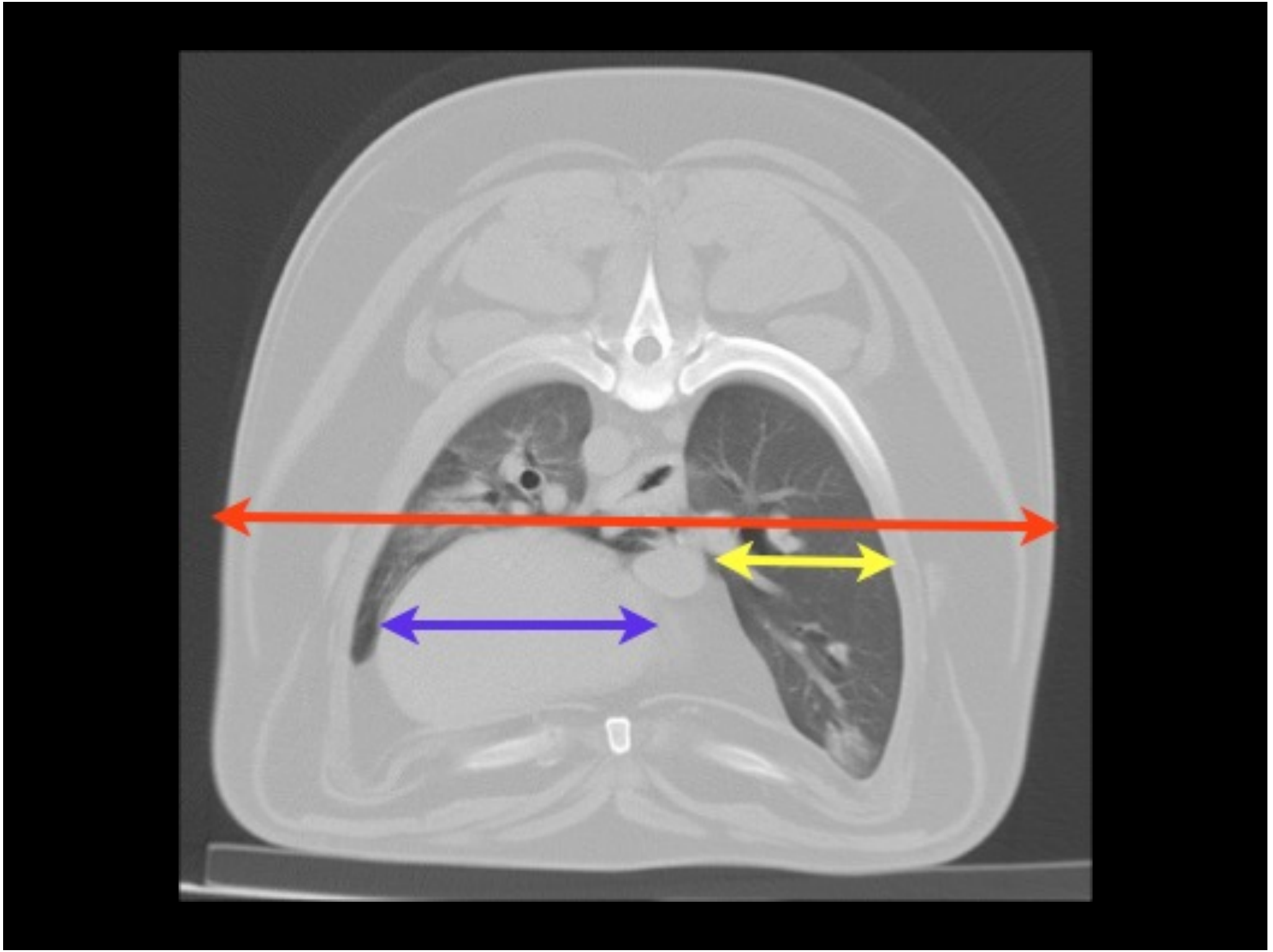
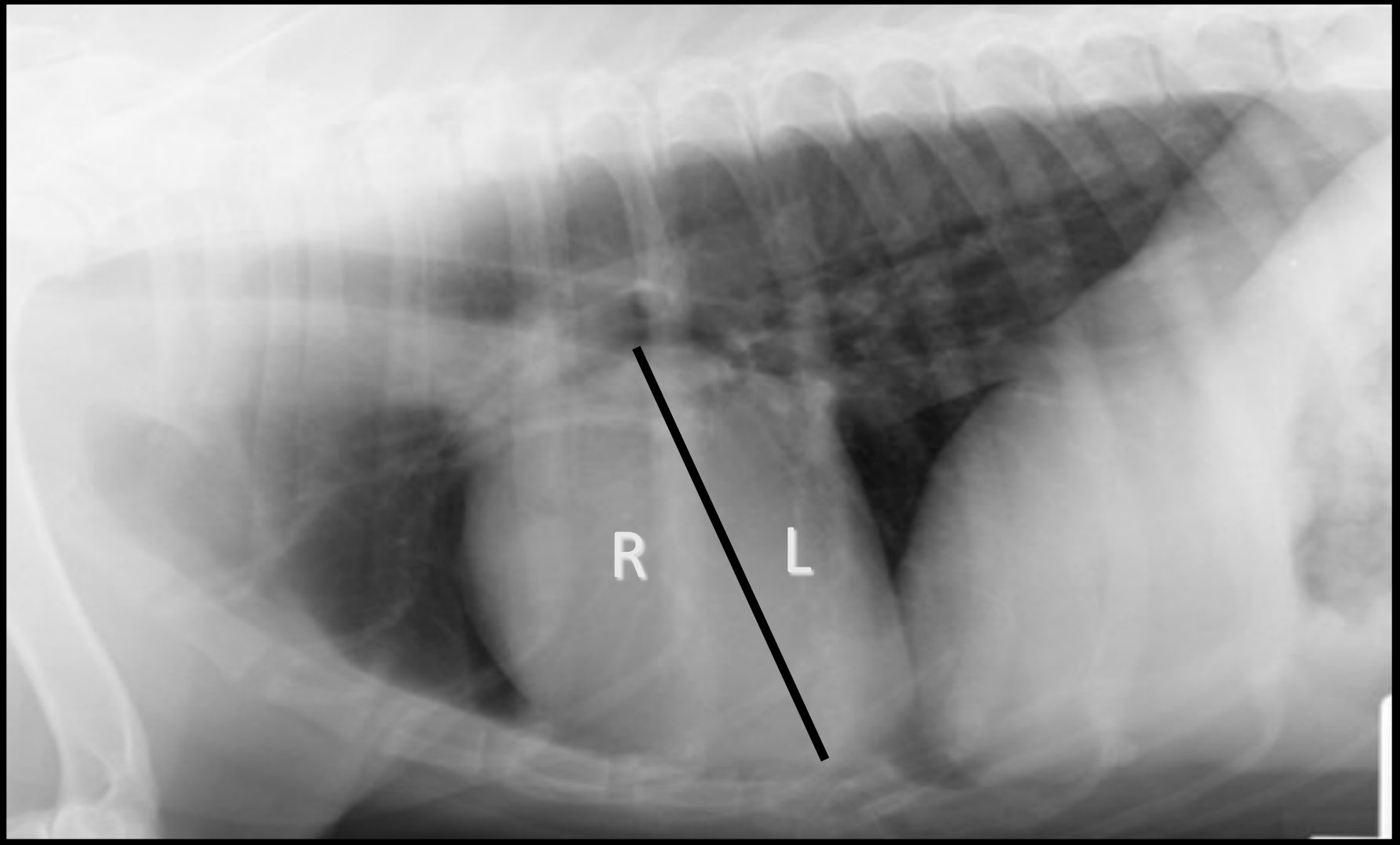
IVR
Italian Veterinary Radiology

