2019 FELINE FORUM

IMAGING DIAGNOSIS OF RESPIRATORY DISEASE:

CASE INTERPRETATION LAB

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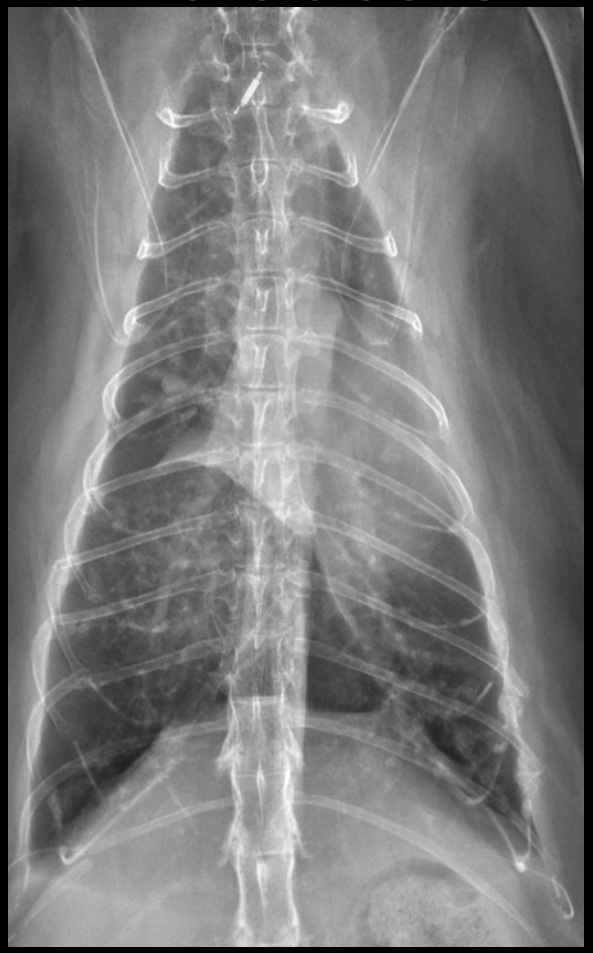
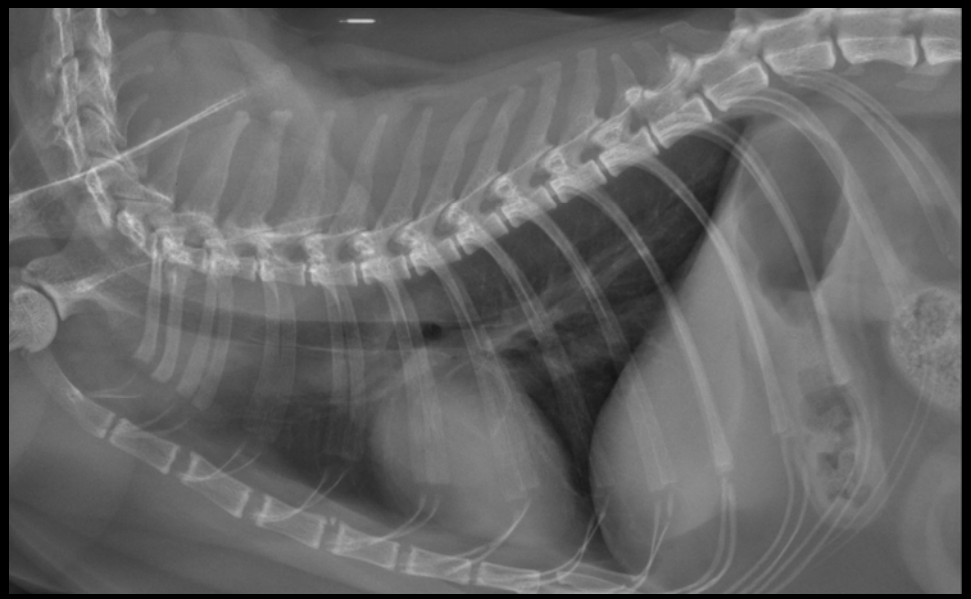
How do you read thoracic radiographs?
What do you hope to gain from this session?



FIRST THINGS FIRST

Evaluate

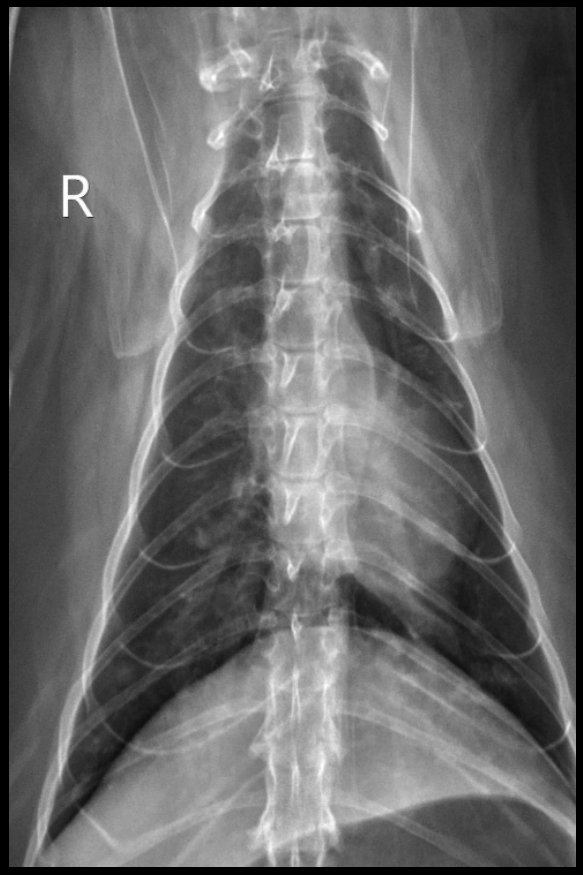
- Radiographic technique
- Patient position
- THEN…
  - Normal or abnormal?



1. Thoracic “Compartments”
2. Interpretation Strategy
3. Application – Cases
   - Pulmonary patterns
   - Pleural effusion
   - Mediastinal masses

THORACIC COMPARTMENTS

- Extra-thoracic
  - Body Wall
  - Diaphragm
- Pleural Space
- Pulmonary parenchyma
  - Airways
  - Vessels
- Mediastinum
  - Heart/Pericardium



INTERPRETATION STRATEGY

1. **Extrathoracic abnormalities:**
   - Cranial abdomen & diaphragm
   - Sternum & soft tissues
   - Thoracic limbs
   - Cervical area
   - Ribs & thoracic vertebrae

2. **Pleural space abnormalities** (must know the exact locations of the expected pleural fissures)
   - Is there a pleural effusion?
   - Is there a pneumothorax?
   - Is there a pleural mass?
   - Is there an extrapleural sign?

3. **Pulmonary parenchyma**
   - Is the pulmonary parenchyma normal or abnormal?
   - If abnormal, is there increased or decreased opacity?
   - What is the anatomic location of the abnormality?
   - What pulmonary pattern is present?

4. **Mediastinum**
   - Cranial mediastinum (ventral & dorsal)
     - Mass(es) present? Mediastinal widening on the ventrodorsal view?
     - Tracheal (including deviation) abnormalities?
     - Esophageal abnormalities?
     - Pneumomediastinum present?
   - Middle mediastinum
     - Dorsal: Tracheobronchial lymph node enlargement? Tracheal deviation? Esophageal abnormalities?
     - Ventral: Cardiac abnormalities?
   - Caudal mediastinum
     - Dorsal: Aorta & esophagus
     - Ventral: Accessory lung lobe mass resulting in caudal vena cava border effacement

Source: https://www.cliniciansbrief.com/article/reporting-technique-thoracic-abnormalities?cWPEWMhWZh

ROENTGEN SIGNS

- Number
- Size
- Shape
- Contour
- Opacity
- Position

INTERPRETATION STRATEGY

Findings	Radiographic Summary	Dx or DDX	Plan
List abnormal Roentgen signs for each structure/compartment. **Extra-thoracic**: • Chest wall and "everything else" **Pleural**: • pleural fissure lines • retraction of lung from thoracic wall **Pulmonary**: • Pulmonary parenchyma – uniformity, opacity, nodules or masses • Airways & Pulmonary vessels **Mediastinal**: • Heart, great vessels • Lymph nodes • Trachea, Esophagus	Synthesize findings into a brief summary of lesions listed in order of highest to lowest importance.	Create a differential list for each lesion. Tie all radiographic lesions together with a single disease process, if possible. DDX should be listed in priority of highest to lowest likelihood.	Refine a diagnostic plan to confirm or rule out differential(s). Consider if immediate or empirical treatment is warranted by the "big picture".

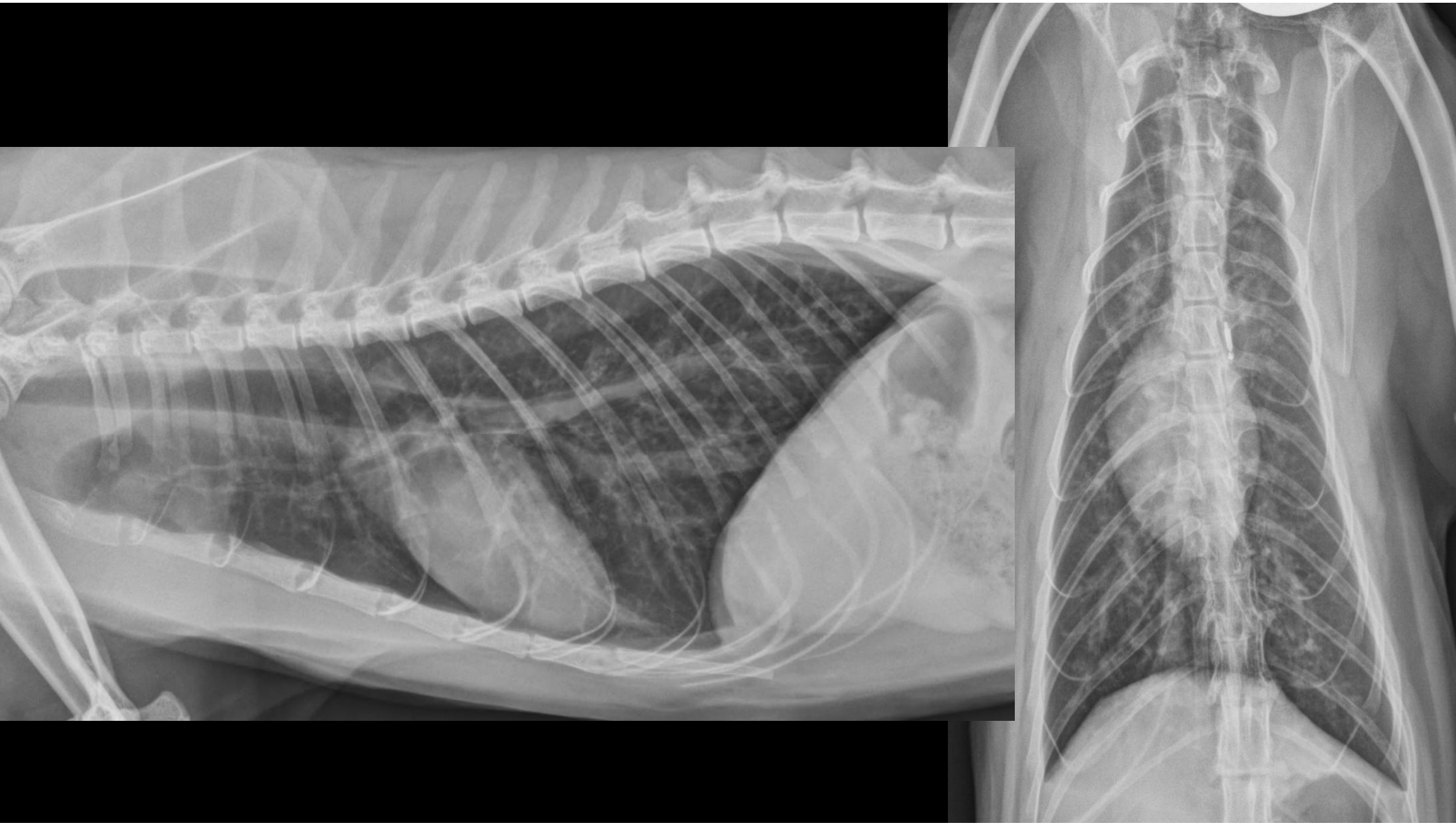
PULMONARY PATTERNS

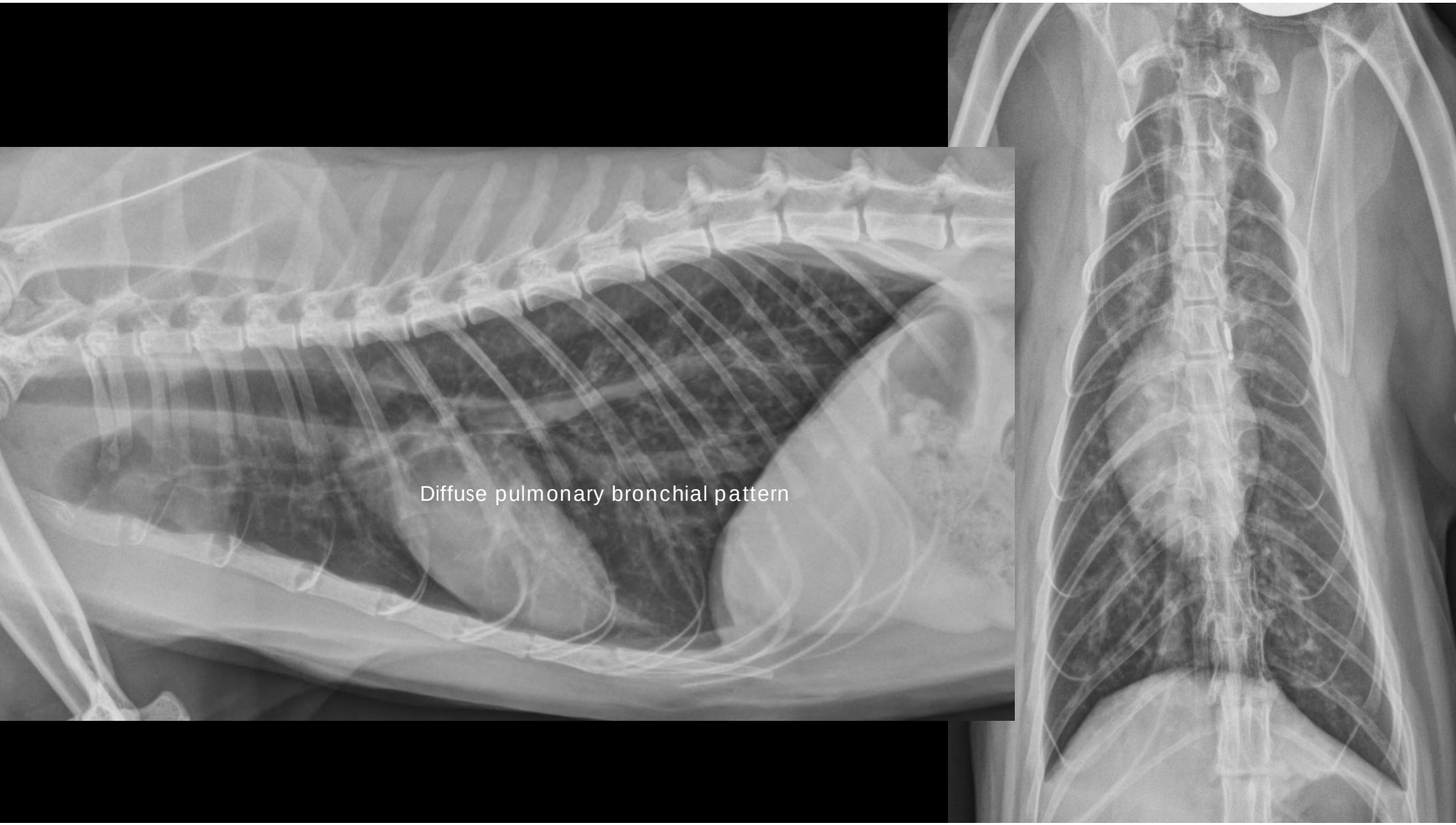
- Bronchial
- Alveolar
- Interstitial
  - Unstructured
  - Structured (nodular)
- (Vascular)

Case 1

Signalment: 3y MC DSH
Chief Complaint: acute tachypnea, dyspnea

Physical exam:
- T: 103.9; P: 228 bpm; R: 72 bpm
- QAR, CRT<2 sec
- Clear lung sounds
- Otherwise normal




Diffuse pulmonary bronchial pattern

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • normal Pleural Space: • normal Pulmonary: • Diffuse bronchial pattern Mediastinum (including heart): • normal	1. Diffuse bronchial pattern (moderate to marked)	R/O feline asthma DDX: lungworm, heartworm, other allergic/infectious/inflammatory bronchial disease (classic presentation)	Airway sampling Baermann fecal +/- HWT +/- Empirical therapy for ddx This patient responded very well to rDVM steroid injection for suspected asthma; came to TAMU for full workup/long term plan

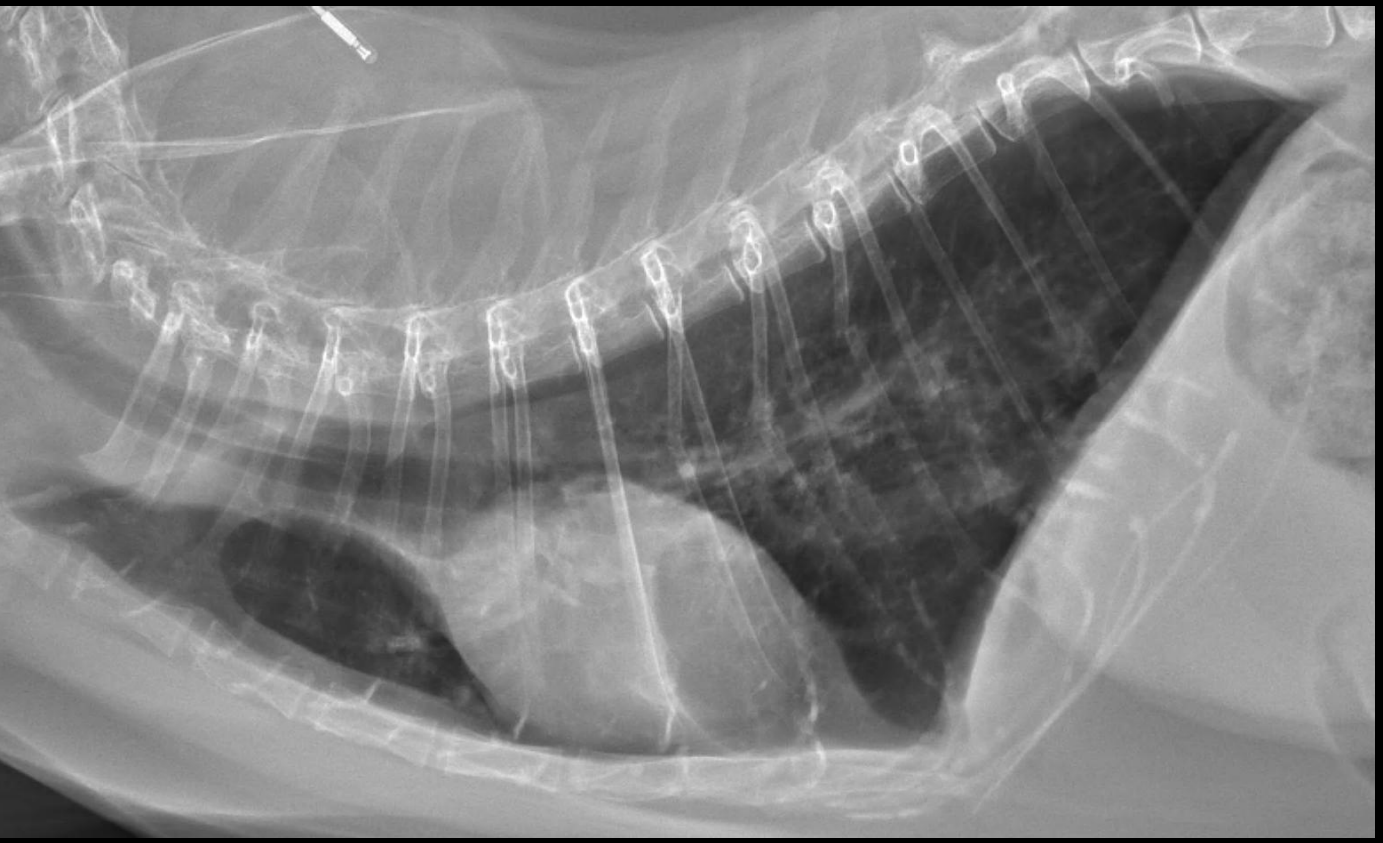
BRONCHIAL PATTERN DDX

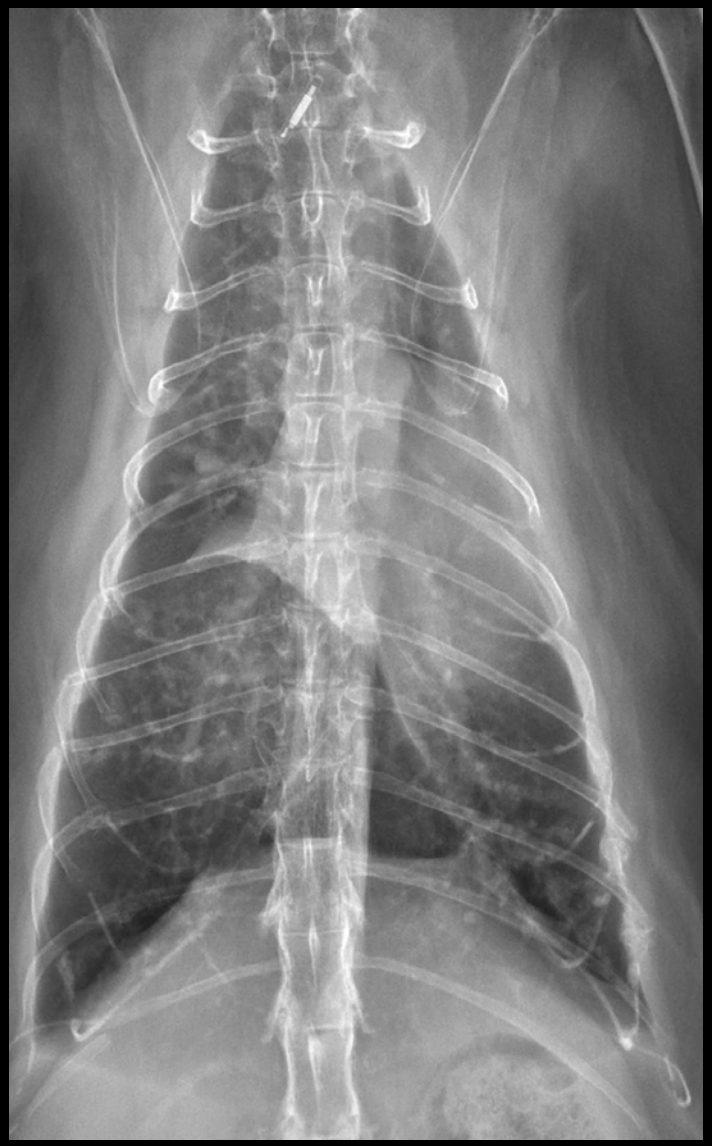
- Thickened bronchial walls
  - Bronchitis
    - Allergic, non-infectious inflammatory (incl asthma, irritants)
    - Infectious (viral, bacterial, parasitic, fungal)
  - Bronchopneumonia
  - Bronchiectasis (if also enlarged)
  - +/- Intraluminal mucous or fluid (border affacement w/ wall)
- Mineralized bronchial walls
  - Degenerative (age related, chondrodystrophic breeds)
  - Dystrophic mineralization (chronic airway dz)
  - Metastaic mineralization (Ca:P imbalance, rare)
- Peribronchial cuffing
  - Edema
  - Pneumonia
  - Infilrates (eosinophils, fungal organisms)

