses*, 2023, 15, 2117.

# Summary

- A systematic approach to interpreting thoracic radiographs is helpful in evaluating all intrathoracic structures and aids in the identification of abnormalities
- There are many causes of respiratory abnormalities in canine and feline patients
- Combining systematic evaluation of images with patient signalment and history is helpful in ranking differential diagnoses

# Questions?