Radiographic signs of cardiac disease

Edoardo Auriemma
Edoardo.auriemma@gmail.com

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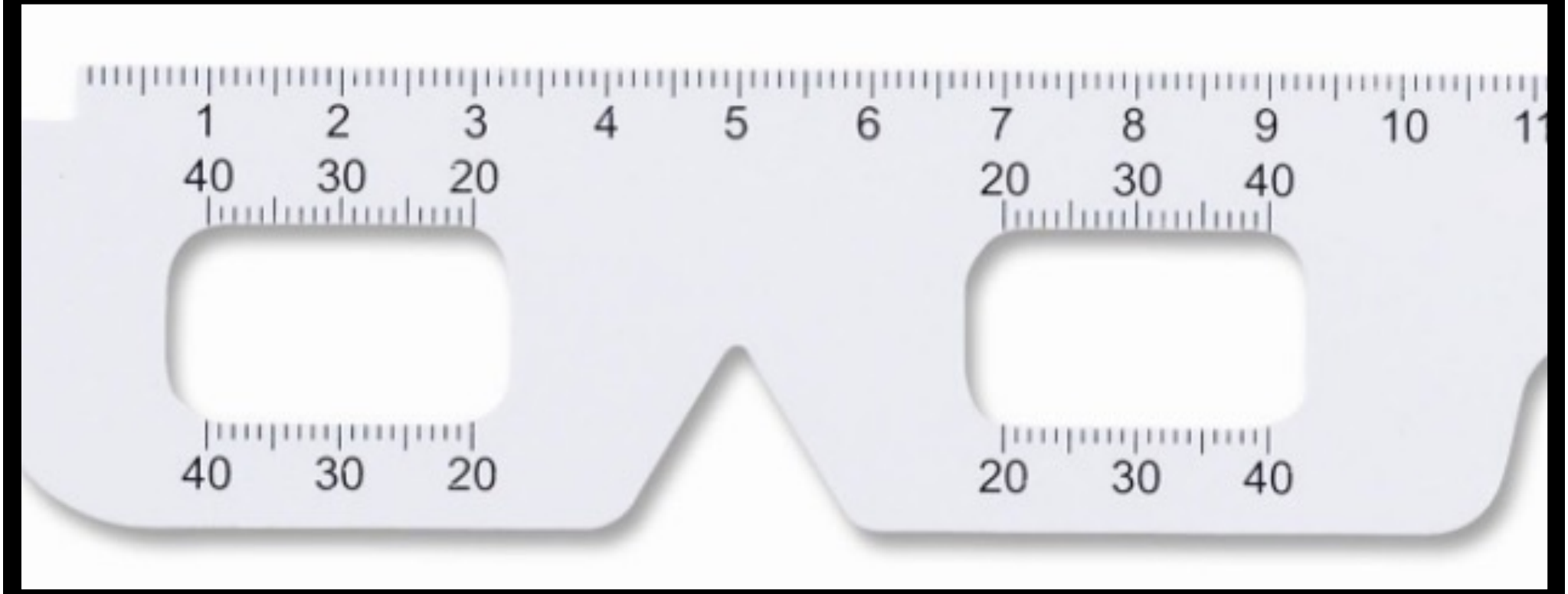
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DIAGNOSTIC ACCURACY OF TESTS BASED ON RADIOLOGIC MEASUREMENTS OF DOGS AND CATS: A SYSTEMATIC REVIEW

CHRISTOPHER R. LAMB, JUSTIN R. NELSON

A systematic review of diagnostic tests based on radiologic measurements of structures in dogs and cats was done in order to reach generalizable conclusions about the value of making such measurements. Literature search was done using the ISI Web of Knowledge[SM] for studies in the subject category *Veterinary sciences*. Studies were eligible for inclusion that employed length, angle, area or volume measurements from radiographic, ultrasonographic, CT or MR images of dogs or cats as a diagnostic test for a naturally occurring condition, compared the results of imaging with a reference standard, included at least 10 subjects, and sufficient data that a 2 × 2 table of results could be constructed. Quality of studies was assessed using the QUADAS-2 tool. Twenty-six studies were found describing 40 tests that satisfied the inclusion criteria. Tests were radiographic in 22 (55%) instances and ultrasonographic in 18 (45%). Quality of studies was generally low, with a risk of bias in patient selection in 92% studies, performance of the index test in 73% studies, and patient flow in 42% studies. Median (range) number of subjects was 64 (20–305), sensitivity was 77% (38–99%), specificity was 82% (50–99%), positive likelihood ratio was 4.1 (1–103), and negative likelihood ratio was 0.29 (0.01–1). Two studies that compared accuracy of radiographic measurements to subjective image interpretation alone found no difference. Evidence is weak that radiologic measurements of structures in dogs and cats are useful for diagnosis, hence measurements should not be emphasized as a basis for diagnosis in either teaching or clinical imaging reports. © 2014 *American College of Veterinary Radiology.*