Case 2

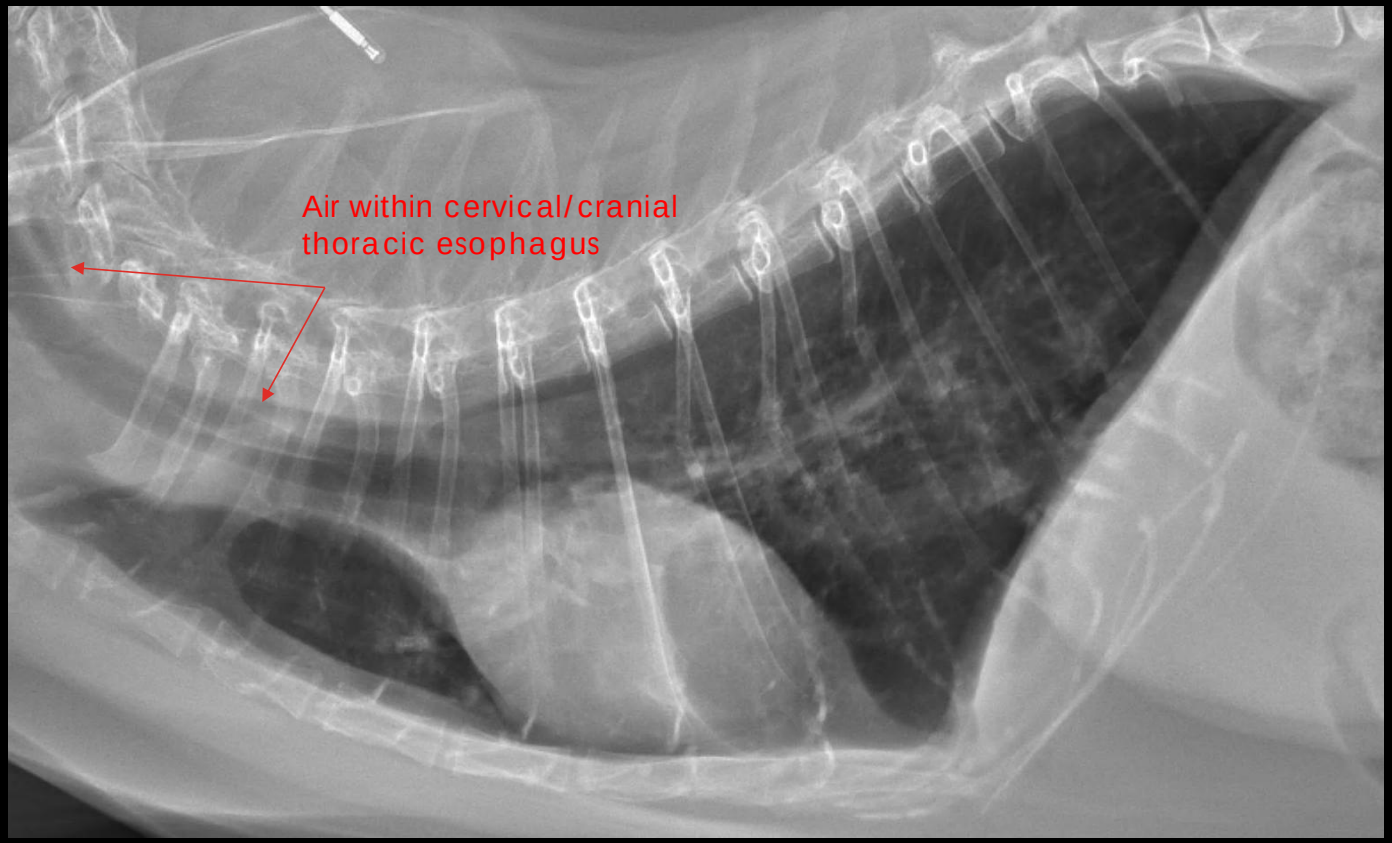
Signalment: 11y MC DSH
Chief Complaint: tachypnea

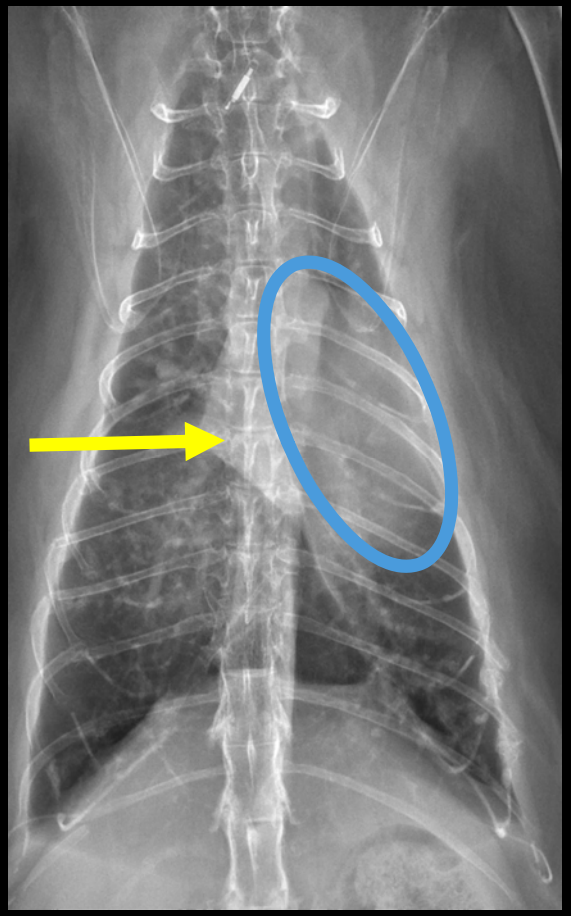
Physical exam:
- Normal temperature & heart rate
- Tachypnea



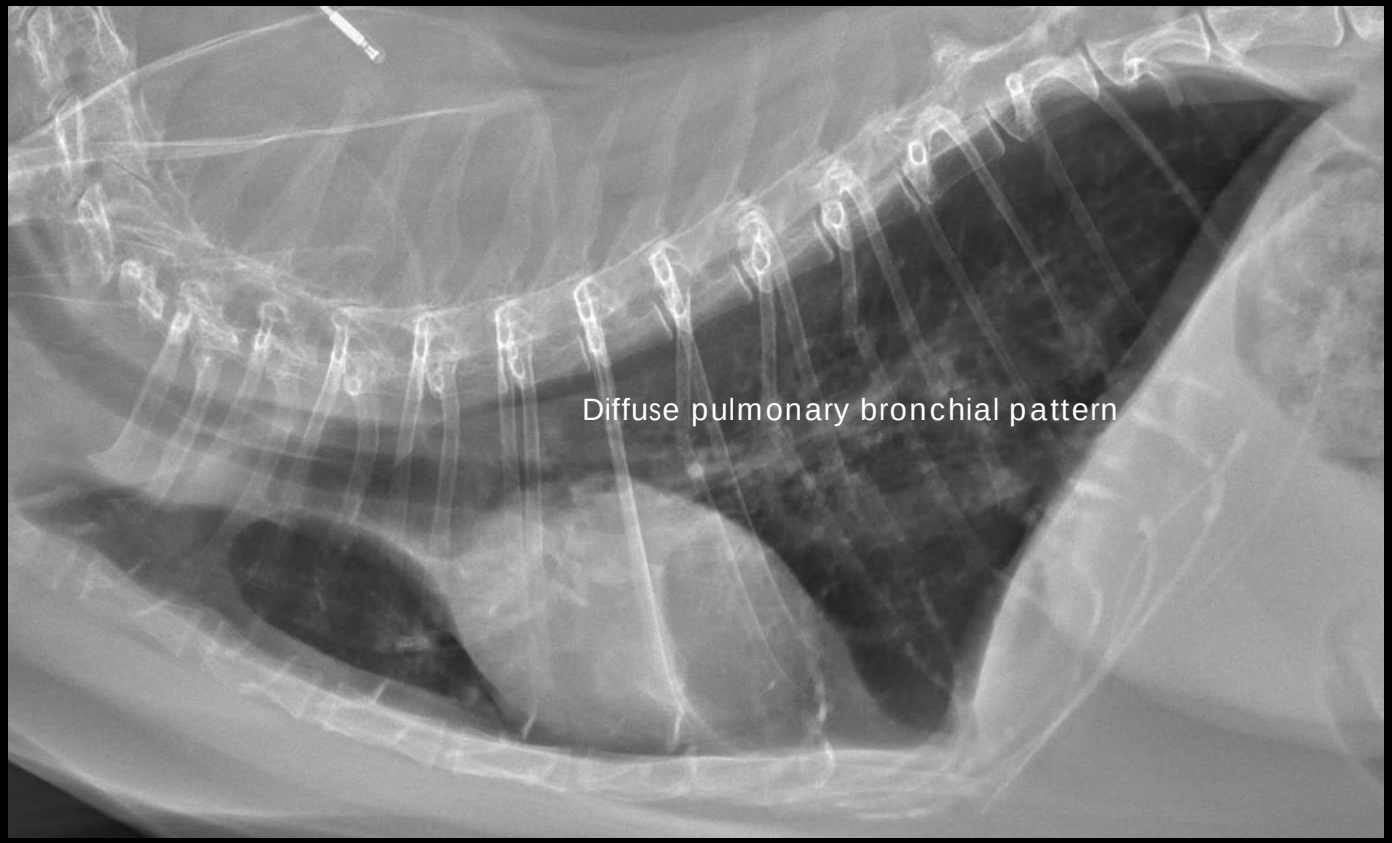


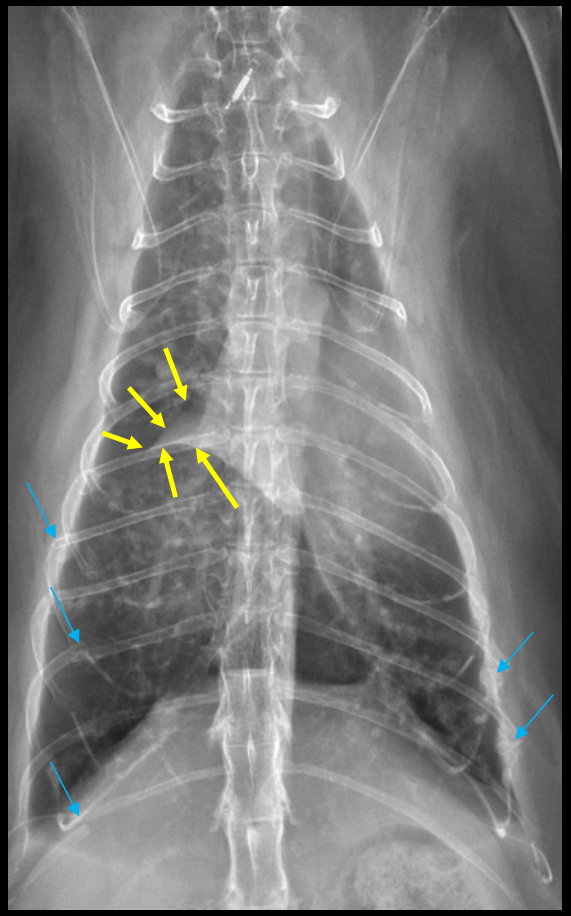
Leftward mediastinal shift; neither lung/hemithorax is normal, but this is probably best classified as “ipsilateral” because of the increased opacity & poor definition of in the region of the caudal sub-segment of the left cranial lung lobe





Also note collapse (triangular “bat wing” appearance) of right middle lung lobe; and multiple chronic rib fractures





Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • normal Pleural Space: • normal Pulmonary: • Collapse/increased opacity of right middle lung lobe (lobar borders) • Increased opacity of caudal subsegment of left cranial lung lobe • Diffuse bronchial pattern Mediastinum (including heart): • Air in cervical/cranial mediastinal esophagus • Leftward mediastinal shift (ipsilateral?)	1. Diffuse pulmonary bronchial pattern (moderate) 2. Alveolar pattern in right middle & left cranial (caudal subsegment) lung lobes 3. Leftward mediastinal shift 4. Rib fractures (chronic, healed) 5. Aerophagia	R/O feline asthma with bronchial mucus plugging causing secondary collapse of lungs and mediastinal shift DDX: lungworm, heartworm, other allergic/infectious/inflammatory bronchial disease Rib fractures; r/o self-trauma associated with chronic, severe airway disease	Airway sampling Baermann fecal +/- HWT +/- Empirical therapy for ddx

ALVEOLAR PATTERN DDX

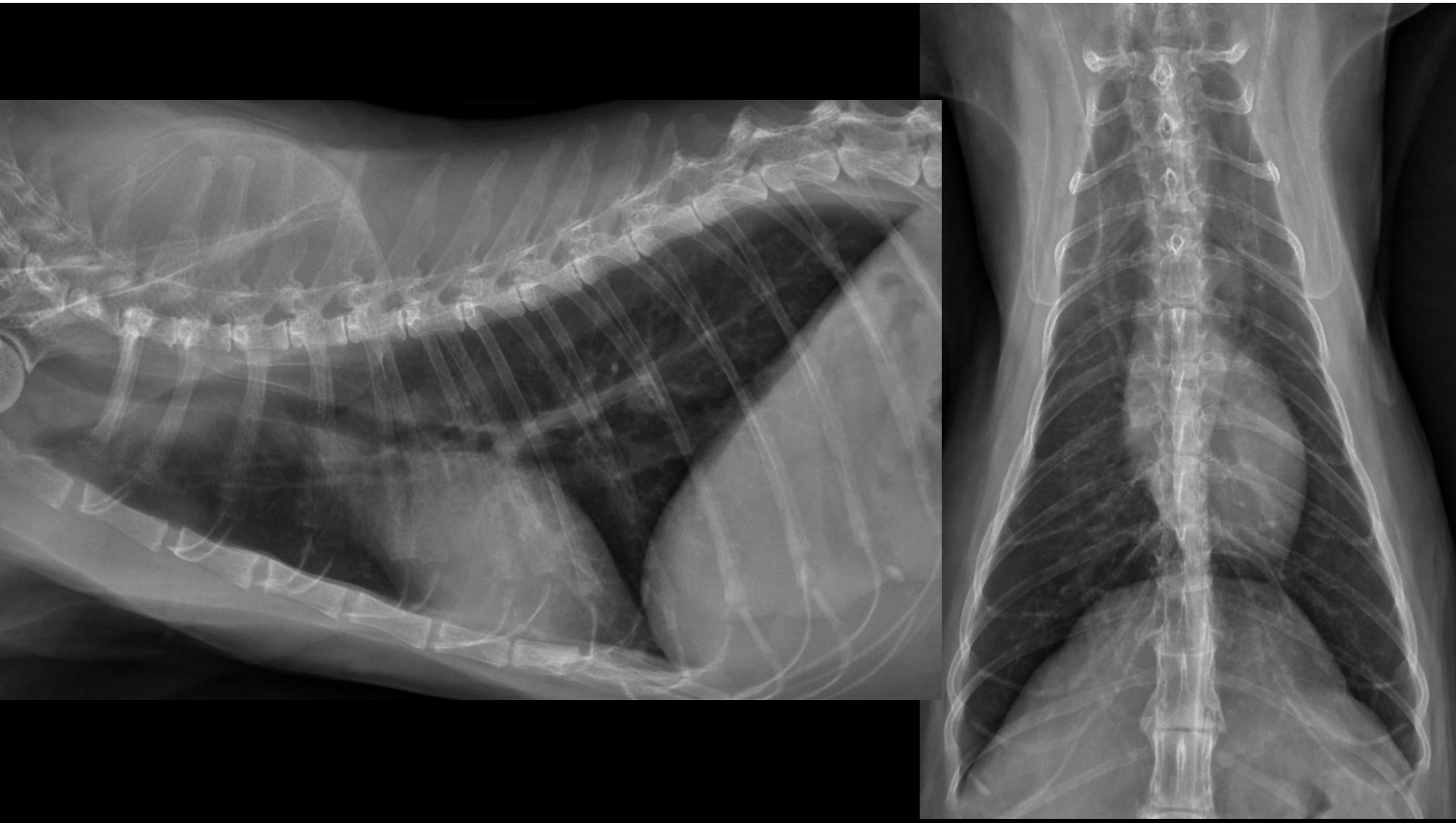
- Atelectasis
- Pneumonia / pneumonitis
  - Aspiration vs infectious (inhaled vs hematogenous)
  - granulomatous, eosinophilic, other
- Pulmonary edema
  - Cardiogenic vs non-cardiogenic
  - ARDS
  - (Vasculitis)
- Neoplasia
  - Lymphoma vs other solid tumor
- Hemorrhage
  - Trauma/contusion vs coagulopathy
- Pulmonary thromboembolism
- Lung lobe torsion (rare)

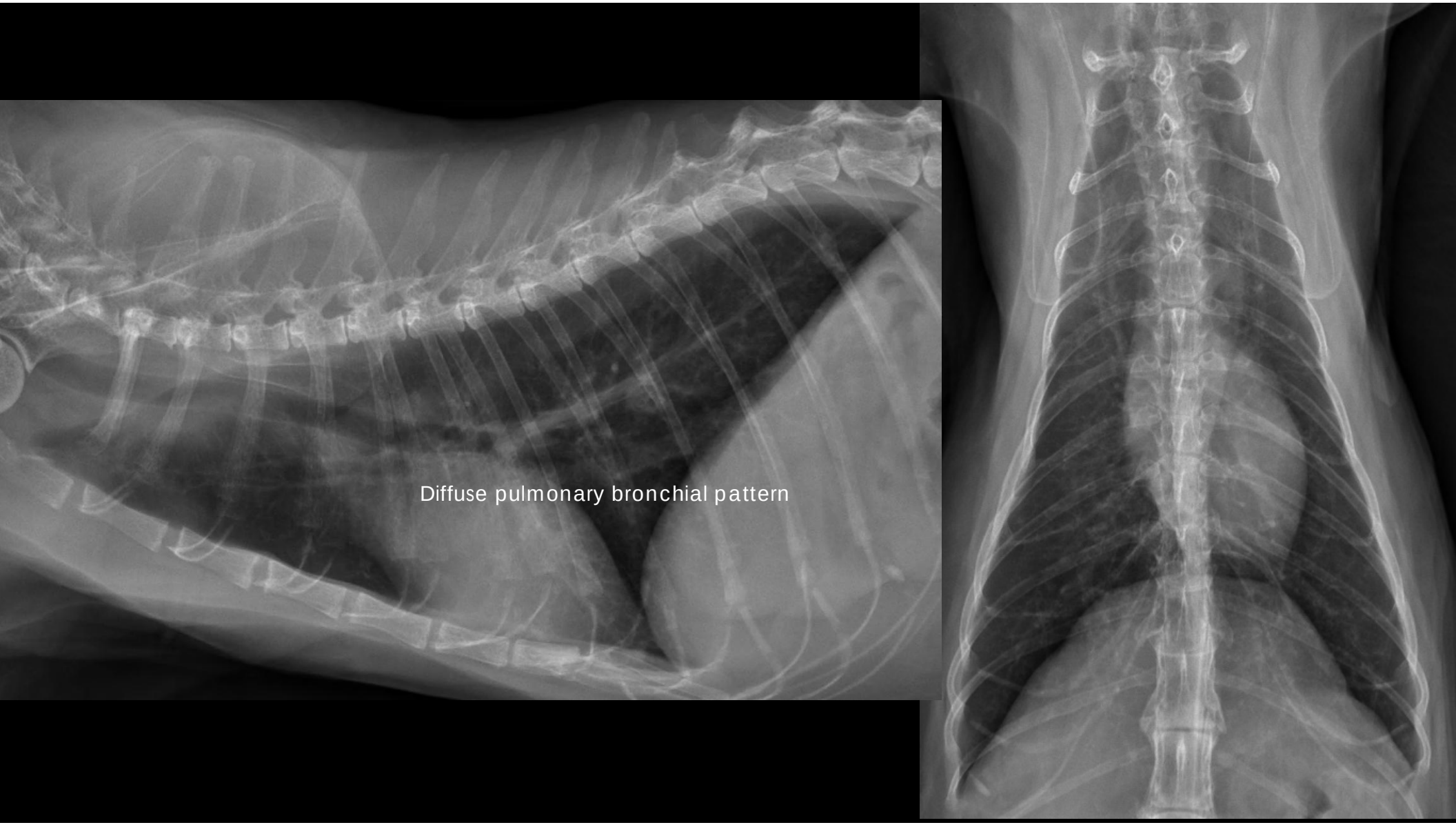
Case 3

Signalment: 22y FS Manx
Chief Complaint: chronic tachypnea (long term/"always" per owner), no coughing or dyspnea noted

Physical exam:

- Normal temperature & heart rate;
- Tachypnea (R: 88 bpm)
- Soft systolic parasternal murmur (inconsistently heard)
- Increased BV sounds bilaterally
- Otherwise normal



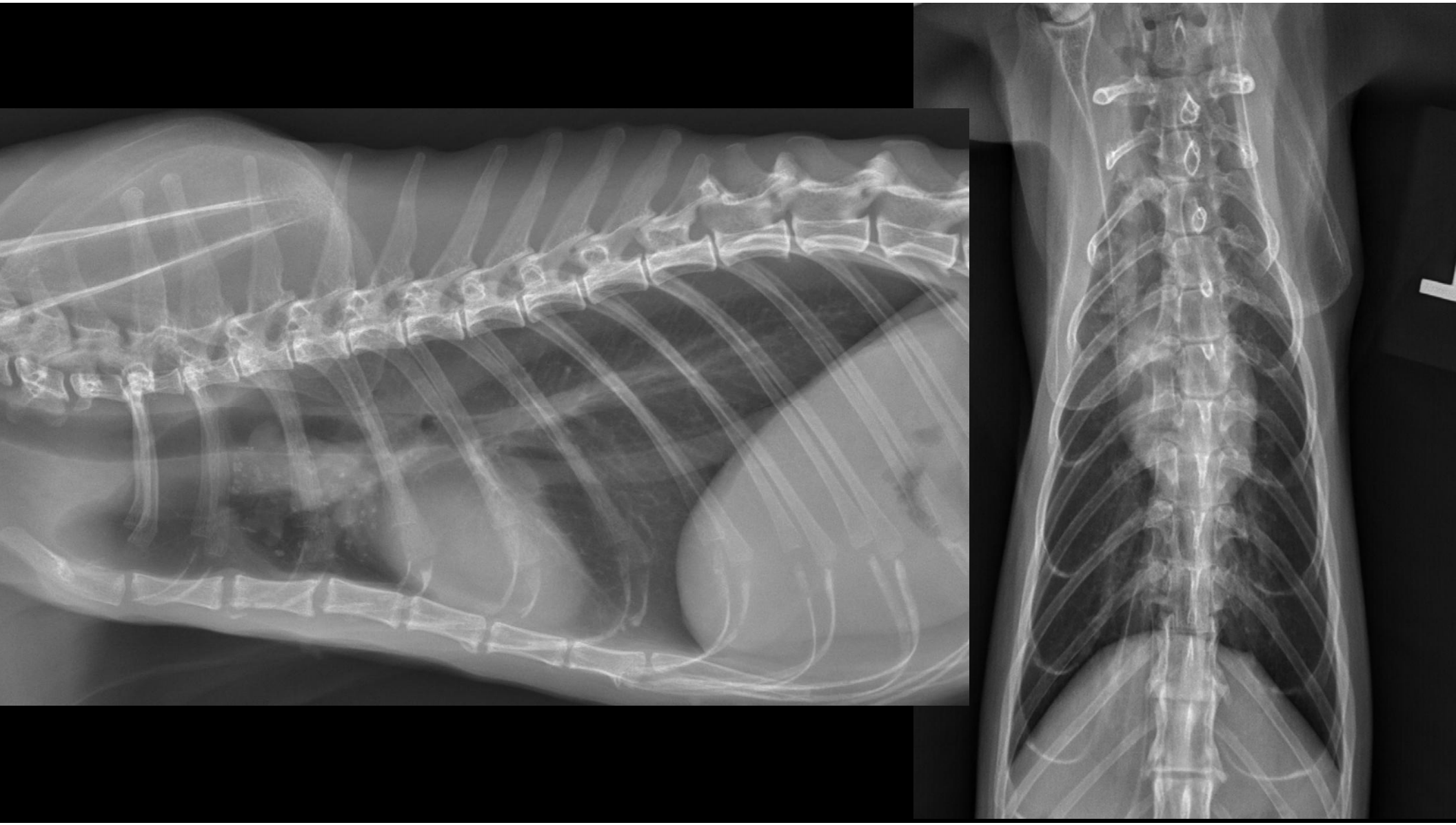

Diffuse pulmonary bronchial pattern

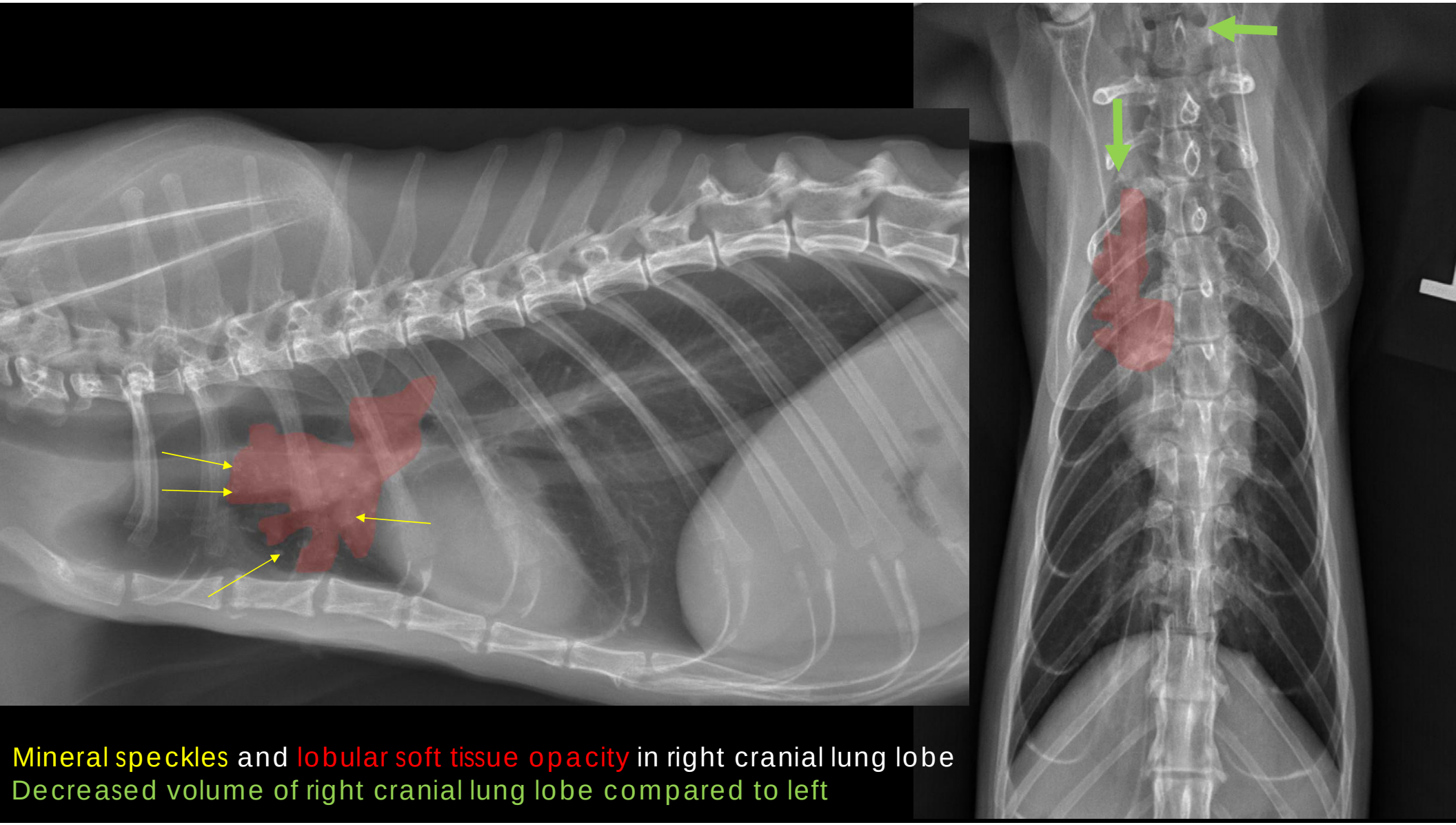
Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • normal Pleural Space: • normal Pulmonary: • Diffuse bronchial pattern Mediastinum (including heart): • normal	1. Diffuse bronchial pattern (mild considering pt age)	R/O feline asthma DDX: lungworm, heartworm, other allergic/infectious/inflammatory bronchial disease (classic presentation)	Airway sampling Baermann fecal +/- HWT +/- Empirical therapy for ddx

Case 4

Signalment: 12y FS DSH
Chief Complaint: decreased appetite, weight loss, lethargy, sneezing

Physical exam:
- BCS 2/9
- T: 103F; P: 220 bpm; R: 30 bpm
- Moderate to severe dental disease w/ resorptive lesions
- Grade 2/6 left parasternal murmur
- Palpably small kidneys





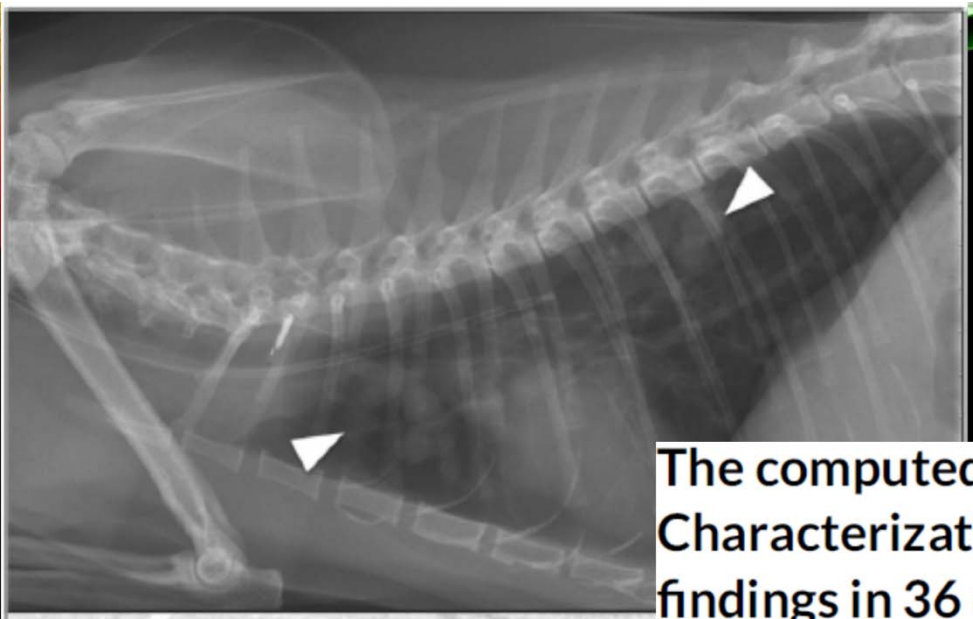
Mineral speckles and lobular soft tissue opacity in right cranial lung lobe

Decreased volume of right cranial lung lobe compared to left

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • Very thin BCS Pleural Space: • normal Pulmonary: • Multiloblar soft tissue opacity in right cranial lung lobe; area speckled with mineral foci • Decreased volume of RCr LL Mediastinum (including heart): • normal	1. Soft tissue and mineral opacity in right cranial lung lobe "tree-in-bud" pattern	R/O chronic lower airway /bronchial disease (inactive?) with secondary bronchial dilation and broncholithiasis	No lower respiratory clinical signs... Look elsewhere for cause of weight loss/lethargy Baseline blood work/ UA Abdominal radiographs/ ultrasound *We found small cell lymphoma in the small intestine of this cat to account for clinical signs.

TREE-IN-BUD

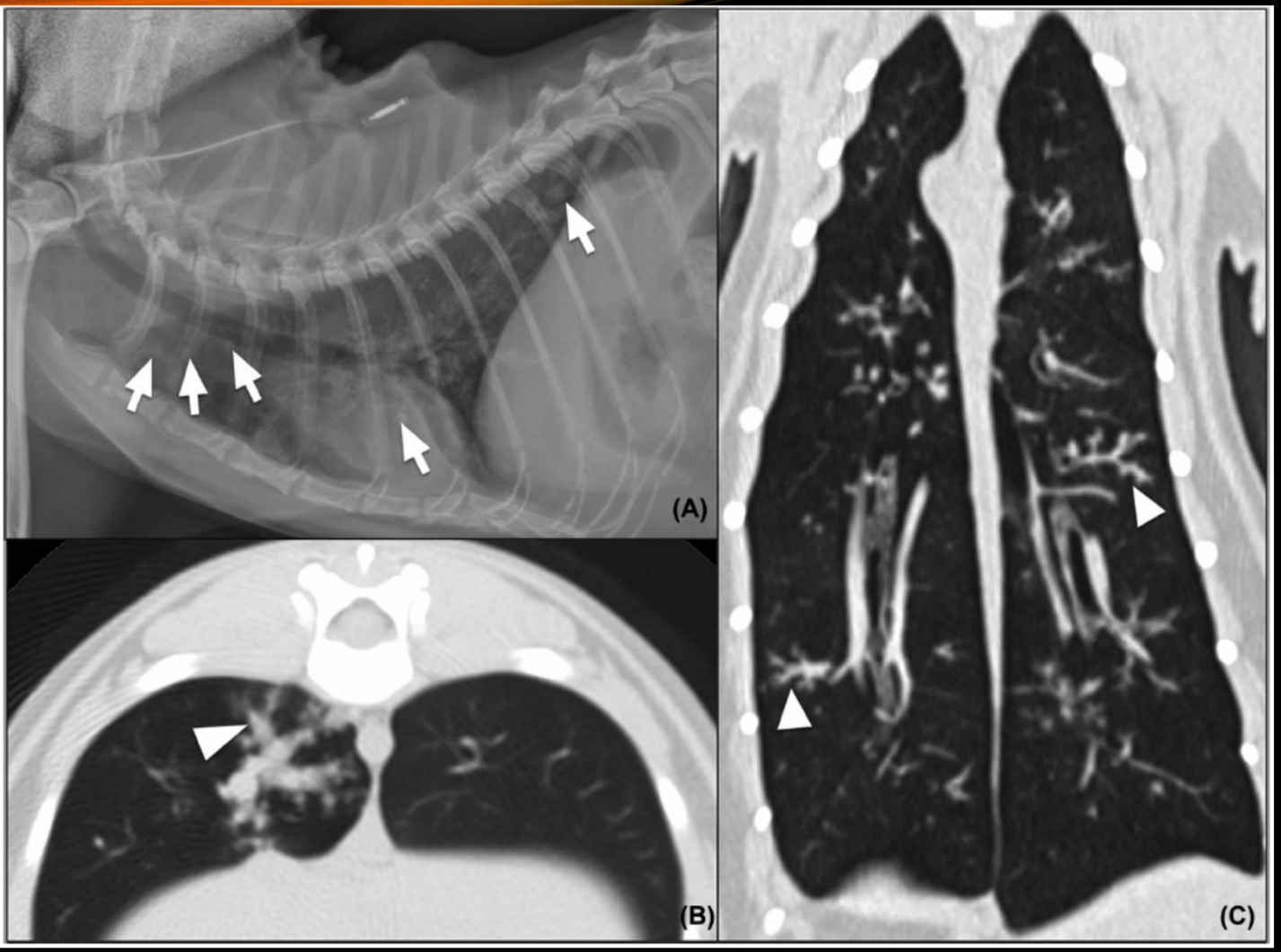
- Structured pulmonary opacities in “respiratory” cats =
  - eosinophilic granulomas
  - mucous plugging
  - mimic neoplasia/metastasis!
- **Tree-in-bud pattern** is combo of nodular & linear branching opacities that represent dilated bronchi filled w/ mucous or secretions



TREE-IN-BUD

The computed tomographic "tree-in-bud" pattern: Characterization and comparison with radiographic and clinica findings in 36 cats

Harriet Hahn[1] | Swan Specchi[2] | Isabelle Masseau[3] | Carol Reinero[4] | Ghita Benchekroun[5] | Jaime Rechy[6] | Gabriela Seiler[6] | Pascaline Pey[1]



TREE-IN-BUD

- bronchial or bronchiolar plugging & dilation
- Rads underestimate number & severity compared to CT
- CT better able to distinguish interstitial nodules from bronchial associated dz
- **16%** of cats were asymptomatic
- **33%** dx w/ bronchial disease
- **64%** presumed dx bronchial disease (d/t clinical signs)

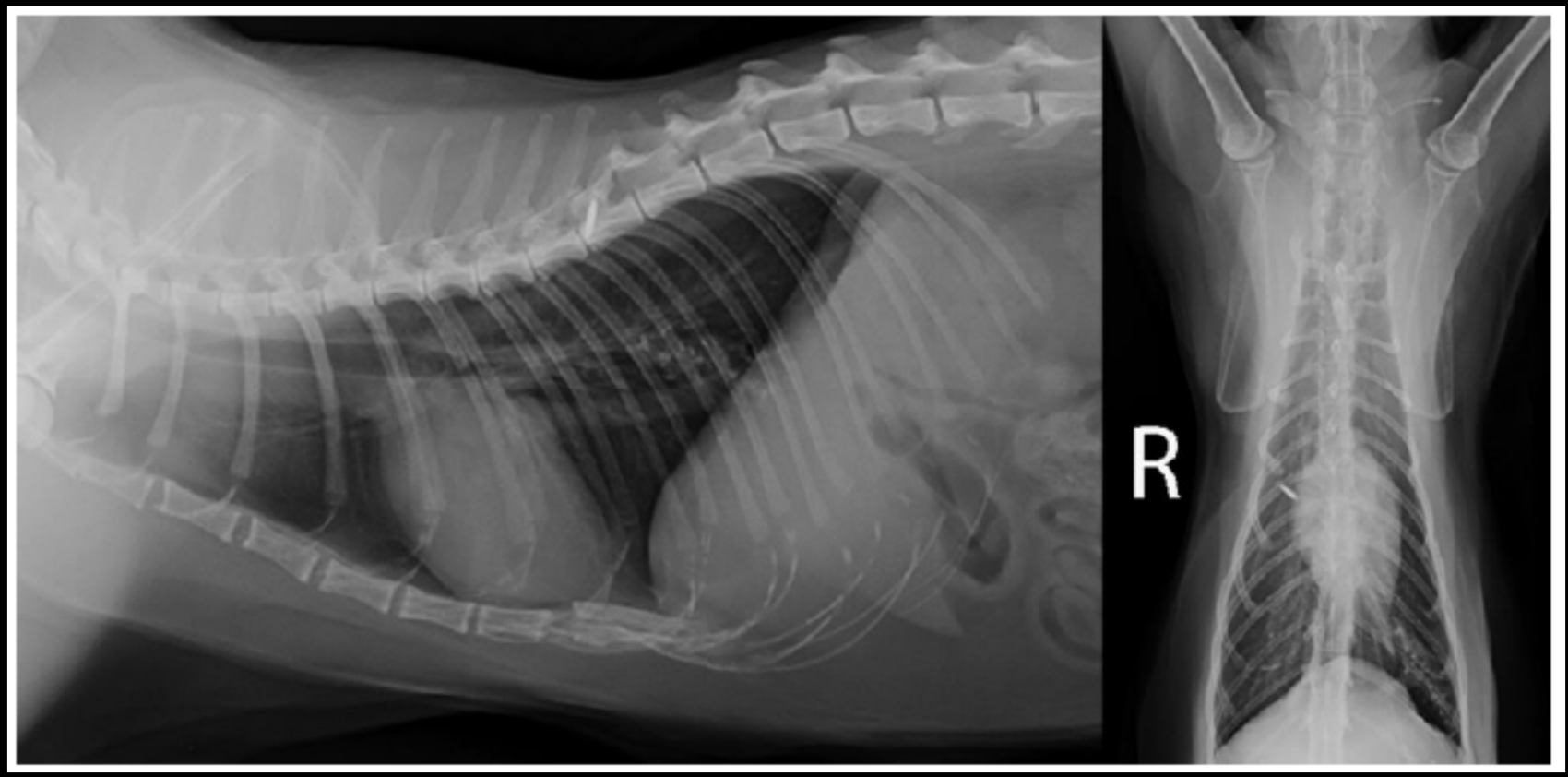
BRONCHOLITHIASIS

Dystrophic mineralization of intraluminal bronchial secretions secondary to chronic inflammatory airway disease

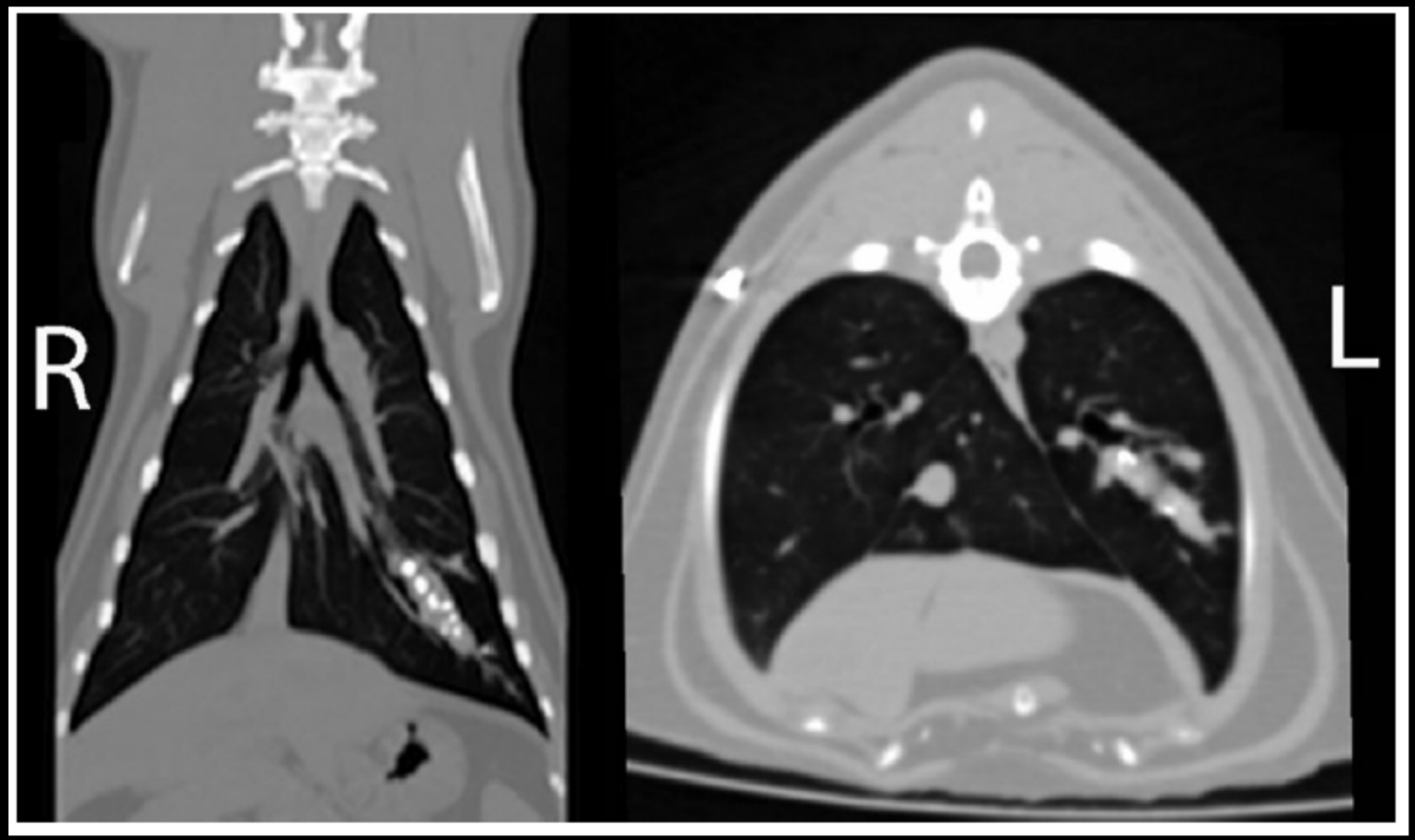
CT findings in two cats with broncholithiasis

Patrick Byrne[1], James S Berman[1], Graeme Sutcliffe Allan[2], Jennifer Chau[1] and Vanessa R Barrs[1]