Introduction

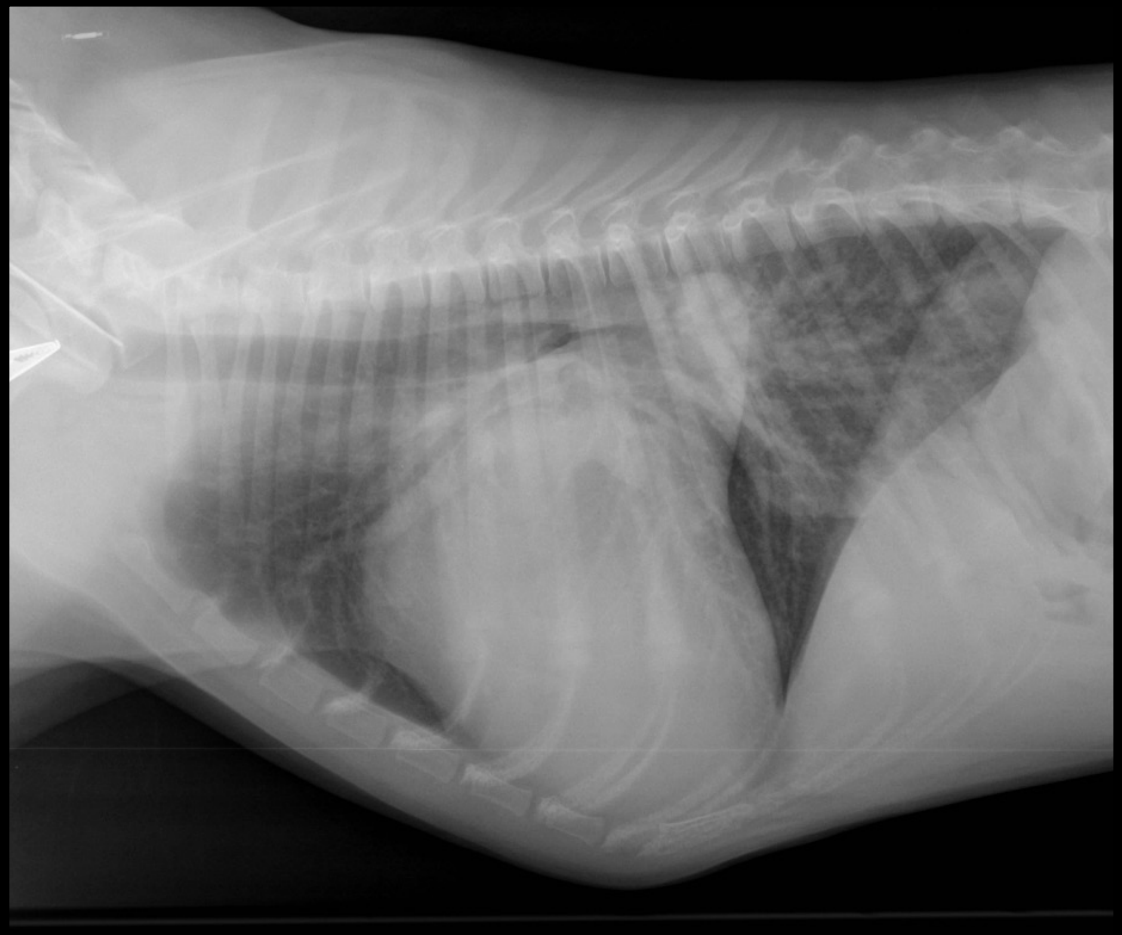
"WHEN YOU CAN MEASURE what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind"

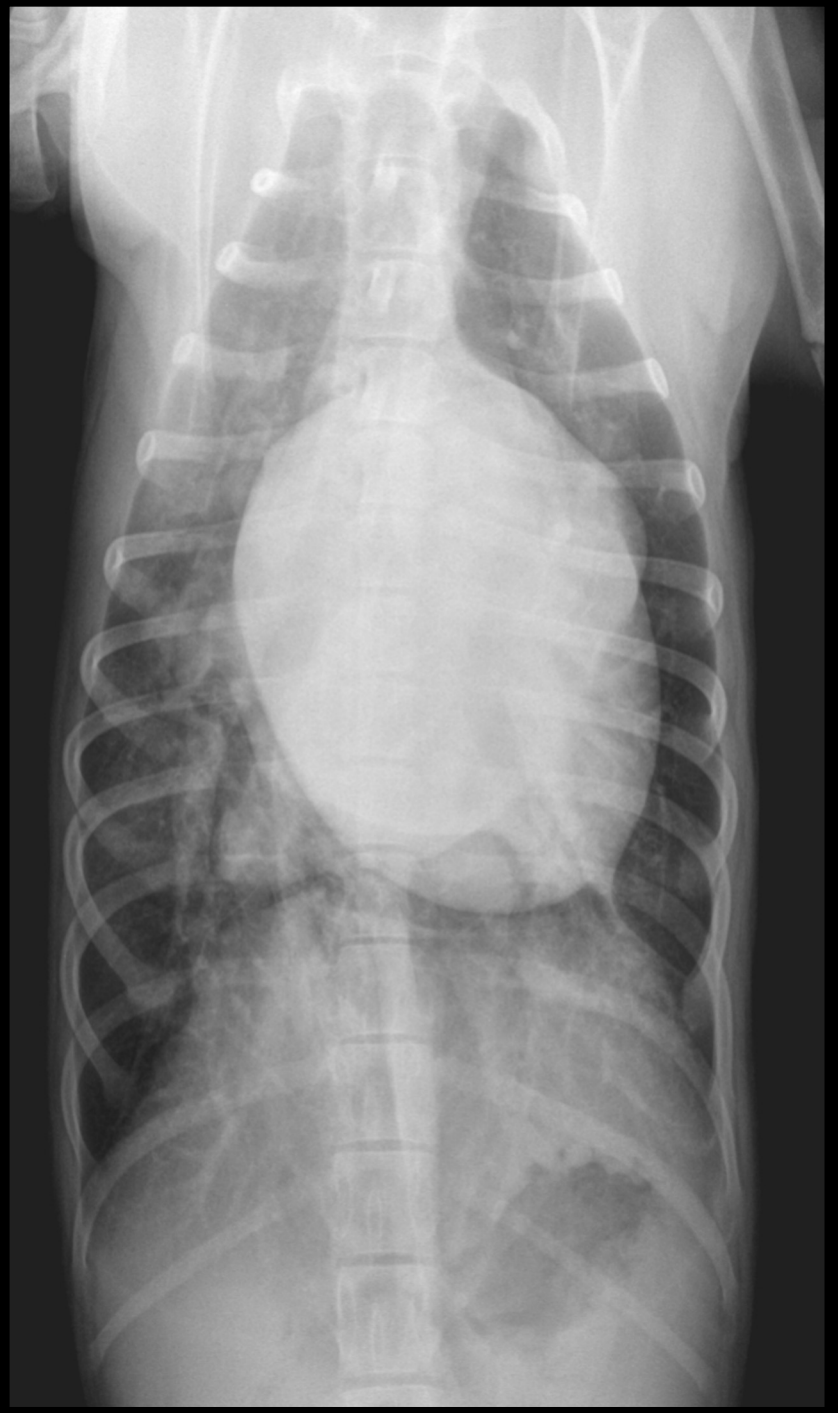
-William Thomson, quoted by Keats and Sistrom.[1]

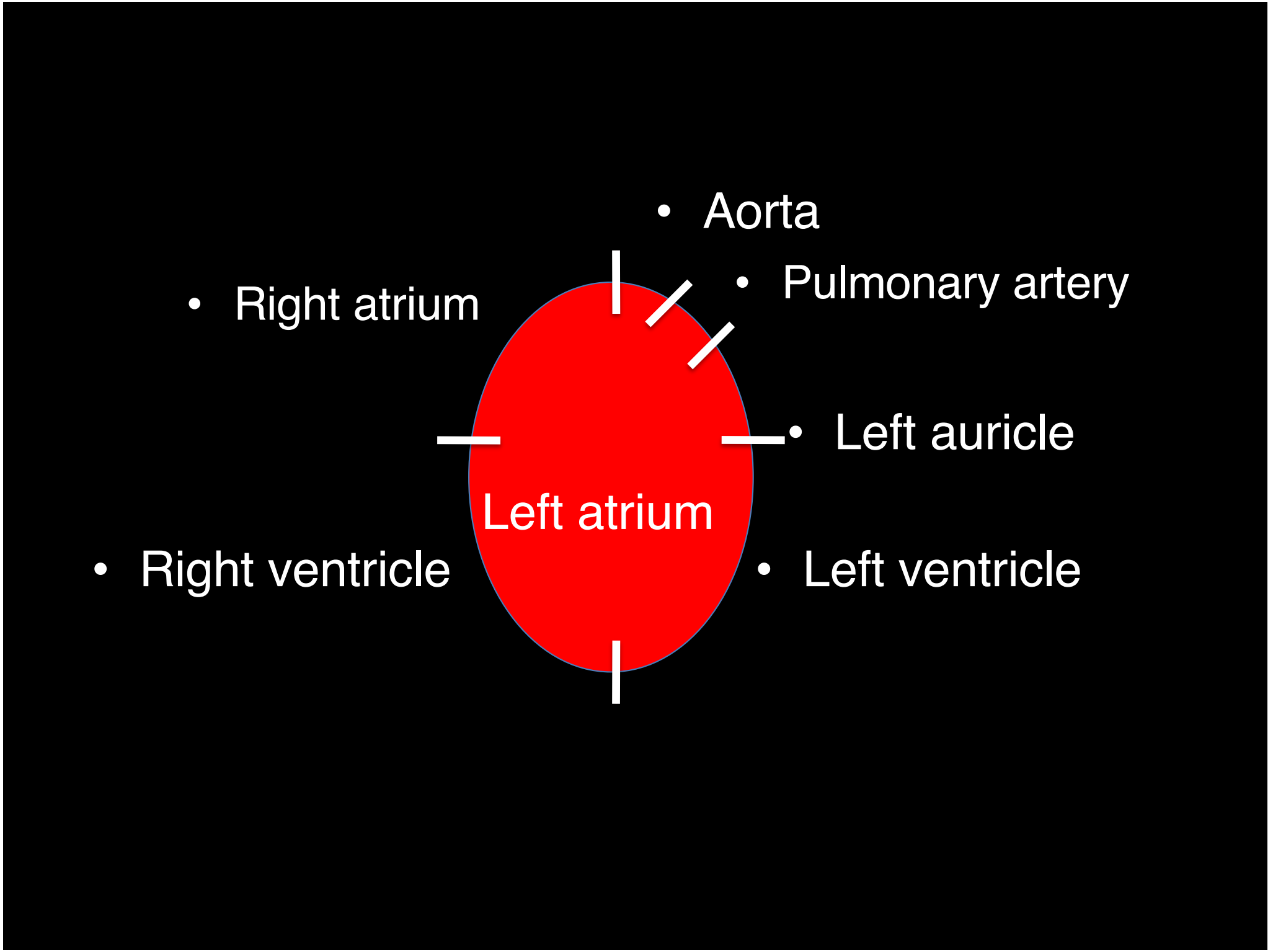
"A radiologist with a ruler is a radiologist in trouble"

-Ben Felson.[2]

These quotations illustrate two different opinions about the use of measurements, albeit for different purposes. William Thomson, a mathematician and engineer[3] is recognized for his work in thermodynamics, including determining –273.15°C to be the value of absolute zero.* He considered accurate measurement to be essential for physical science research. Ben Felson, a clinical radiologist[4], is