BRONCHOLITHIASIS



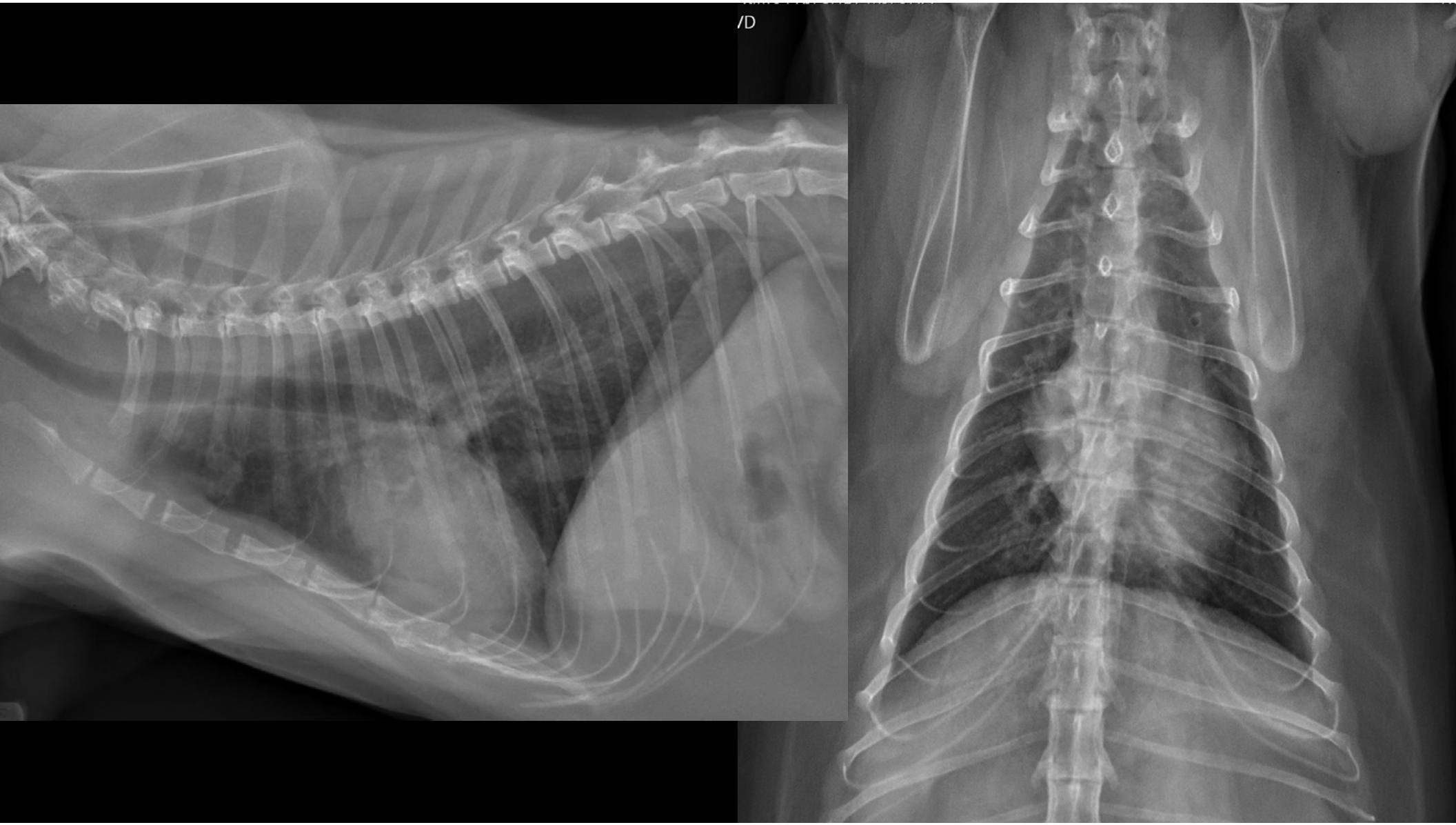
BRONCHOLITHIASIS



Case 5

Signalment: 5y MC DLH
Chief Complaint: non-progressive, chronic stertor/snoring for 4 years; audible respiration from across the room; occasional cough

Physical exam:
- BCS 7/9
- T: normal; P: 180 bpm; R: 32 bpm
- Increased BV sounds bilaterally (inhalation)
- Intermittent stertor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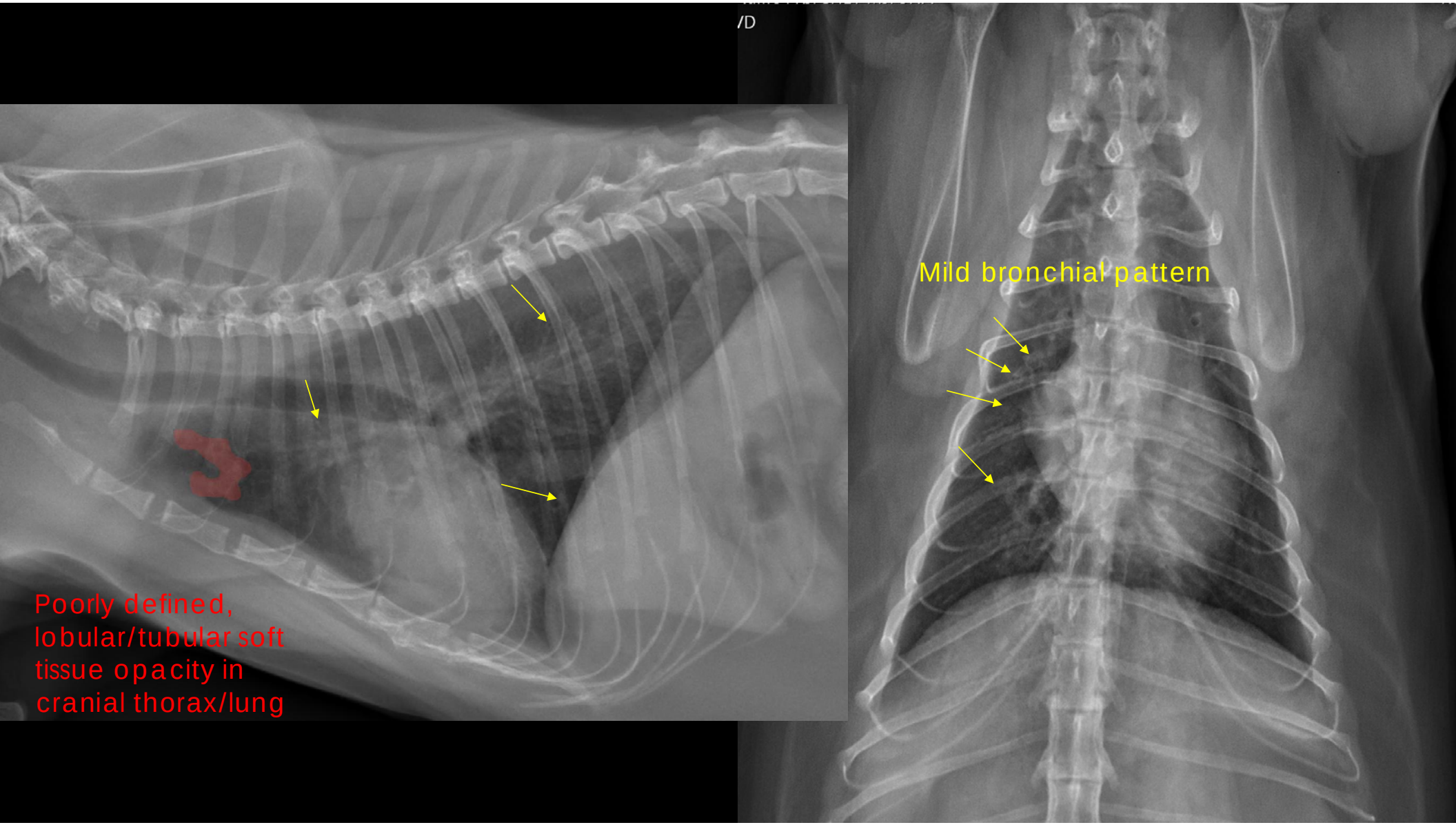
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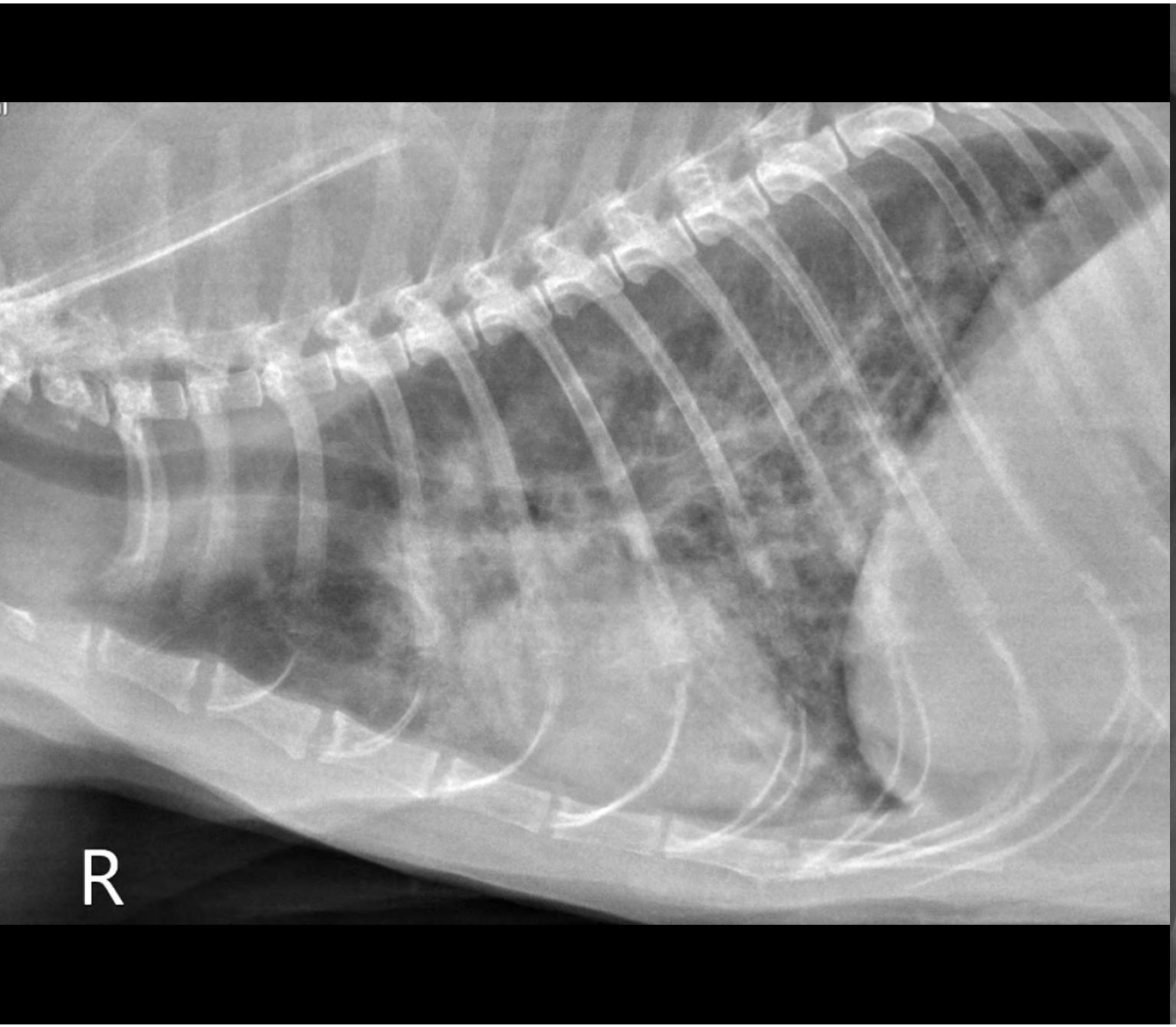
Mild bronchial pattern
Poorly defined, lobular/tubular soft tissue opacity in cranial thorax/lung

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • Overweight BCS (lots of SQ fat) Pleural Space: • normal Pulmonary: • Multiloblar soft tissue opacity in right cranial lung lobe • Mild, diffuse bronchial pattern Mediastinum (including heart): • Normal (with extra fat)	1. Soft tissue opacity in right cranial lung lobe "tree-in-bud" pattern 2. Diffuse bronchial pattern	R/O chronic lower airway /bronchial disease like feline asthma with secondary bronchial dilation	Airway sampling Baermann fecal +/- HWT +/- Empirical therapy for ddx Consider close exam/imaging to rule out rhinitis or other upper airway dz if necessary

Case 6

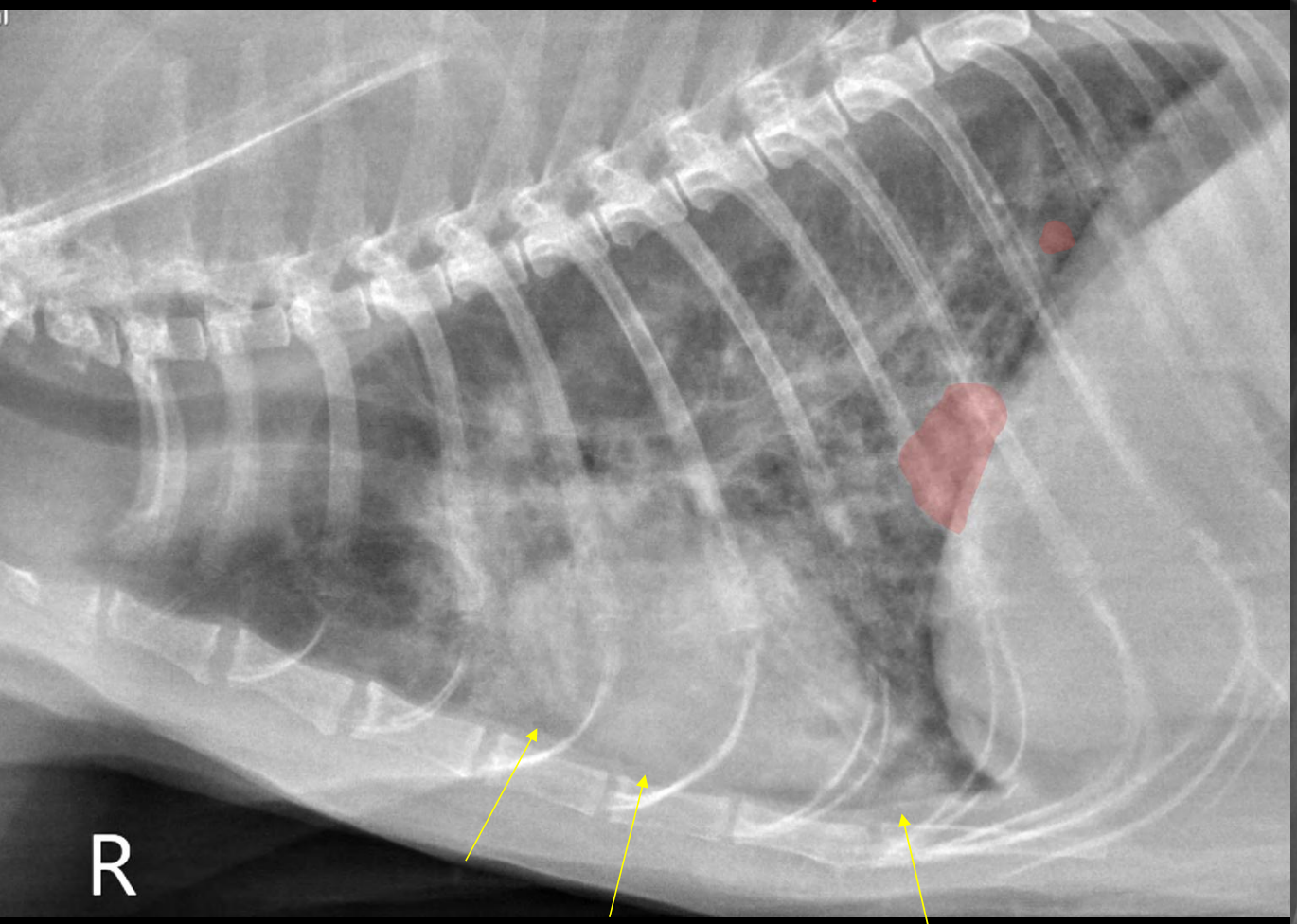
Signalment: 10y MC DSH
Chief Complaint: weight loss, poor appetite

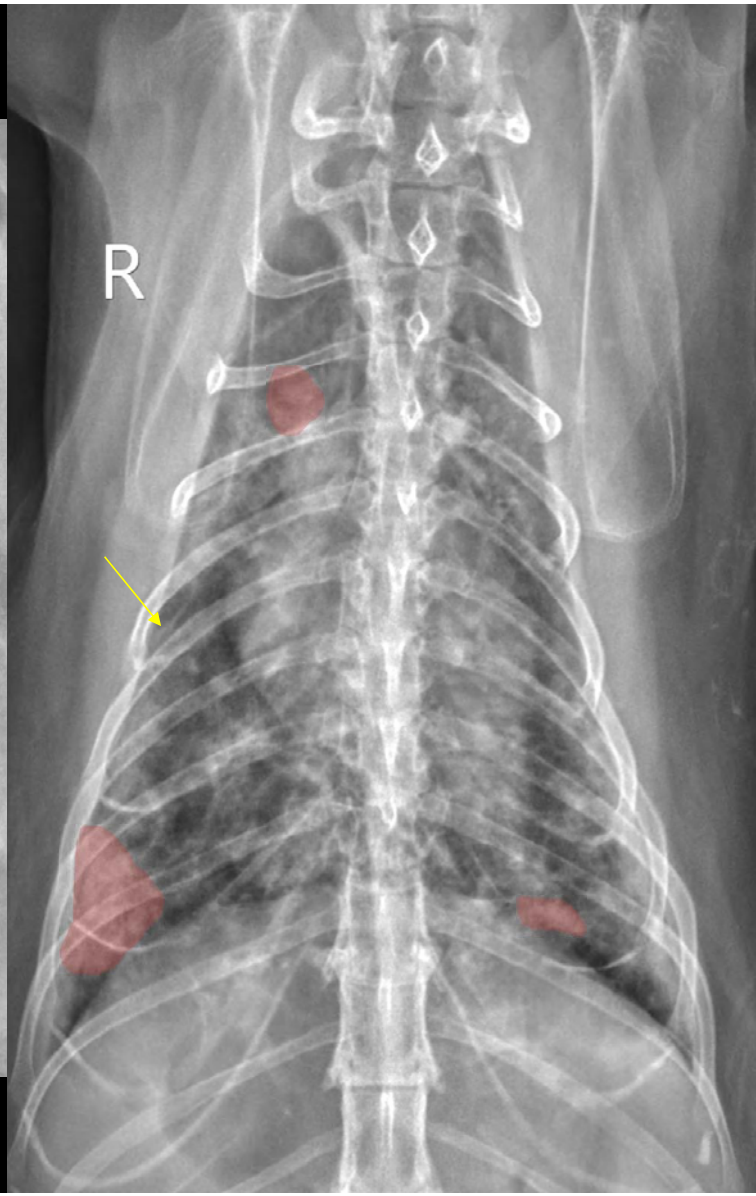
Physical exam:
- T: 102.7F; P: 218 bpm; R: 80 bpm
- BCS 3/9, poor muscle mass
- Prolonged skin tent
- Increased BV sounds bilaterally; no crackles or wheezes
- Severe dental disease


R


R

Multifocal pulmonary infiltrates,
some of which have a shape.. Nodules??





Scant fluid opacity in pleural space; thin pleural fissure
line between right cranial/right middle lung lobes

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • nsf Pleural Space: • Mildly incr soft tissue/fluid opacity in pleural space? Ventral to heart Pulmonary: • Moderate to severe, diffuse/multifocal patchy interstitial coalescing to alveolar infiltrates; • variably sized soft tissue nodules throughout all lungs Mediastinum (including heart): • Normal (with extra fat)	1. Moderate to severe, patchy/multifocal mixed pulmonary pattern (with nodules) 2. Probable mild pleural effusion	DDX: granulomatous disease (fungal, eosinophilic, parasitic) or neoplasia (metastatic or infiltrative round cell) *Confirmed Histoplasma infection via necropsy	Lots of ways this could go.. • Baseline blood work + UA • Fungal antigen testing • Abdominal imaging (US) • Possible airway sampling and/or thoracic US with guided nodule aspirates • Baermann fecal • +/- HWT

NODULAR (INTERSTITIAL) PATTERN DDX

C
- **C**yst

H
- **H**ematoma, hematocele

A
- **A**bscess

N
- **N**eoplasia
  - Primary lung tumor
  - Metastatic disease

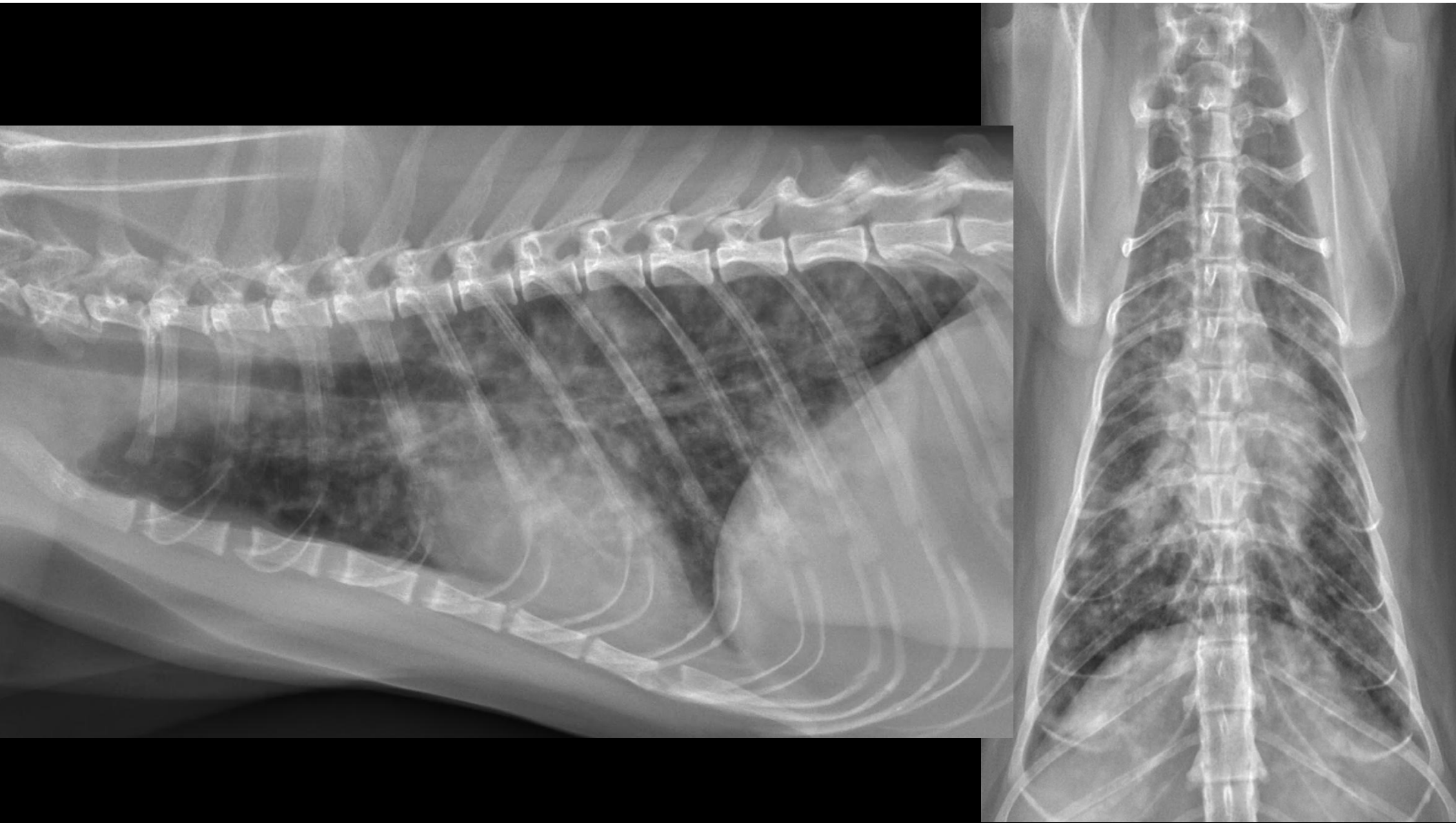
G
- **G**ranuloma
  - Fungal
  - Parasitic (heartworm, lungworm)
  - Foreign body
  - Eosinophilic
  - Bacterial