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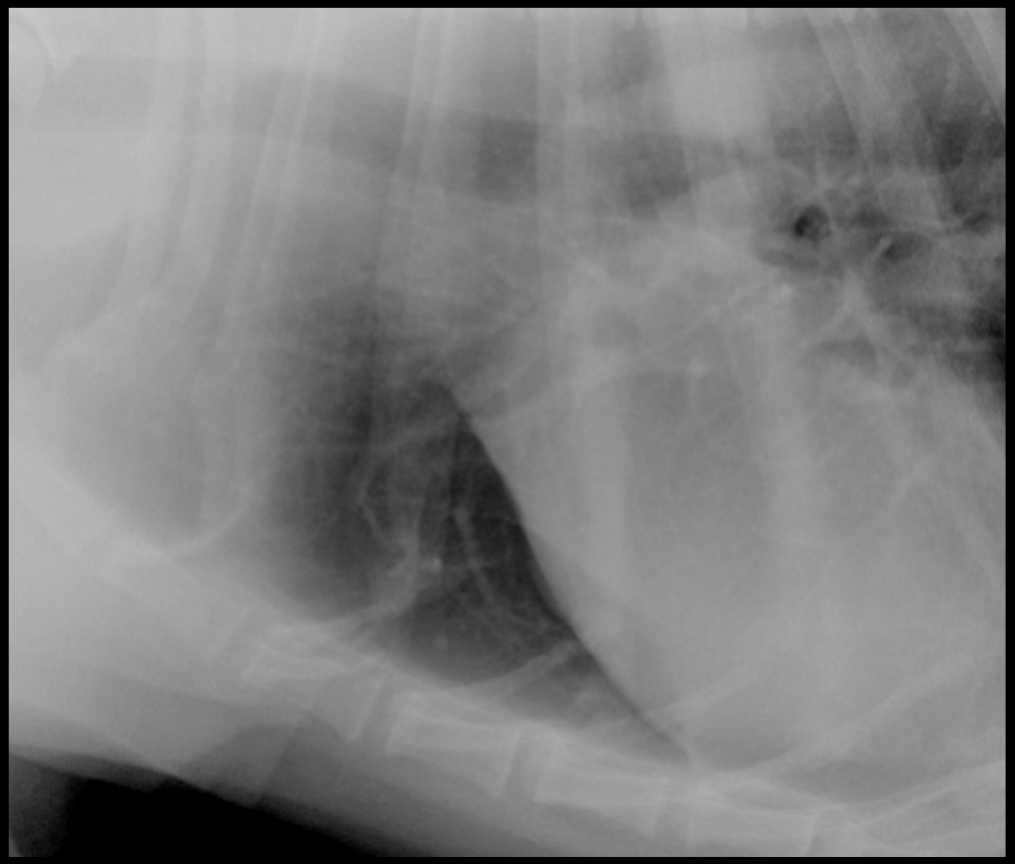
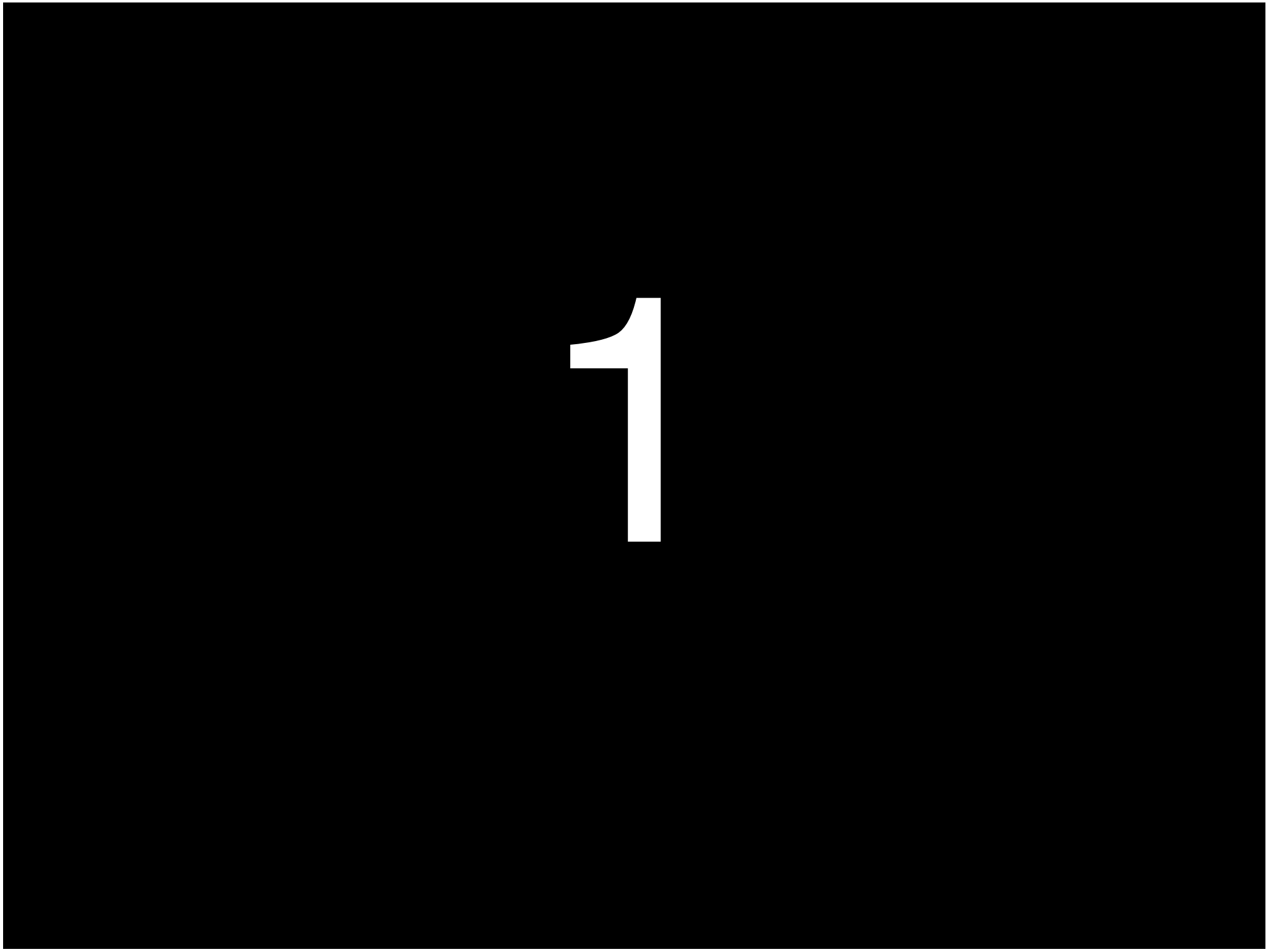
• Right atrium
• Left auricle
Left atrium
• Right ventricle
• Left ventricle

Heart and vessels

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animals

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Article

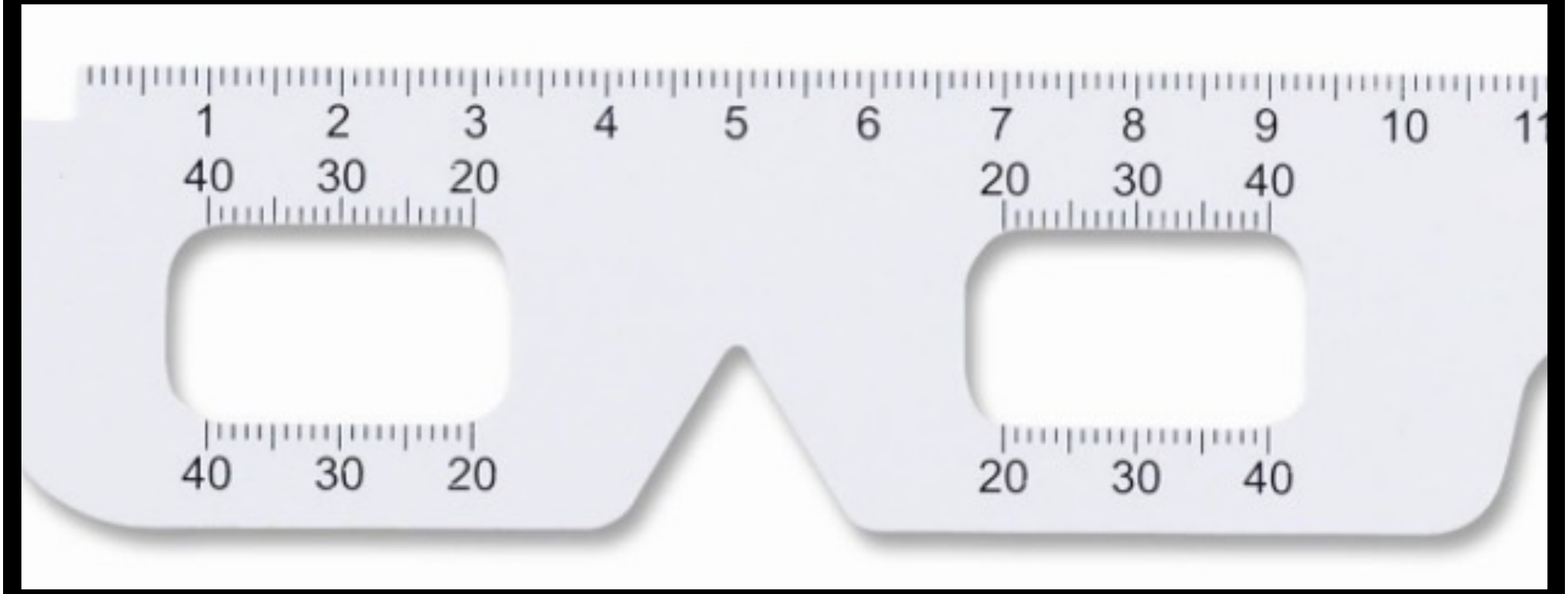
Methods of Radiographic Measurements of Heart and Left Atrial Size in Dogs with and without Myxomatous Mitral Valve Disease: Intra- and Interobserver Agreement and Practicability of Different Methods

Charanthorn Levicar [1,*], Ingo Nolte [1,*], José Luis Granados-Soler [1], Fritjof Freise [2], Jonathan Friedemann Raue [1] and Jan-Peter Bach [1]

[1] Clinic for Small Animals, University of Veterinary Medicine Hannover, Foundation, 30559 Hannover, Germany

[2] Institute for Biometry, Epidemiology and Information Processing, University of Veterinary Medicine Hannover, Foundation, 30559 Hannover, Germany

* Correspondence: charanthorn.levicar@tiho-hannover.de (C.L.); ingo.nolte.ir@tiho-hannover.de (I.N.)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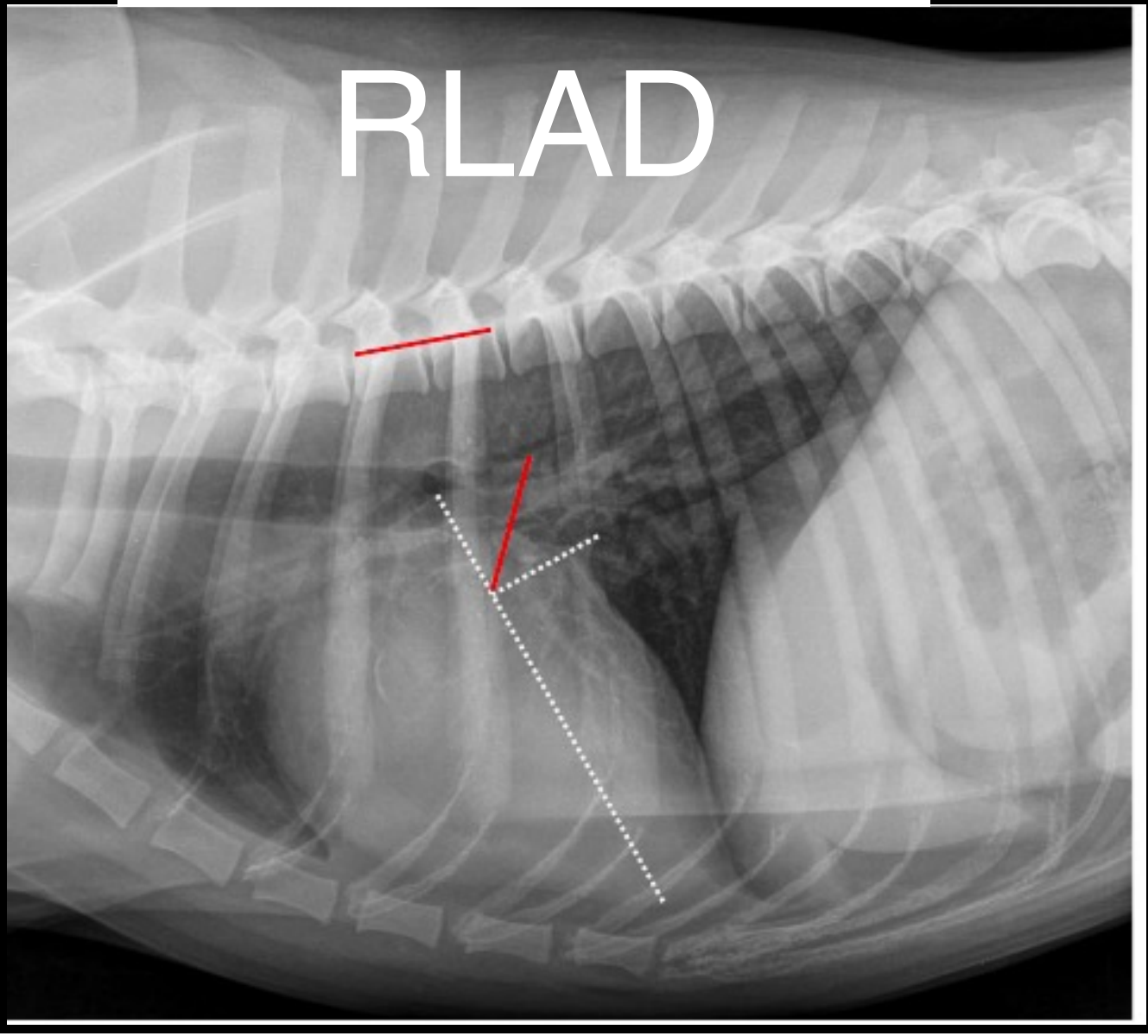

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Article

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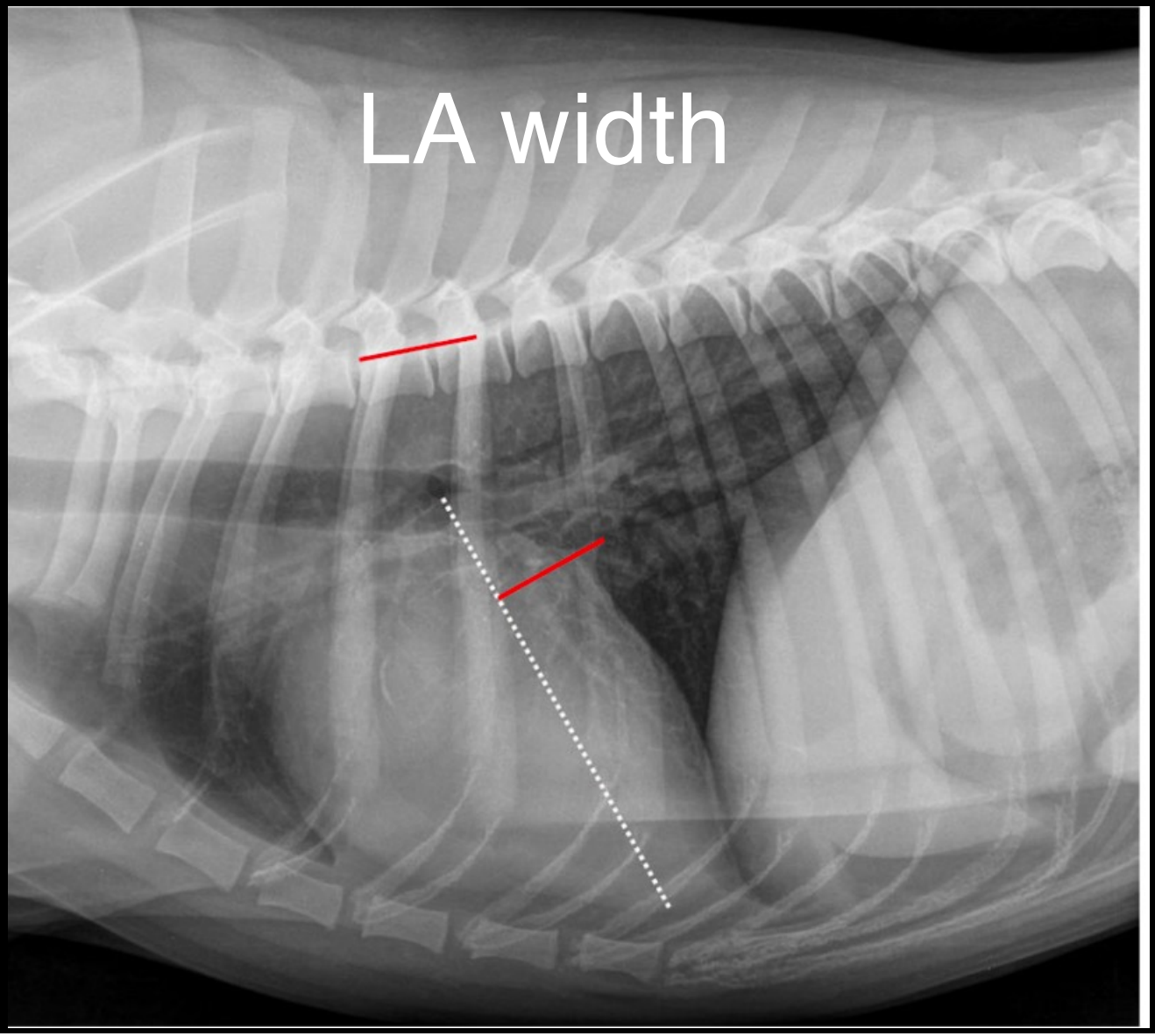