Also…
- Fluid filled bulla
- Mucus filled bronchus

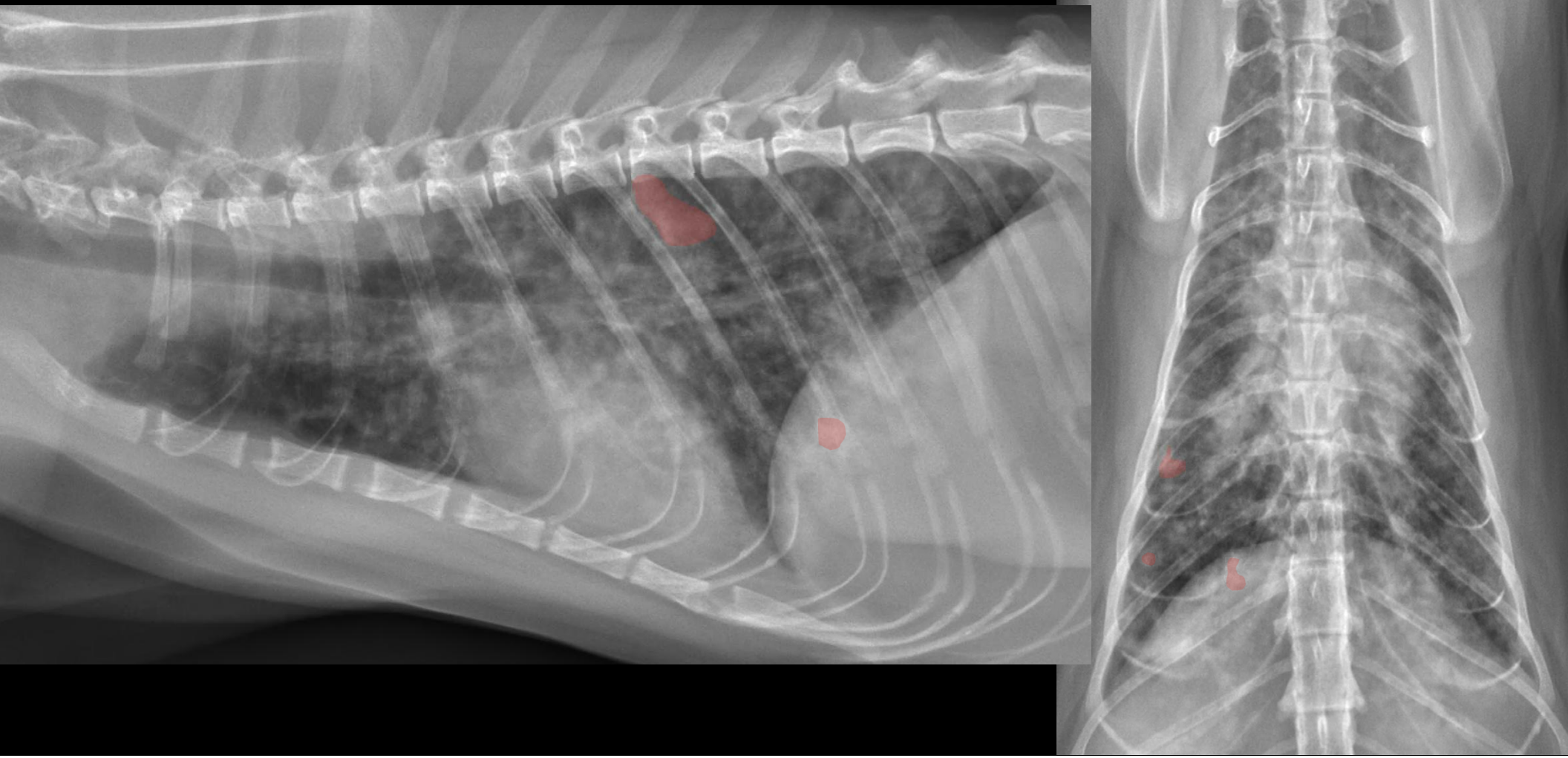
Case 7

Signalment: 6y MC Siamese
Chief Complaint: chronic lethargy, anorexia

Physical exam:
- T: 102.6F; P: 180 bpm; R: 80 bpm
- BCS 7/9
- Otherwise normal



Severe, diffuse bronchial & interstitial patterns with
multifocal soft tissue nodules



Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • nsf Pleural Space: • nsf Pulmonary: • Severe, diffuse bronchial & interstitial patterns that seem to coalesce into small/multifocal nodules Mediastinum (including heart): • nsf	1. Severe, diffuse bronchial & interstitial patterns w/ likely multifocal nodules MIXED pulmonary pattern	DDX: granulomatous disease (fungal, eosinophilic, parasitic) bronchial disease (w/ mucus plugging) or neoplasia (metastatic or infiltrative round cell) *Confirmed Histoplasma infection via fungal antigen titers	Lots of ways this could go.. • Baseline blood work + UA • Fungal antigen testing • Abdominal imaging (US) • Possible airway sampling • Baermann fecal • +/- HWT

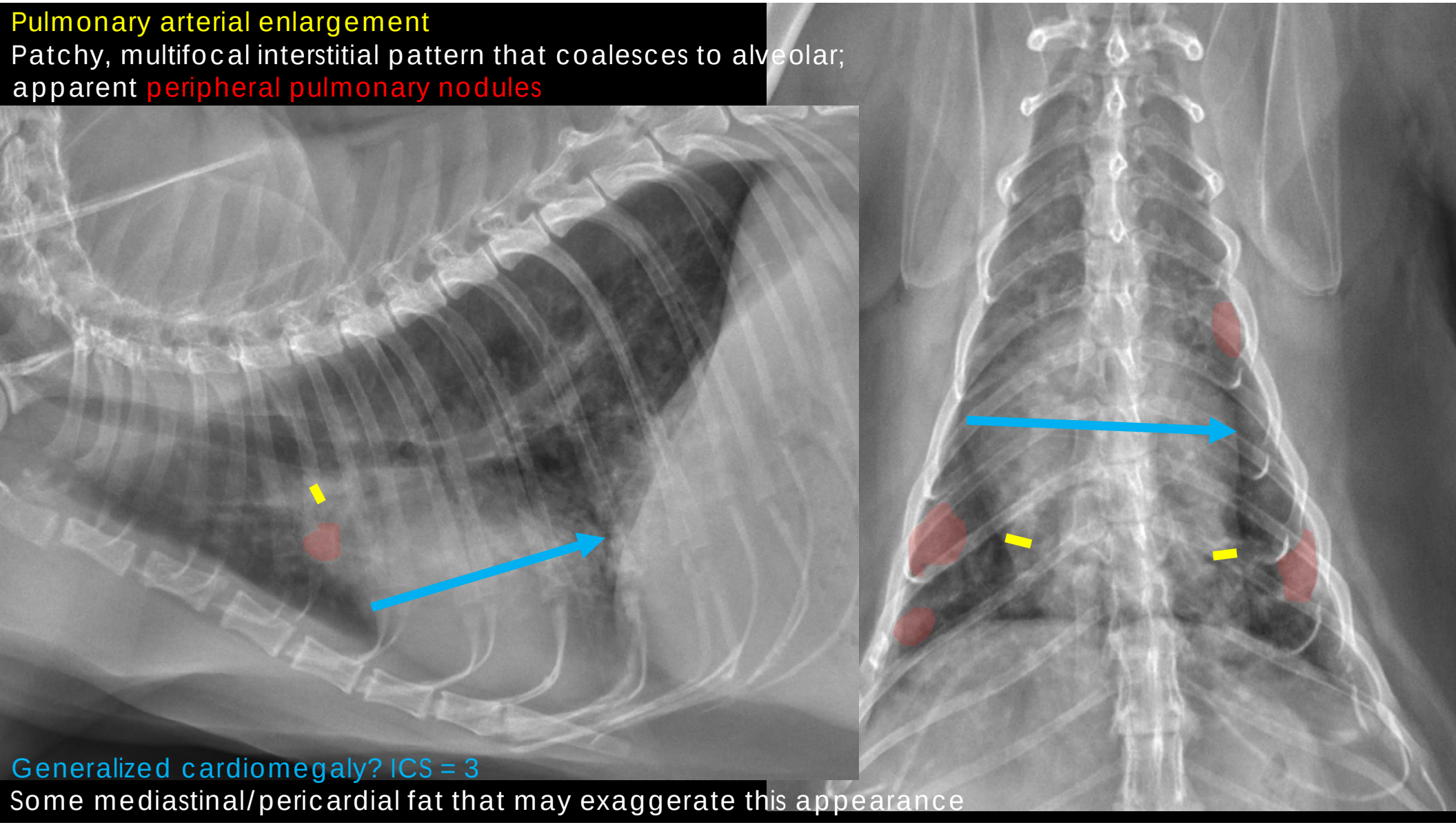
Case 8

Signalment: 11y MC DSH
Chief Complaint: increased respiratory rate, decreased appetite

Physical exam:
- T: 100.8F; P: 172 bpm; R: 58 bpm
- BCS 6/9
- Otherwise normal

Pulmonary arterial enlargement

Patchy, multifocal interstitial pattern that coalesces to alveolar; apparent peripheral pulmonary nodules



Generalized cardiomegaly? ICS = 3

Some mediastinal/pericardial fat that may exaggerate this appearance

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • nsf Pleural Space: • nsf Pulmonary: • Pulmonary arterial enlargement • Multifocal interstitial/alveolar pattern with nodules Mediastinum (including heart): • Possible generalized cardiomegaly • Increased fat in the mediastinum…	1. MIXED pulmonary pattern with nodules	DDX: granulomatous disease (fungal, eosinophilic, parasitic) bronchial disease (w/ mucus plugging) or neoplasia (metastatic or infiltrative round cell) *heart normal on echo; mildly enlarged MPA on echo = pulmonary hypertension? *Confirmed Histoplasma infection via fungal antigen titers	Lots of ways this could go.. • Baseline blood work + UA • Fungal antigen testing • HWT (bumped up because of PA enlargement!) • Abdominal imaging (US) • Possible airway sampling • Baermann fecal

HISTOPLASMOSIS

- Clinical presentation can be nonspecific
- 6/15 cats (40%) had normal thoracic radiographs
- 9/15 cats (60%) had interstitial (diffuse or nodular), miliary, or mixed patterns

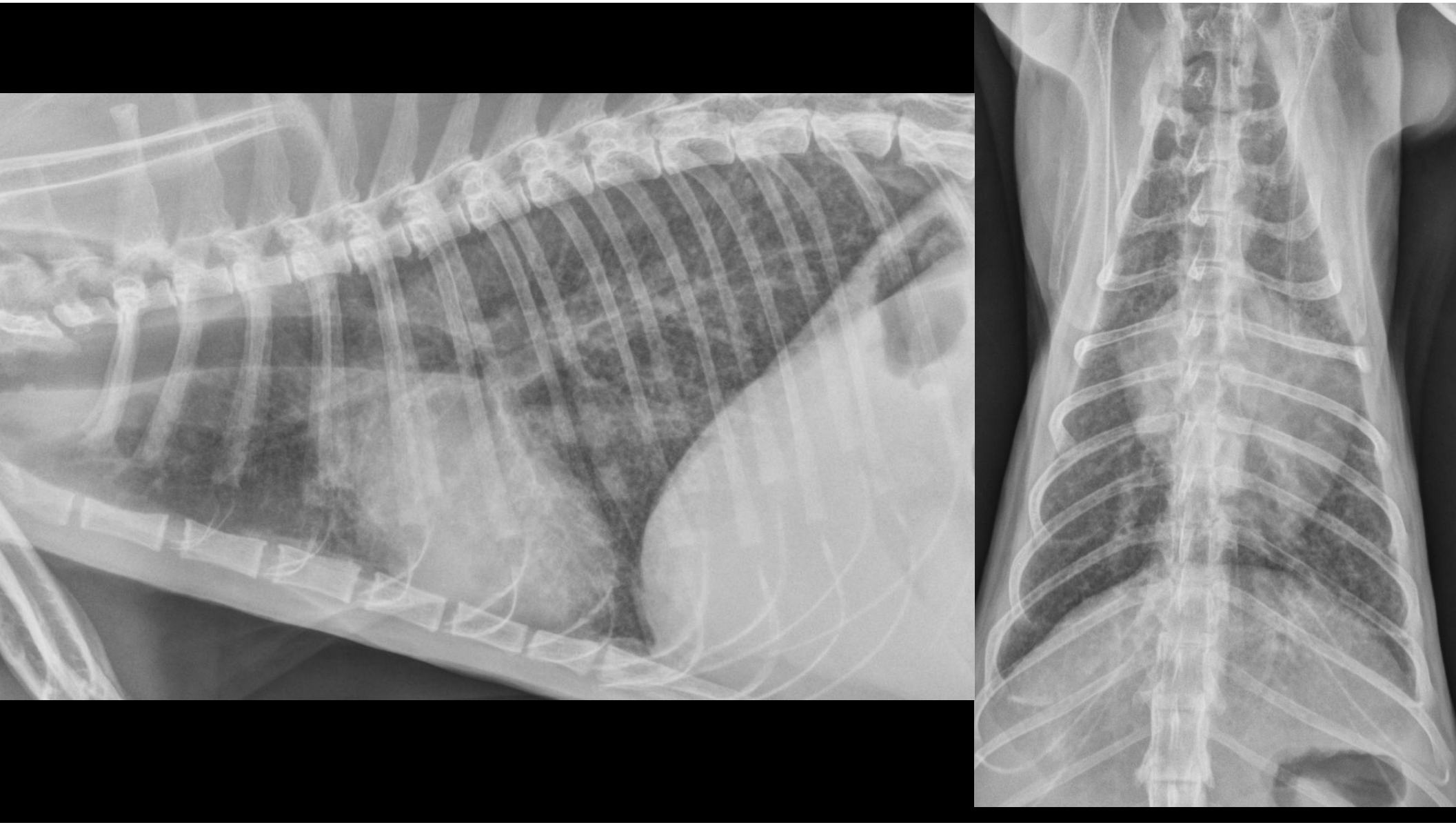
Feline Histoplasmosis: A Retrospective Study of 22 Cases (1986–2009)

Harmeet K. Aulakh, BVSc&AH, MVSc, Karanvir S. Aulakh, BVSc&AH, MS, Gregory C. Troy, DVM, MS, DACVIM

Case 9

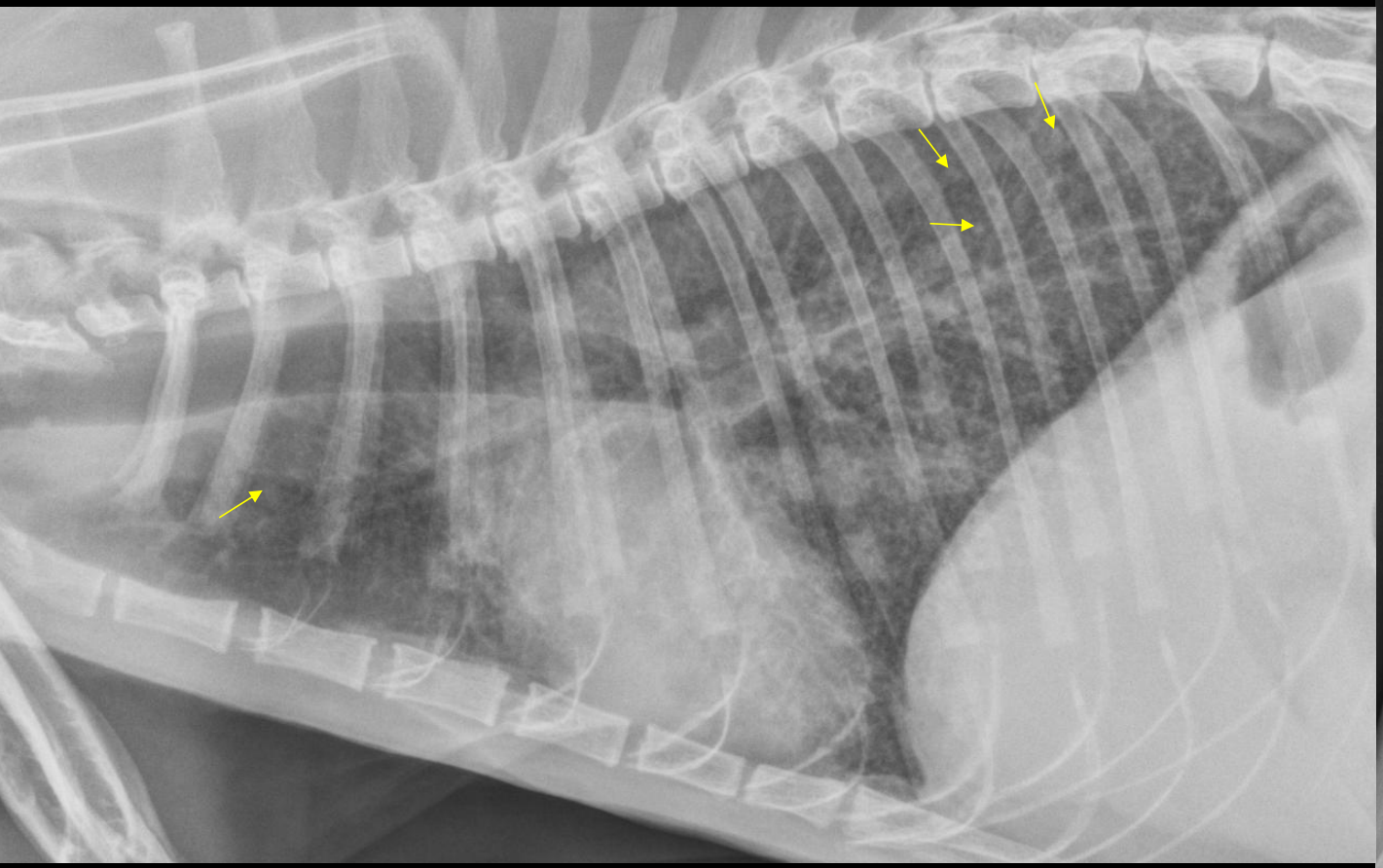
Signalment: 11y MC DSH
Chief Complaint: weight loss (chronic)

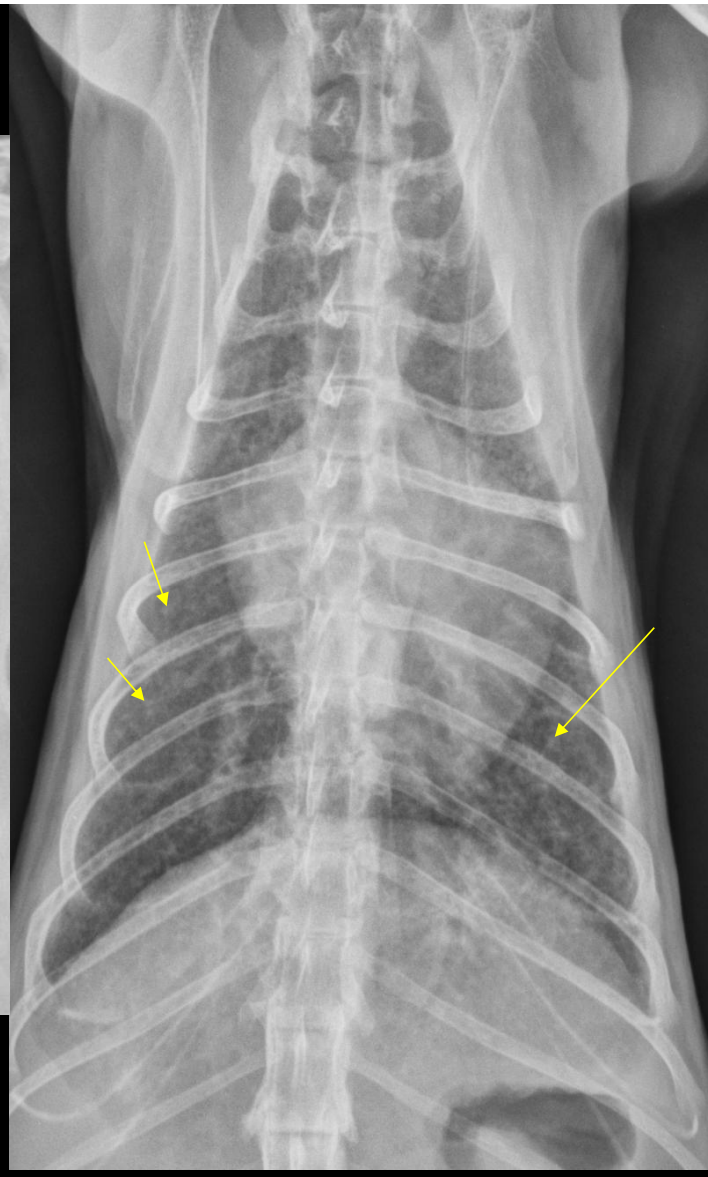
Physical exam:
- T: normal; P: 190 bpm; R: 60 bpm
- BCS 4/9
- Tachypneic with episodes of abdominal effort when stressed; increased BV sounds bilaterally
- Otherwise normal



Diffuse pulmonary interstitial and bronchial patterns

Milary nodules?!





Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • nsf Pleural Space: • nsf Pulmonary: • Severe, diffuse bronchial & interstitial patterns with miliary nodules suspected Mediastinum (including heart): • nsf	1. MIXED pulmonary pattern with nodules	DDX: granulomatous disease (fungal, eosinophilic, parasitic) or less likely neoplasia (infiltrative round cell vs metastatic) *heart normal on echo; mildly enlarged MPA on echo = pulmonary hypertension? *Confirmed Histoplasma infection via splenic aspirate (splenomegaly) Primary bronchial diseases are unlikely with concurrent interstitial/alveolar infiltrates	Lots of ways this could go.. • Baseline blood work + UA • Fungal antigen testing • HWT (bumped up because of PA enlargement!) • Abdominal imaging (US) • Possible airway sampling • Baermann fecal

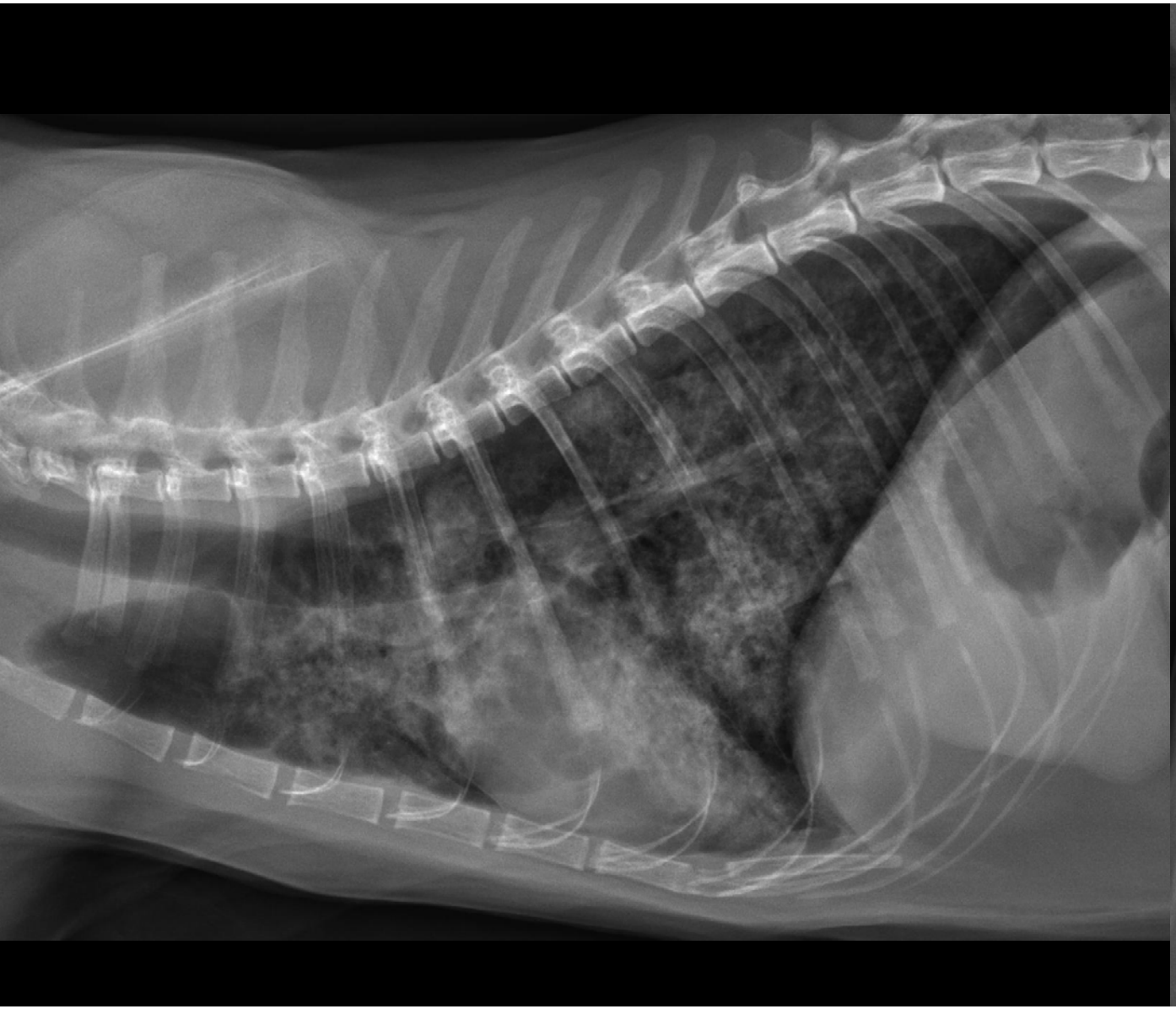
INTERSTITIAL (UNSTRUCTURED) PATTERN DDX

- Pulmonary edema
  - Cardiogenic vs non-cardiogenic
- Pneumonia
  - Fungal, viral, bacterial
- Pneumonitis
  - eosinophilia [HW], uremia, leptospirosis, irritant
- Fibrosis
  - degenerative or pathologic
- Hemorrhage
  - Contusion vs coagulopathy
- Vasculitis
- Diffuse neoplasia (lymphoma)
- Pulmonary mineralization

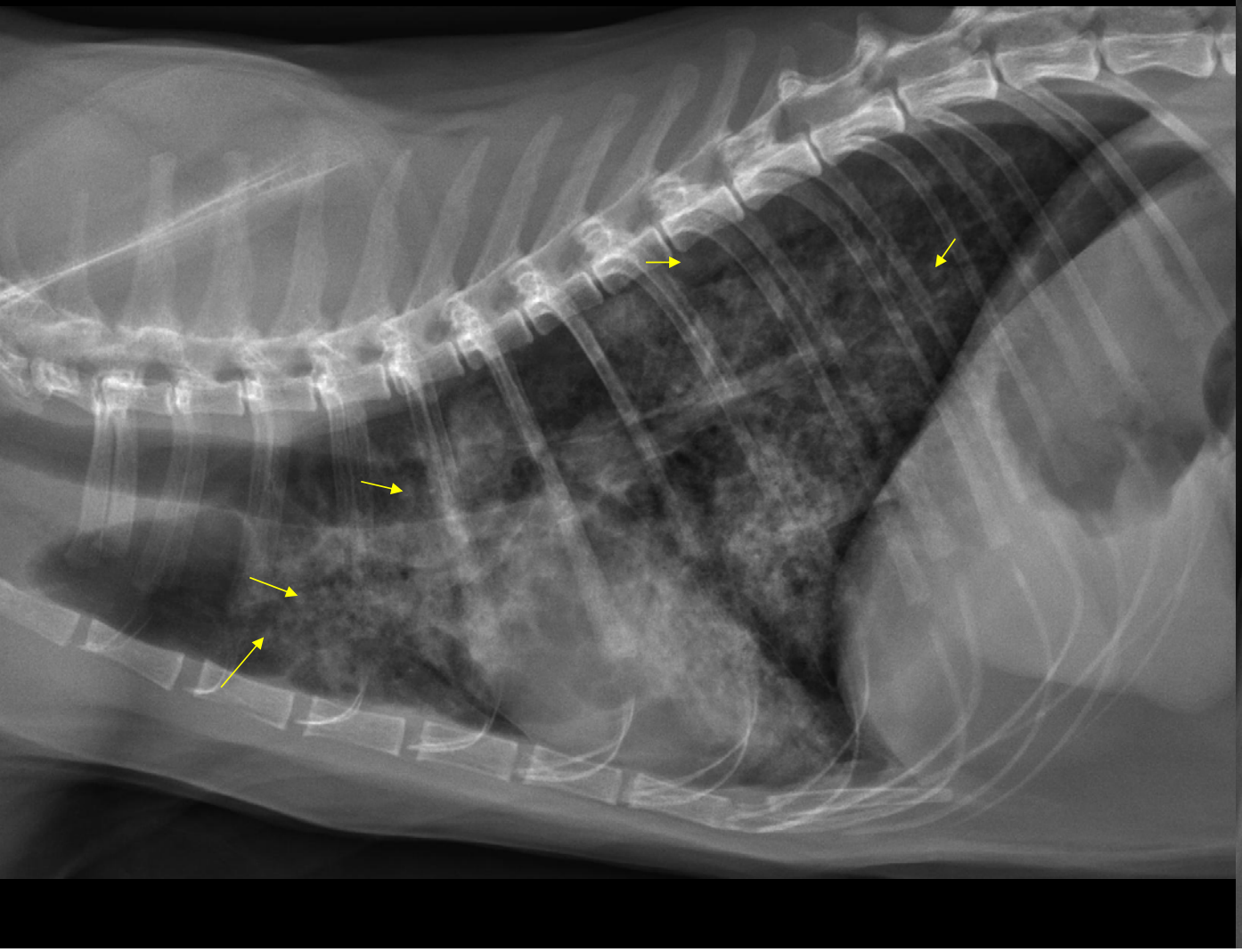
Case 10

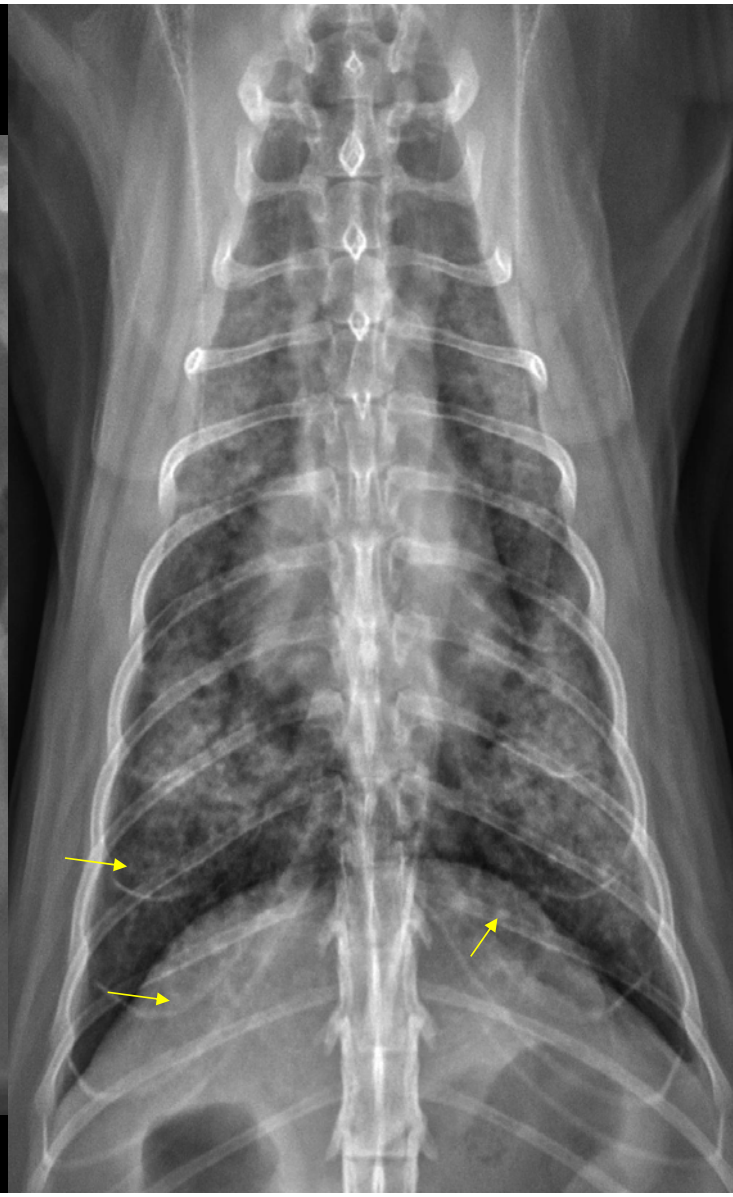
Signalment: 4y MC DLH
Chief Complaint: respiratory difficulty (acute onset, 2wk duration), worsened with steroid therapy

Physical exam:
- T: normal; P: 190 bpm; R: 60 bpm
- BCS 4/9
- Tachypneic with episodes of abdominal effort when stressed; increased BV sounds bilaterally
- Otherwise normal



Severe, military interstitial pattern coalescing to alveolar





Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • nsf Pleural Space: • nsf Pulmonary: • Severe, diffuse interstitial & alveolar patterns with miliary nodules Mediastinum (including heart): • Nsf	1. MIXED pulmonary pattern with nodules	DDX: granulomatous disease (fungal, eosinophilic, parasitic) or less likely neoplasia (round cell?) *heart normal on echo; mildly enlarged MPA on echo = pulmonary hypertension? *Confirmed Histoplasma infection via urine antigen & necropsy (lung, tracheobronchial lymph node, spleen)	Lots of ways this could go.. • Baseline blood work + UA • Fungal antigen testing • Abdominal imaging (US) • Possible airway sampling • Baermann fecal

LUNGWORM

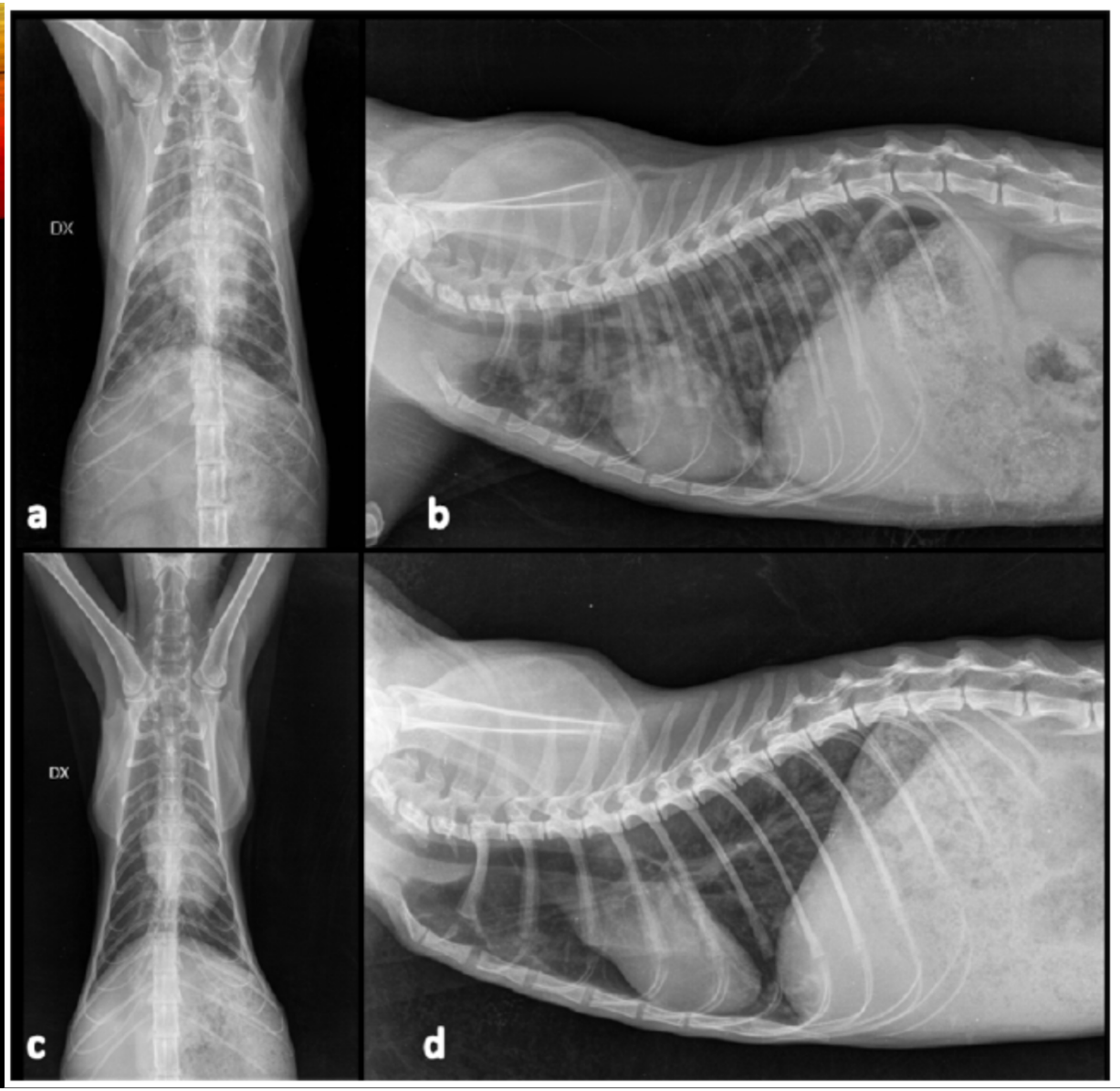
- Important DDx for pulmonary infiltrates!
  - May be asymptomatic; consider endemic areas
- Dx - airway lavage sampling, Baermann, +/- fecal flotation
- Can Tx empirically w/o definitive Dx
  - fenbendazole, ivermectin, selamectin

LUNGWORM

- Radiographic patterns (24 cats):
  - Interstitial – 24
    - unstructured = 19
    - nodular = 5
  - Bronchial = 21
  - Alveolar = 10
- Caudal lobar pulmonary arterial dilation = 2

Single and mixed feline lungworm infections: clinical, radiographic and therapeutic features of 26 cases (2013–2015)

Paolo E Crisi, Giovanni Aste, Donato Traversa, Angela Di Cesare, Elettra Febo, Massimo Vignoli, Domenico Santori, Alessia Luciani and Andrea Boari



LUNGWORM

LUNGWORM

Prevalence survey of gastrointestinal and respiratory parasites of shelter cats in northeastern Georgia, USA

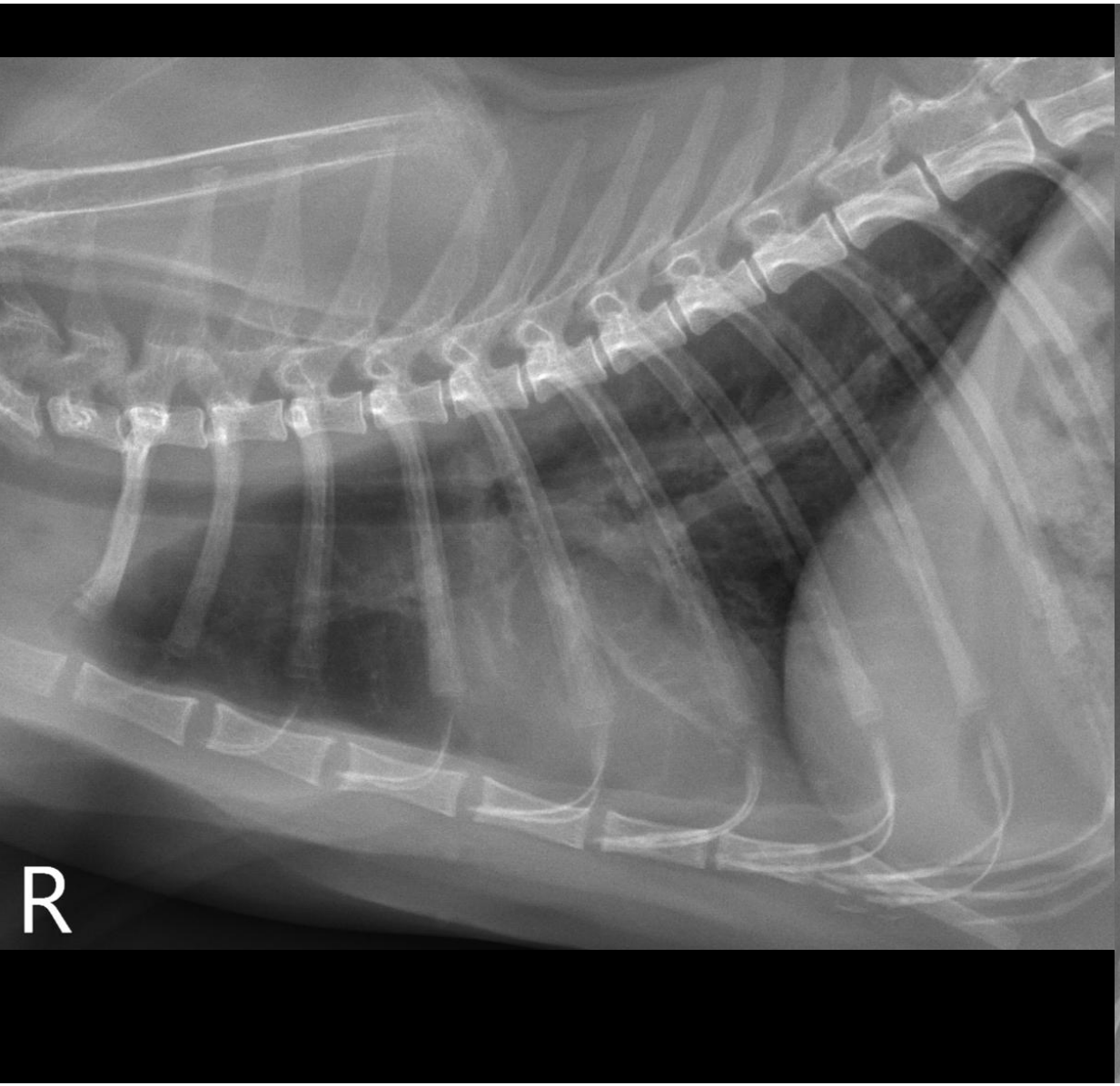
Kristen R. Hoggard, Dixie M. Jarriel, Thomas J. Bevelock, Guilherme G. Verocai*,1

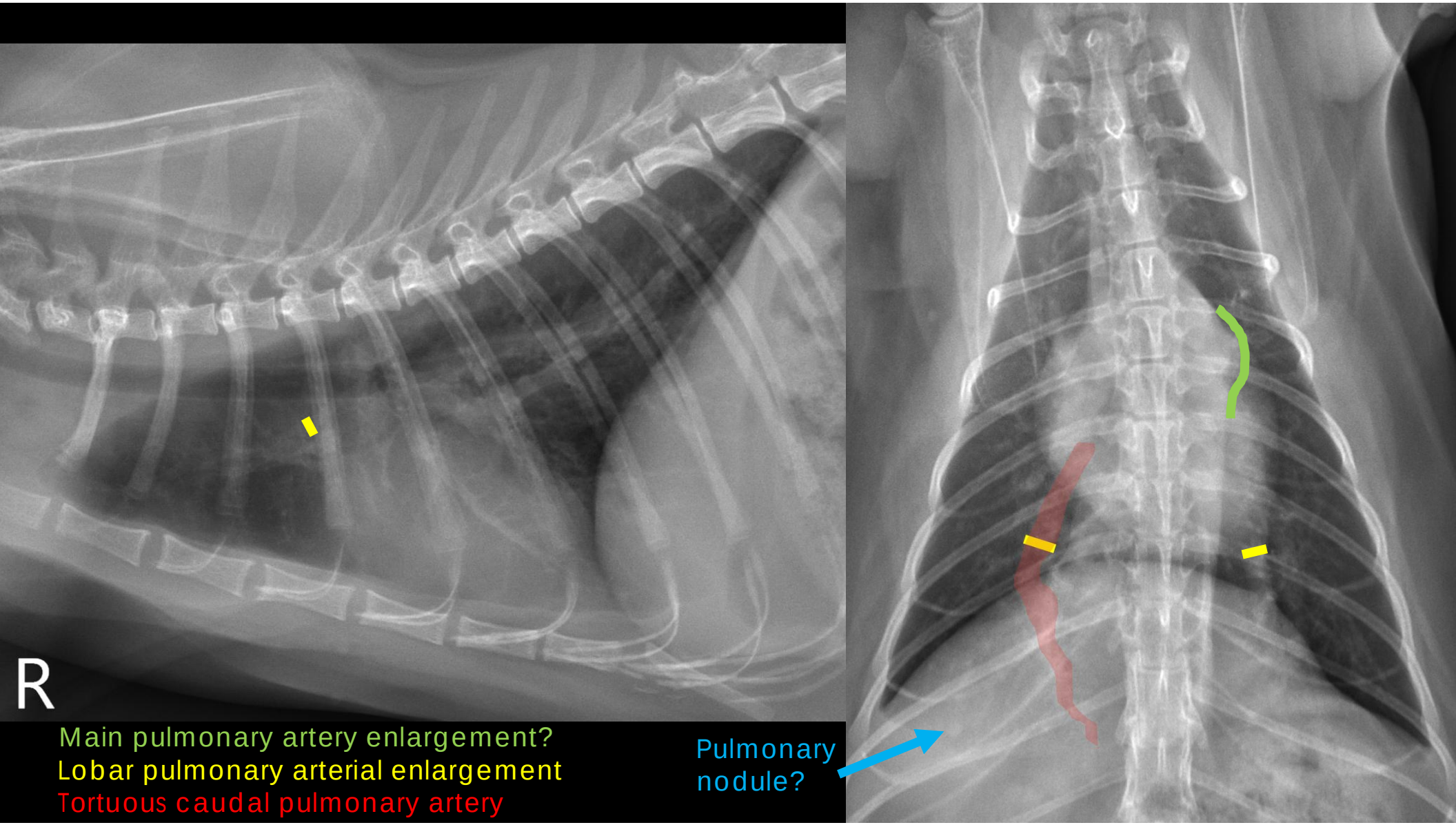
"A recent [European] prevalence study…using the Baermann method has found that feline lungworm prevalence is higher than historically reported, which may indicate that current prevalence reports of A. abstrusus *within the US may be inaccurate."*

Case 11

Signalment: 6y FS DSH
Chief Complaint: acute coughing fit resulting in collapse; seen 1 month ago for wheezing, sneezing, and nasal discharge

Physical exam:
- BCS 6/9
- T: 102F; P: 176 bpm; R: 24 bpm
- II/VI right basilar murmur
- Normal BV sounds bilaterally; no crackles/wheezes
- No ocular or nasal discharge today


R



R
Main pulmonary artery enlargement?
Lobar pulmonary arterial enlargement
Tortuous caudal pulmonary artery
Pulmonary nodule?