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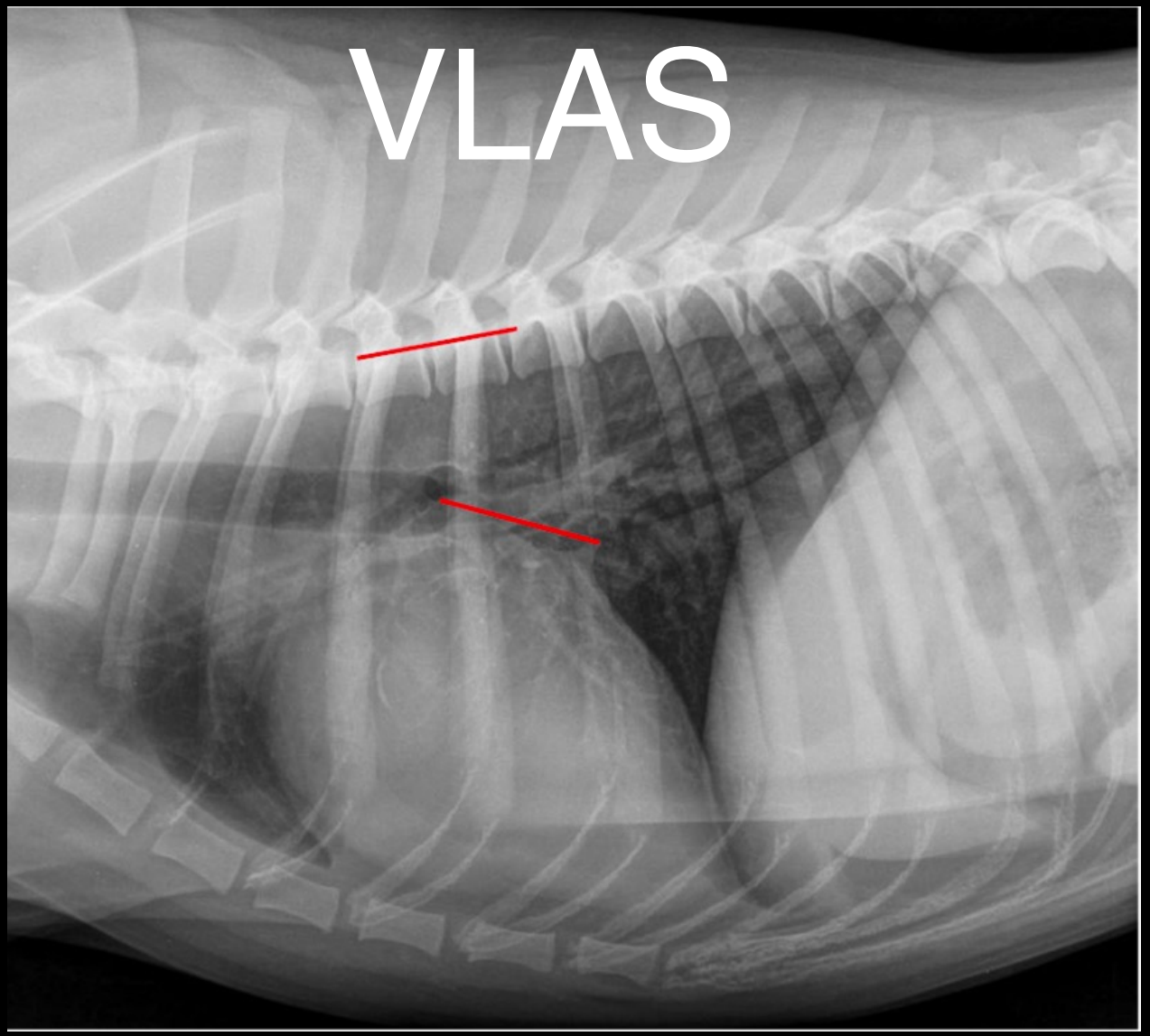

animals

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Article

Methods of Radiographic Measurements of Heart and Left Atrial Size in Dogs with and without Myxomatous Mitral Valve Disease: Intra- and Interobserver Agreement and Practicability of Different Methods