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • NSF Pleural Space: • normal Pulmonary: • Enlarged, tortuous caudal pulmonary arteries • Thickened large bronchial walls • Suspect small pulmonary nodule in right caudal lung lobe Mediastinum (including heart): • Main pulmonary arterial enlargement?	1. Enlarged, tortuous pulmonary arteries 2. Right caudal pulmonary nodule	R/O pulmonary hypertension – secondary to heartworm disease or chronic airway/interstitial disease R/O pulmonary granuloma (eosinophilic secondary to HW vs other) less likely neoplasia; poorly correlated on orthogonal view, so could also consider mammary papilla, skin tag, etc Heartworms intermittently seen in right ventricle on echo	HWT Echo +/- fungal antigen testing +/- Baermann Could consider all 4 views for radiographs +/- CT to look for additional pulmonary nodules

HEARTWORM

- REMEMBER: a common clinical sign is … VOMITING.
  (in addition to respiratory signs)
- Radiographic findings:
  - MPA and/or peripheral pulmonary arterial enlargement
  - Tortuous lobar arteries (esp right caudal lung lobe)
  - Patchy, peripheral interstitial pattern in caudodorsal lung?
  - Or… normal.
- HARD = heartworm assoc'd respiratory disease
  - ddx asthma, bronchitis, maybe lungworm

HEARTWORM

Radiographic Diagnosis of Feline Heartworm Disease and Correlation to Other Clinical Criteria: Results of a Multicenter Clinical Case Study

W.R. Brawner, Jr[a]
A.R. Dillon[a]
C.K. Robertson-Plouch[b]
J. Guerrero[b]

Table 1. Heartworm Score Criteria

Score	*Definition*	*Criteria*
0	No radiographic sign of FHD	No radiographic changes consistent with FHD
0.5	Consistent with but not specific for FHD	Increased bronchointerstitial opacity only
1	Mildly indicative of FHD	Caudal lobar artery enlargement with or without pulmonary or other abnormalities
2	Moderately indicative of FHD	Caudal lobar artery enlargement with or without pulmonary or other abnormalities
3	Strongly indicative of FHD	Caudal lobar artery enlargement with or without pulmonary or other abnormalities

Initial and follow up testing in 2-3 mo

Degree of suspicion for HW on Rads

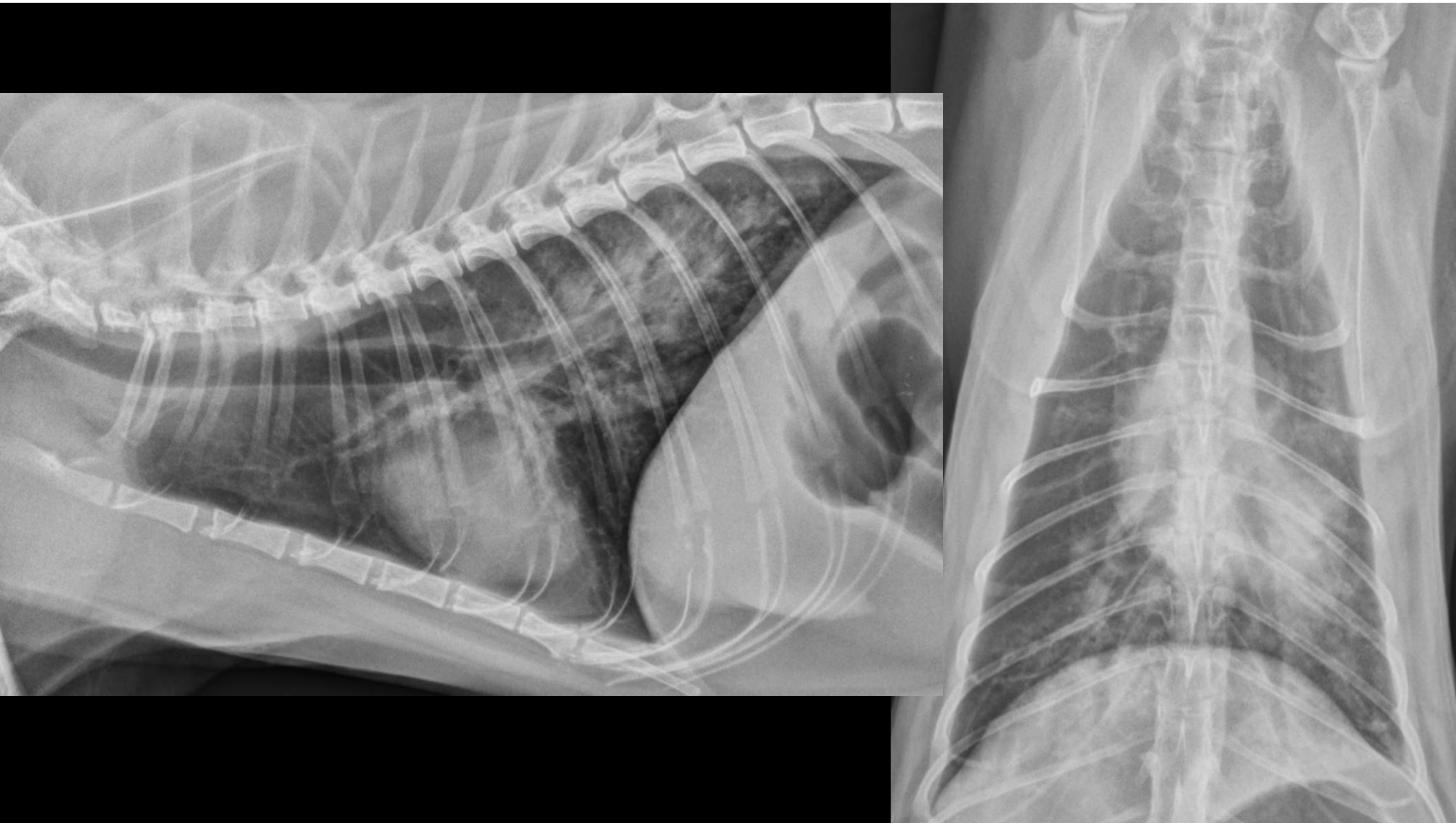
Cats Submitted

Radiographic Score	*No. cats (n = 212)*	*No. antibody positive by one or both tests*
3	6 (3%)	5/6 (83%)
2	14 (7%)	10/14 (71%)
1	18 (8%)	8/18 (44%)
0.5	52 (25%)	17/52 (33%)
0	122 (58%)	53/122 (43%)

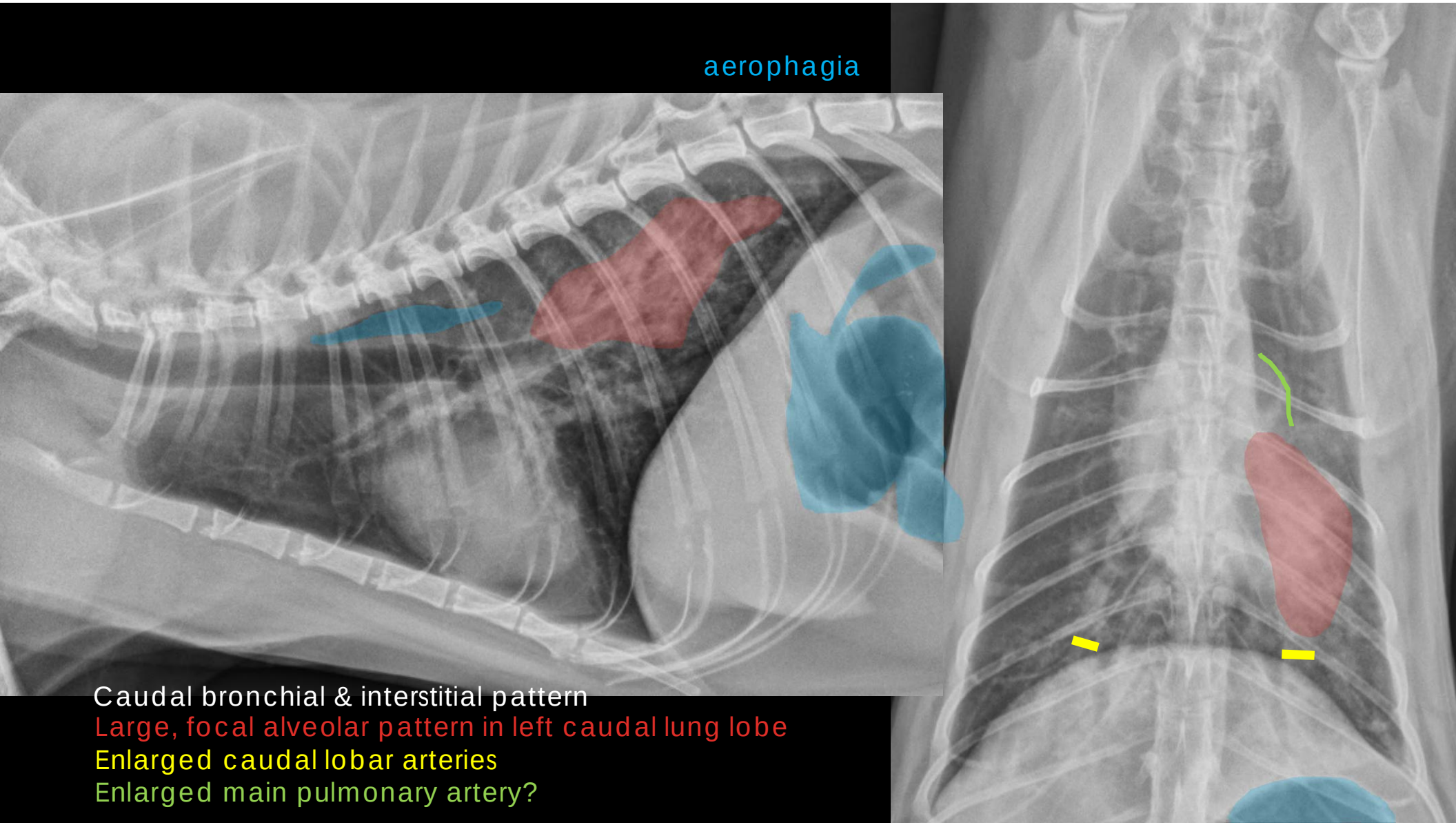
Case 12

Signalment: 10y MC DSH
Chief Complaint: acute difficulty breathing, lethargic; recent onset daily vomiting

Physical exam:
- BCS 4/9
- T: 99.5F; P: 150 bpm; R: 72 bpm
- Poorly responsive on presentation
- Rapid, shallow, open-mouth breathing
- Very thick saliva in oral cavity
- Increased BV sounds bilaterally; no crackles or wheezes



aerophagia



Caudal bronchial & interstitial pattern

Large, focal alveolar pattern in left caudal lung lobe

Enlarged caudal lobar arteries

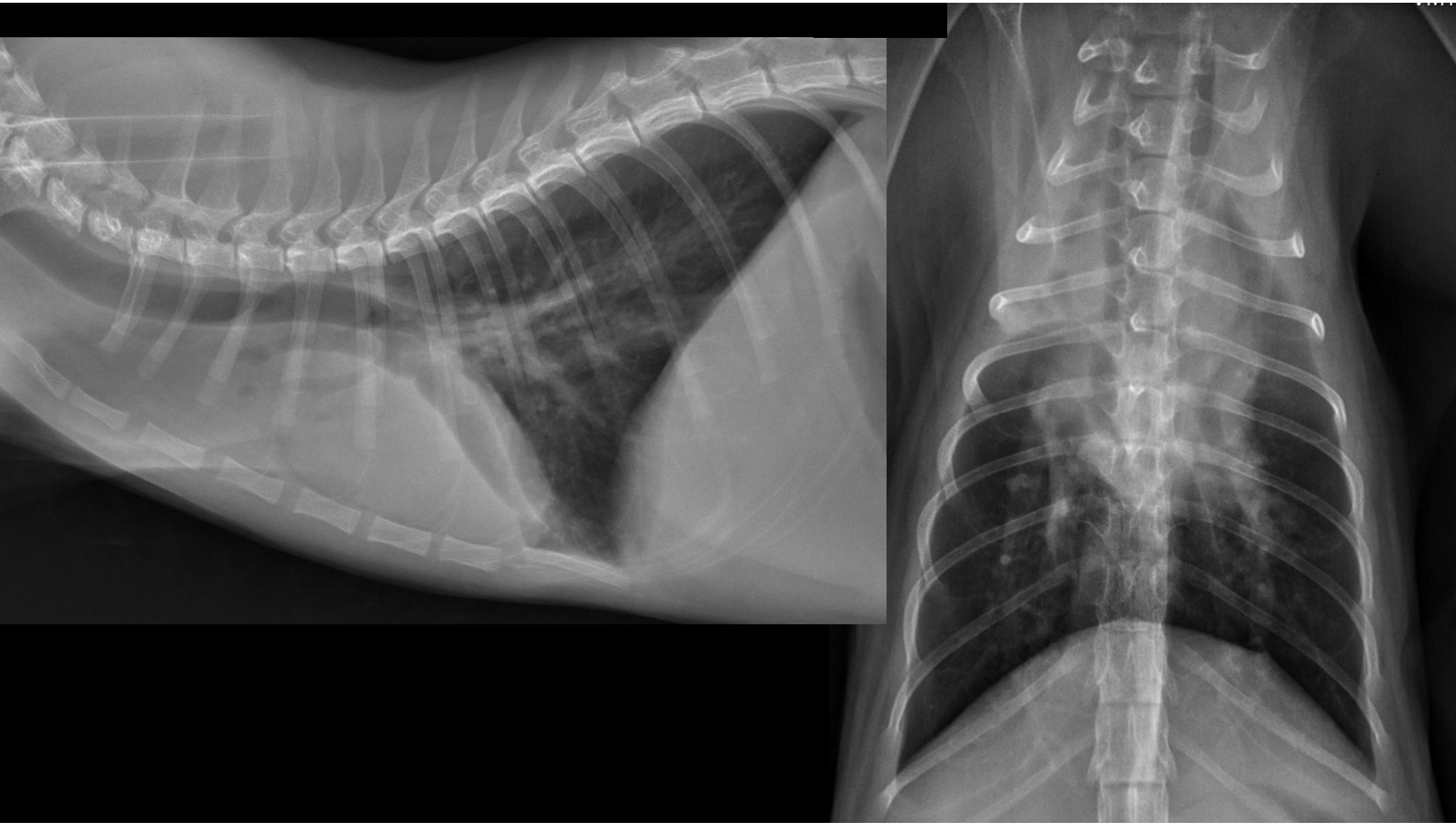
Enlarged main pulmonary artery?

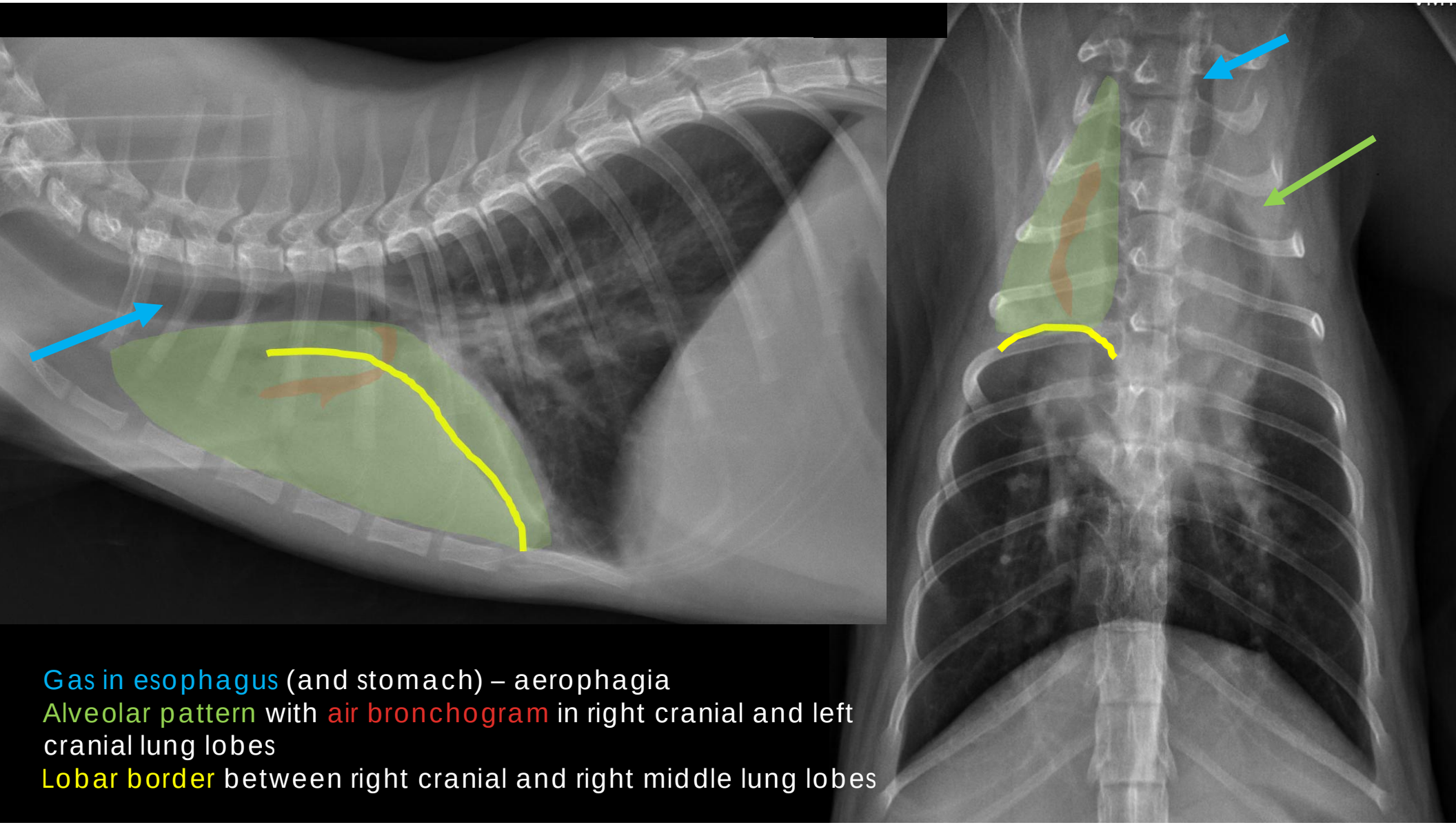
Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • Gas filled stomach & intestine Pleural Space: • normal Pulmonary: • Large, focal alveolar pattern in left caudal lung lobe (elongated shape?) • Enlarged caudal pulmonary arteries • Caudal bronchial & interstitial patterns Mediastinum (including heart): • Main pulmonary arterial enlargement? • Gas in intrathoracic esophagus	1. Focal alveolar pattern in left caudal lung lobe 2. Caudal lobar arterial enlargement 3. Main pulmonary arterial enlargement? 4. aerophagia	R/O pulmonary thromboembolism (more likely to cause acute dyspnea than neoplasia) Or pulmonary edema (non-cardiogenic or less likely cardiogenic) Or neoplasia Or granuloma R/O pulmonary hypertension – secondary to **heartworm disease** or chronic airway/interstitial disease	HWT Echo +/- fungal antigen testing +/- Baermann Baseline blood work + UA

Case 13

Signalment: 7mo M DLH
Chief Complaint: respiratory distress (acute onset today), 5d history of cough

Physical exam:
- T: 103.2F; P: 122 bpm; R: 36 bpm (increased effort)
- QAR
- Mild brown crusting around nares
- Otherwise normal





Gas in esophagus (and stomach) – aerophagia
Alveolar pattern with air bronchogram in right cranial and left cranial lung lobes
Lobar border between right cranial and right middle lung lobes

Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • Gas filled stomach Pleural Space: • (*Increased soft tissue opacity in left cranial thorax.. But this is likely all pulmonary*) Pulmonary: • Large lobar border between right cranial and right middle lung lobes • Air bronchograms in right cranial and left cranial lung lobes with diffuse soft tissue consolidation/infiltrates Mediastinum (including heart): • Border effacement of cranial heart (with lung dz) • Gas in intrathoracic esophagus	1. Multifocal, cranioventrally distributed alveolar patterns in left and right cranial lung lobes 2. Aerophagia	R/O pneumonia (distribution fits with aspiration etiology; other types less likely, but should r/o bacterial/infectious) R/o aerophagia secondary to respiratory distress	Investigate for underlying cause – Is the cat vomiting? Regurgitating? Being syringe fed? Does the cat have signs of neurologic or laryngeal dz? Begin empirical antibiotic therapy? Supportive care (oxygen, fluid therapy) depending on pt status

ASPIRATION PNEUMONIA

Clinical and radiographic findings in cats with aspiration pneumonia: retrospective evaluation of 28 cases

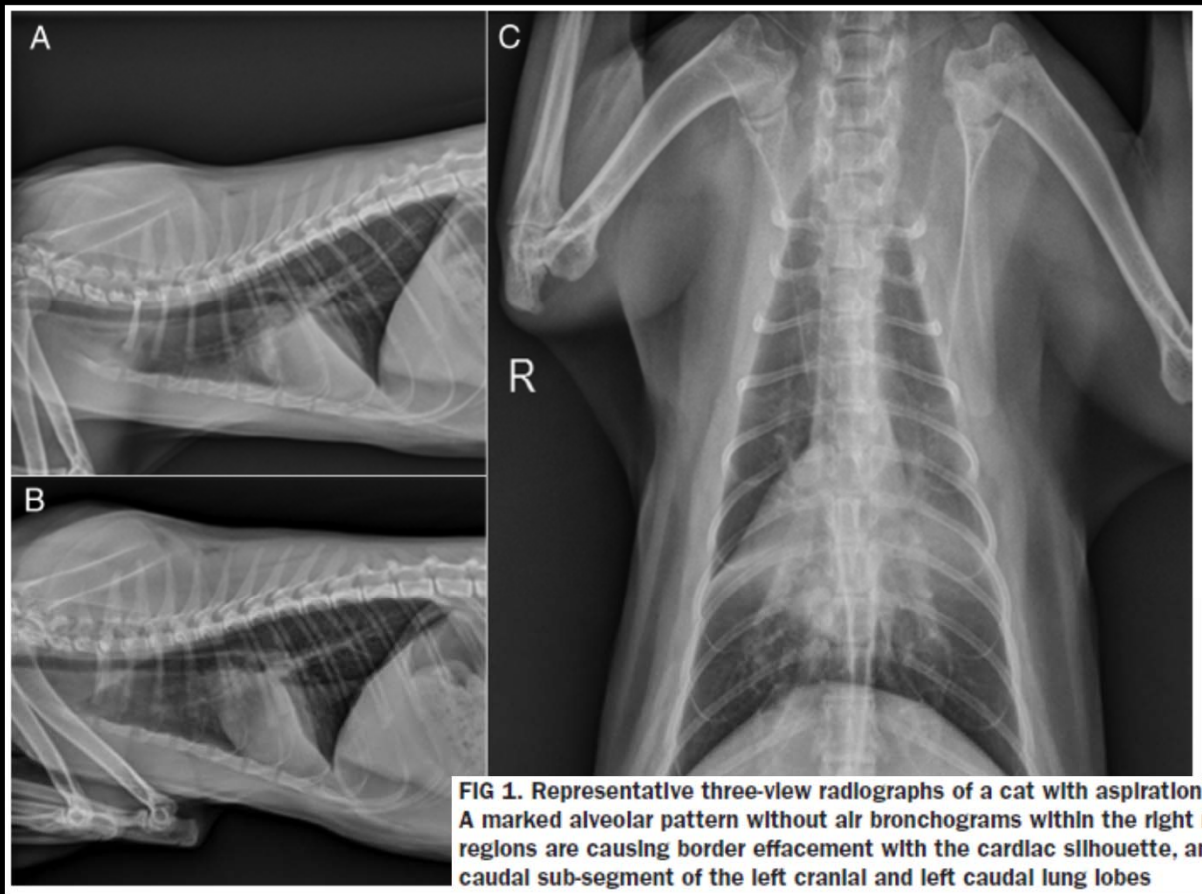
N. Levy[1], E. Ballegeer and A. Koenigshof

Table 2. Predisposing factors for aspiration pneumonia identified in a population of 28 cats

Predisposing factor	Number of cats (%)
Known vomiting	12 (43%)
Recent anaesthesia	11 (39%)
Upper respiratory disease	6 (21%)
Enteral nutrition	5 (18%)
Esophageal disease	4 (14%)
Chronic gastrointestinal disease	2 (7%)
Neurologic disease	2 (7%)
Laryngeal trauma	1 (3.6%)

- **Most common lung lobes:**
  - **Right middle (64%)**
  - **Left cranial (57%)**
  - ***Multiple lobes (57%)***

ASPIRATION PNEUMONIA



Clinical and radiographic findings in cats with aspiration pneumonia: retrospective evaluation of 28 cases

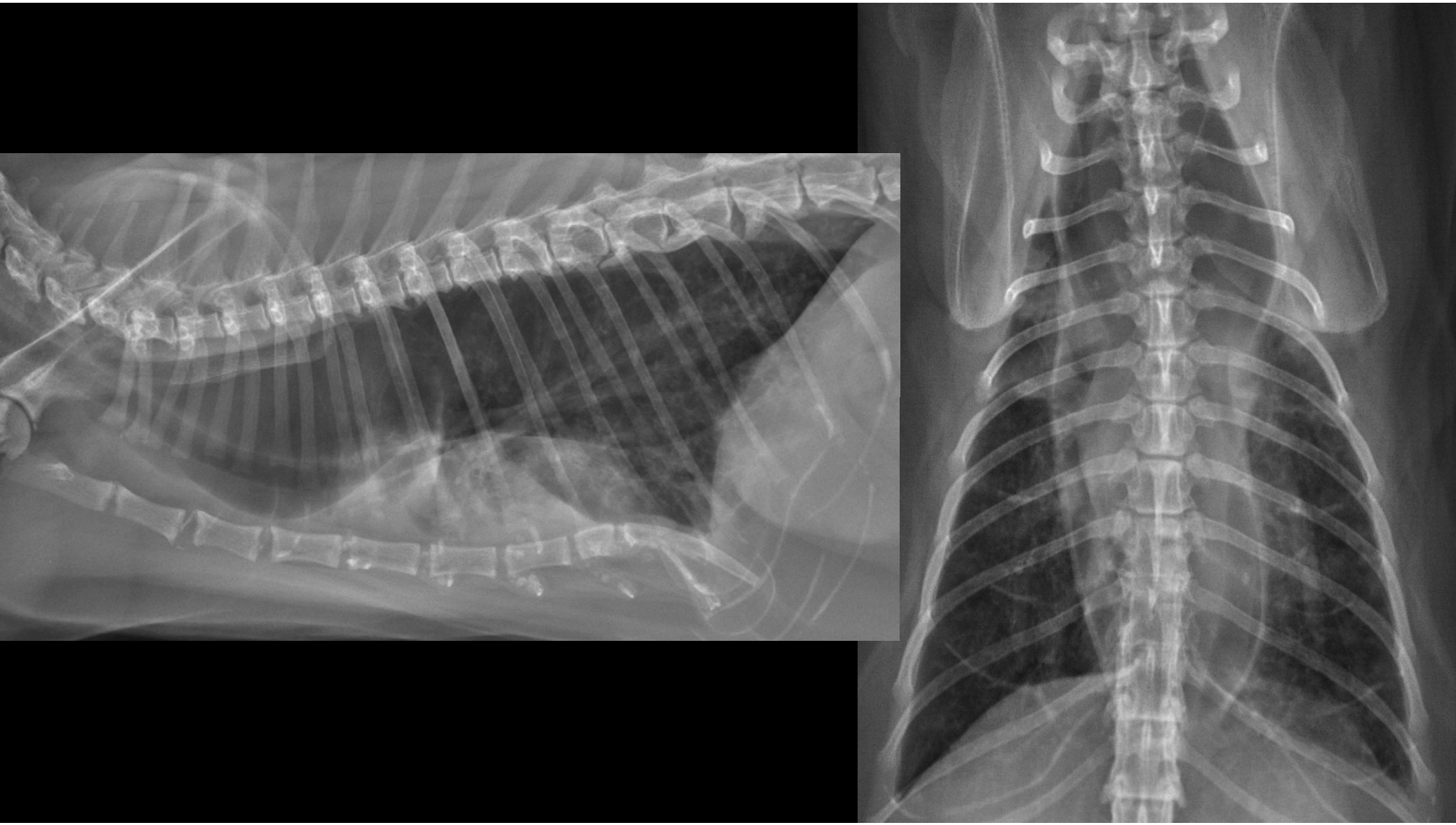
N. Levy[1], E. Ballegeer and A. Koenigshof

FIG 1. Representative three-view radiographs of a cat with aspiration pneumonia (A-right lateral, B-left lateral, and C-ventrodorsal projections). A marked alveolar pattern without air bronchograms within the right middle lung lobe and the caudal subsegment of the left cranial lung lobe. Both regions are causing border effacement with the cardiac silhouette, and lobar signs between the right middle and right caudal lung lobes and the caudal sub-segment of the left cranial and left caudal lung lobes

Case 14

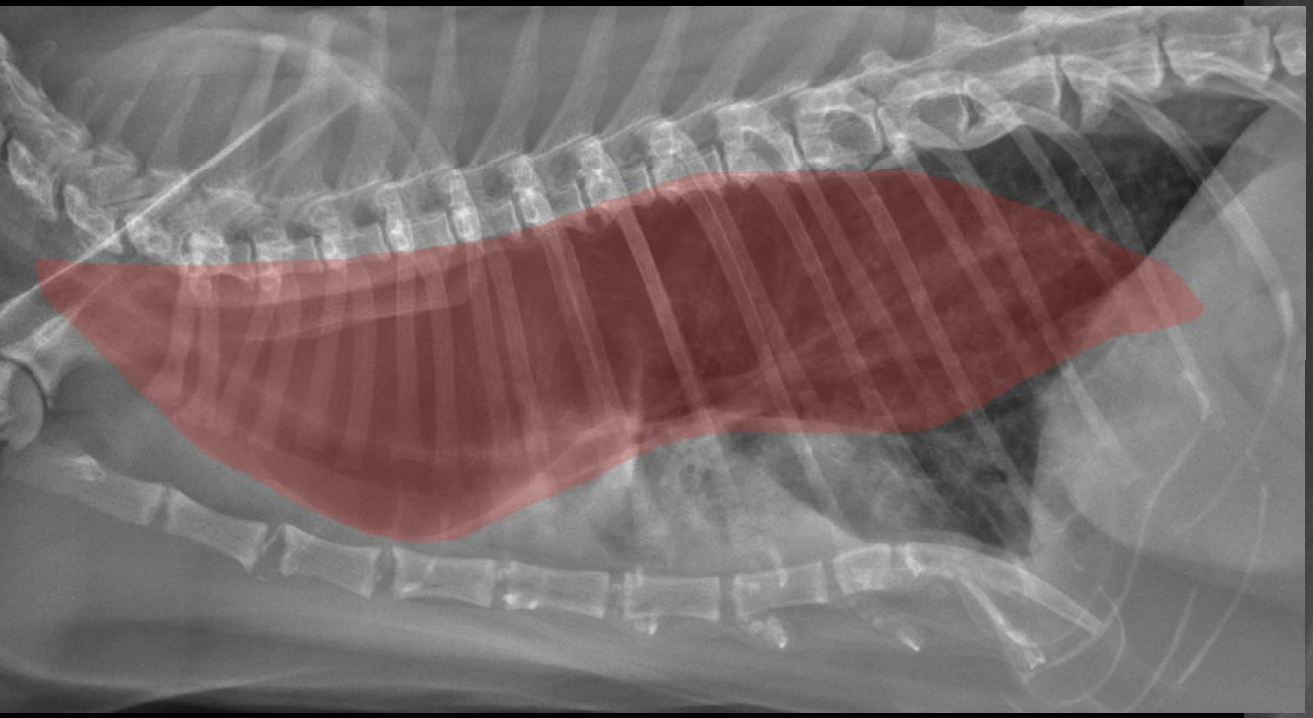
Signalment: 9y FS DSH
Chief Complaint: inappetence, labored breathing

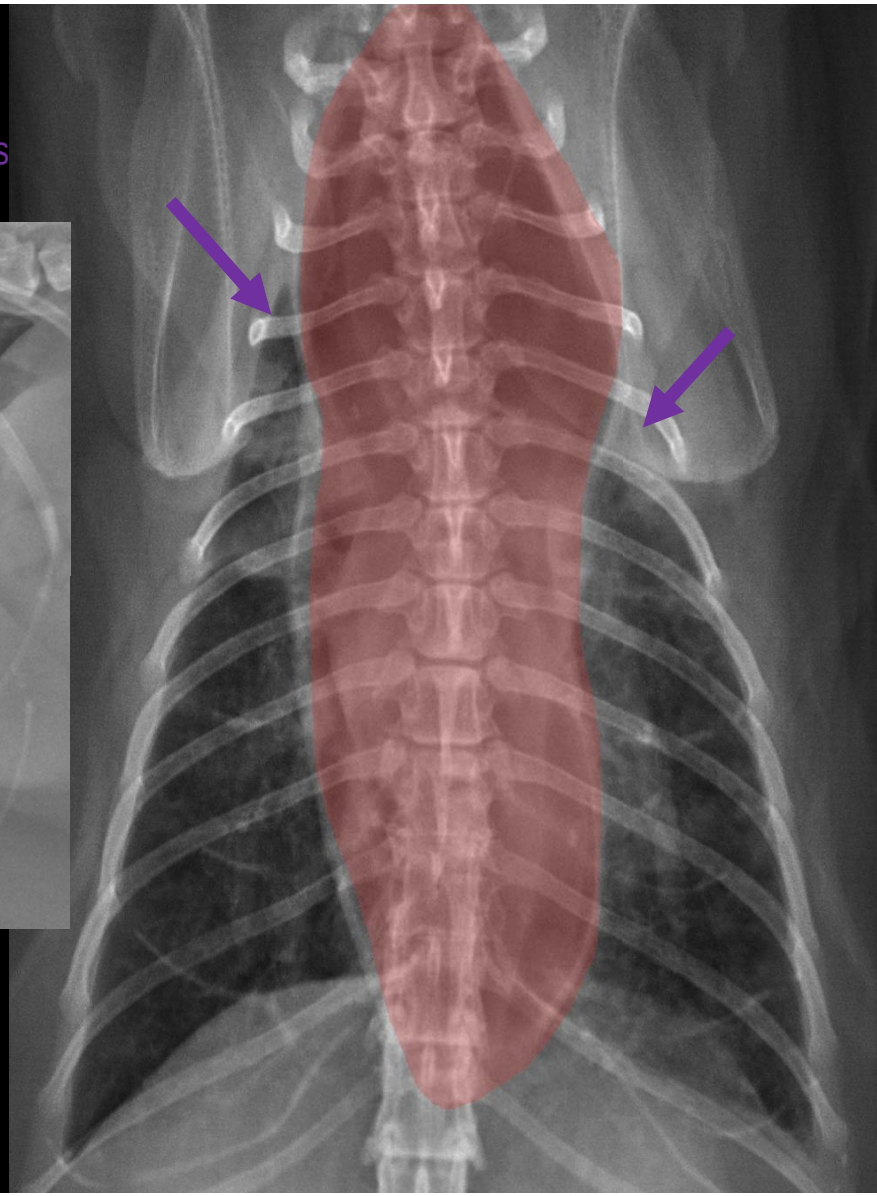
Physical exam:
- T: 98F; P: 220bpm; R: 80 bpm (increased effort)
- BCS 5/9
- Depressed; dehydrated
- Grade IV sternal murmur
- Increased BV sounds bilaterally



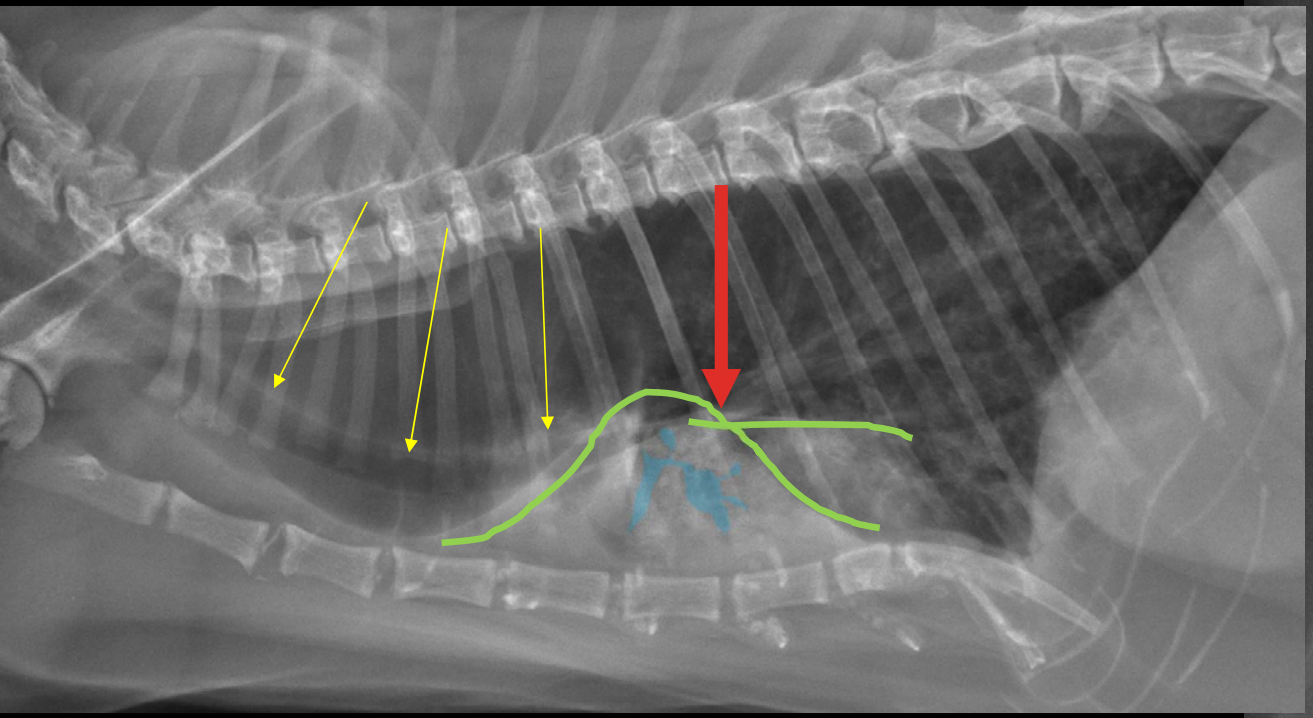
Massive, diffuse esophageal dilation

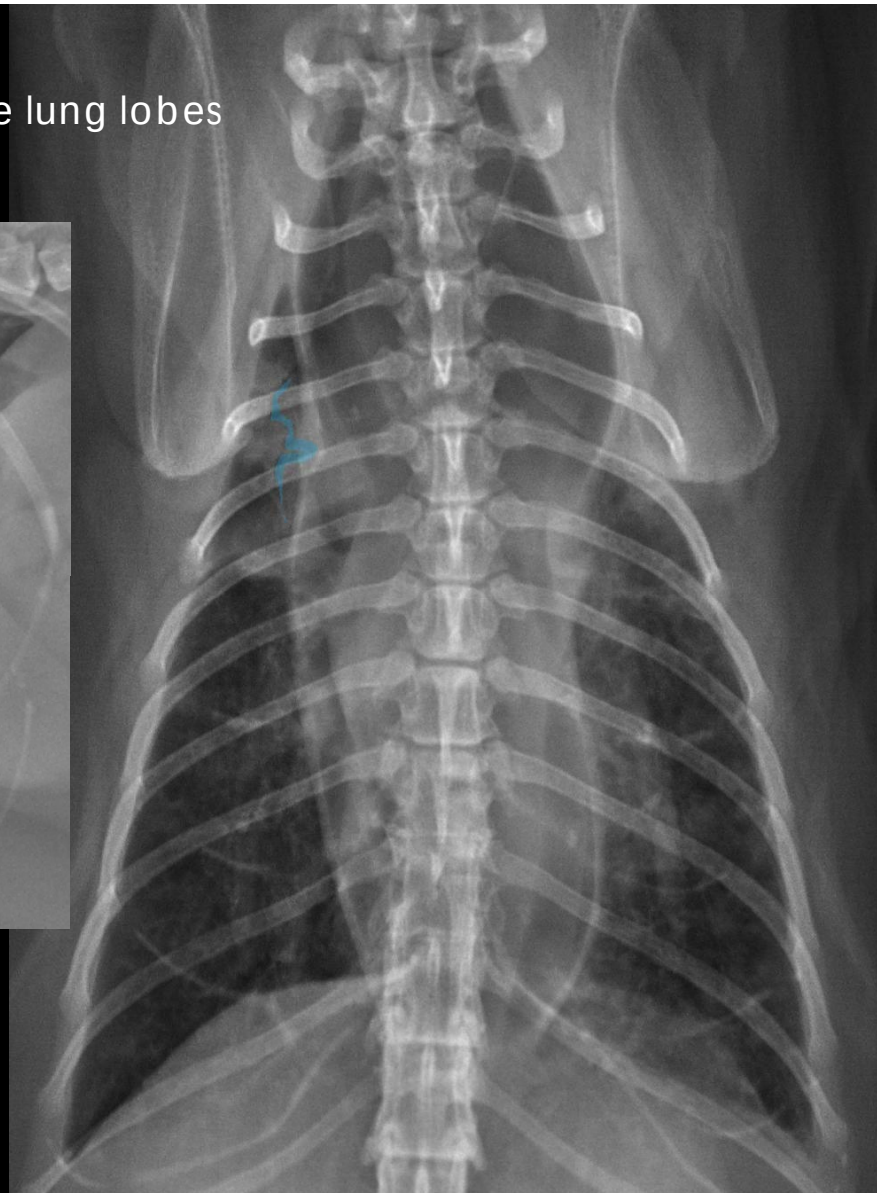
Caudal displacement & increased opacity of cranial lung lobes





Ventral displacement of trachea and heart
Lobar borders and air bronchograms in cranial and middle lung lobes





Findings	Radiographic Summary	Dx or DDX	Plan
Extrathoracic: • Pectus excavatum (mild) Pleural Space: • nsf Pulmonary: • lobar borders, alveolar infiltrate, and air bronchograms summating with cardiac silhouette (right and left cranial lung lobes) • Caudal displacement of cranial lung lobes • Caudal bronchial pattern Mediastinum (including heart): • Severely gas dilated esophagus and secondary diffuse widening of mediastinum • Ventral displacement of trachea • Heart is small and ventrally displaced	1. Diffuse megaesophagus 2. Multifocal, ventrally distributed alveolar pattern 3. Aerophagia	R/O congenital vs acquired megaesophagus with secondary aspiration pneumonia R/o aerophagia secondary to respiratory distress	Investigate for underlying cause of megaesophagus. Treat for pneumonia. Supportive care (oxygen, fluid therapy) depending on pt status

QUESTIONS?

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