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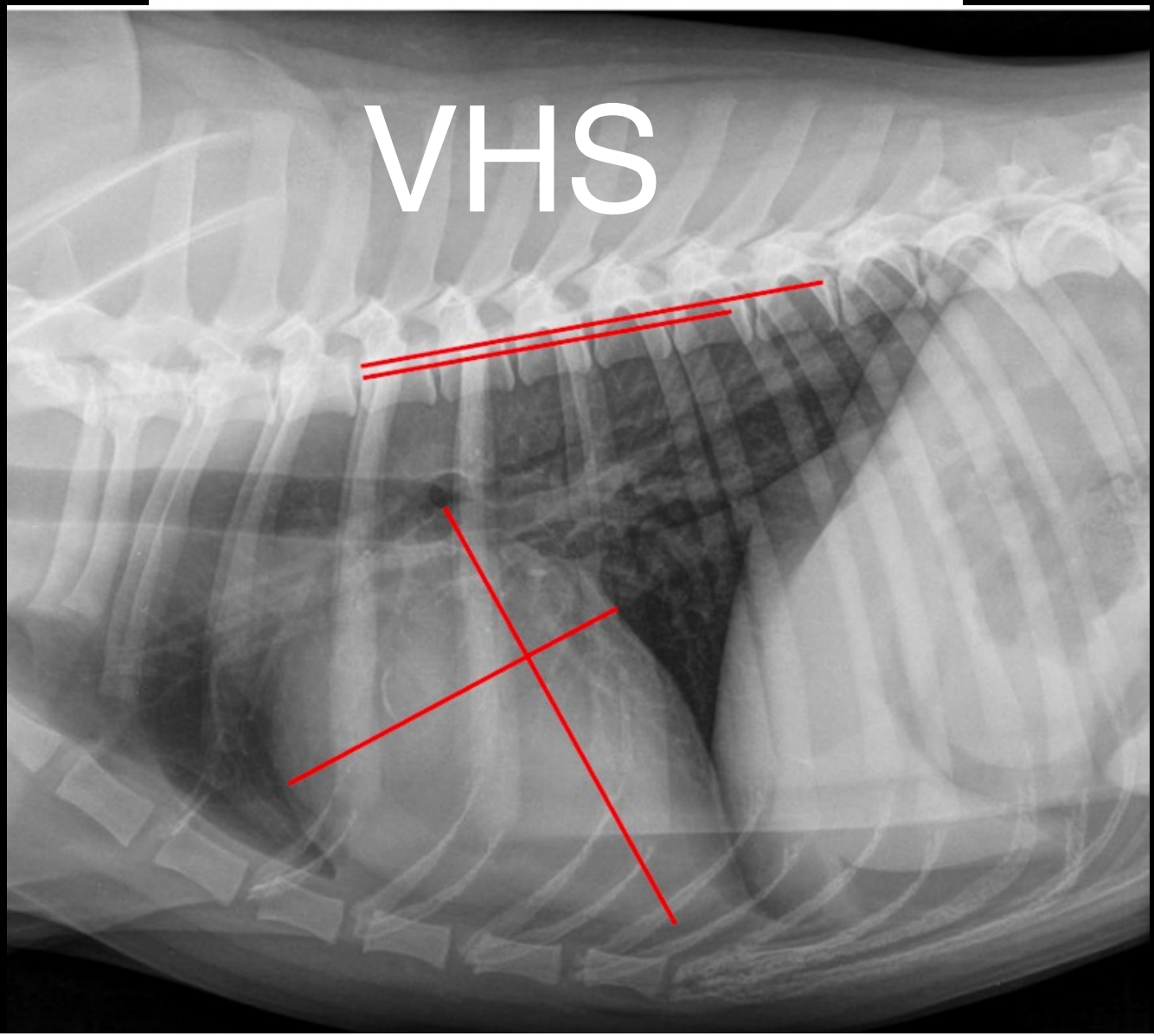
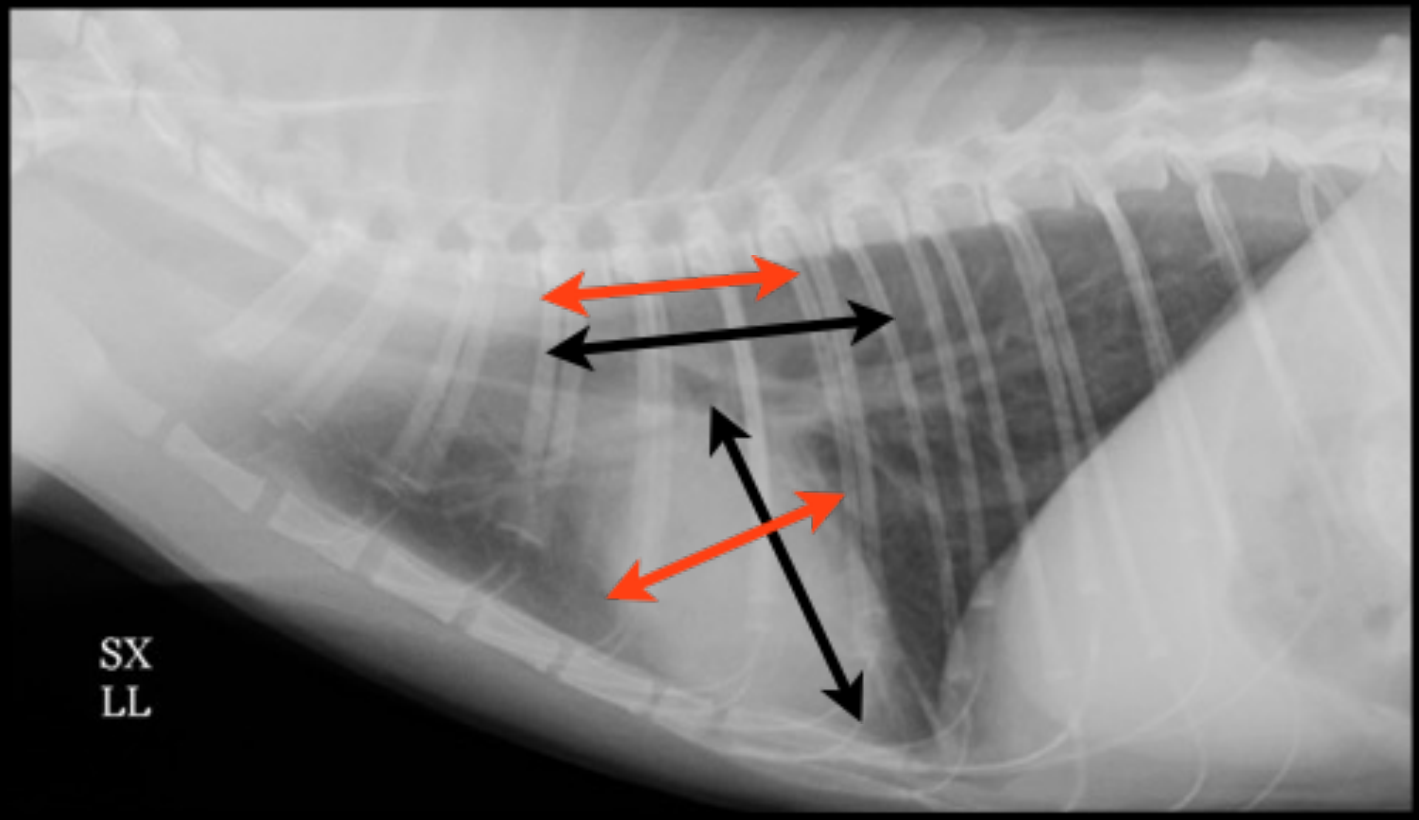


VHS

- DOG: 9.7 ± 0.5
- CAT: 7.5 ± 0.3



Check for updates

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DOI: 10.1111/vru.13402

ORIGINAL RESEARCH

WILEY

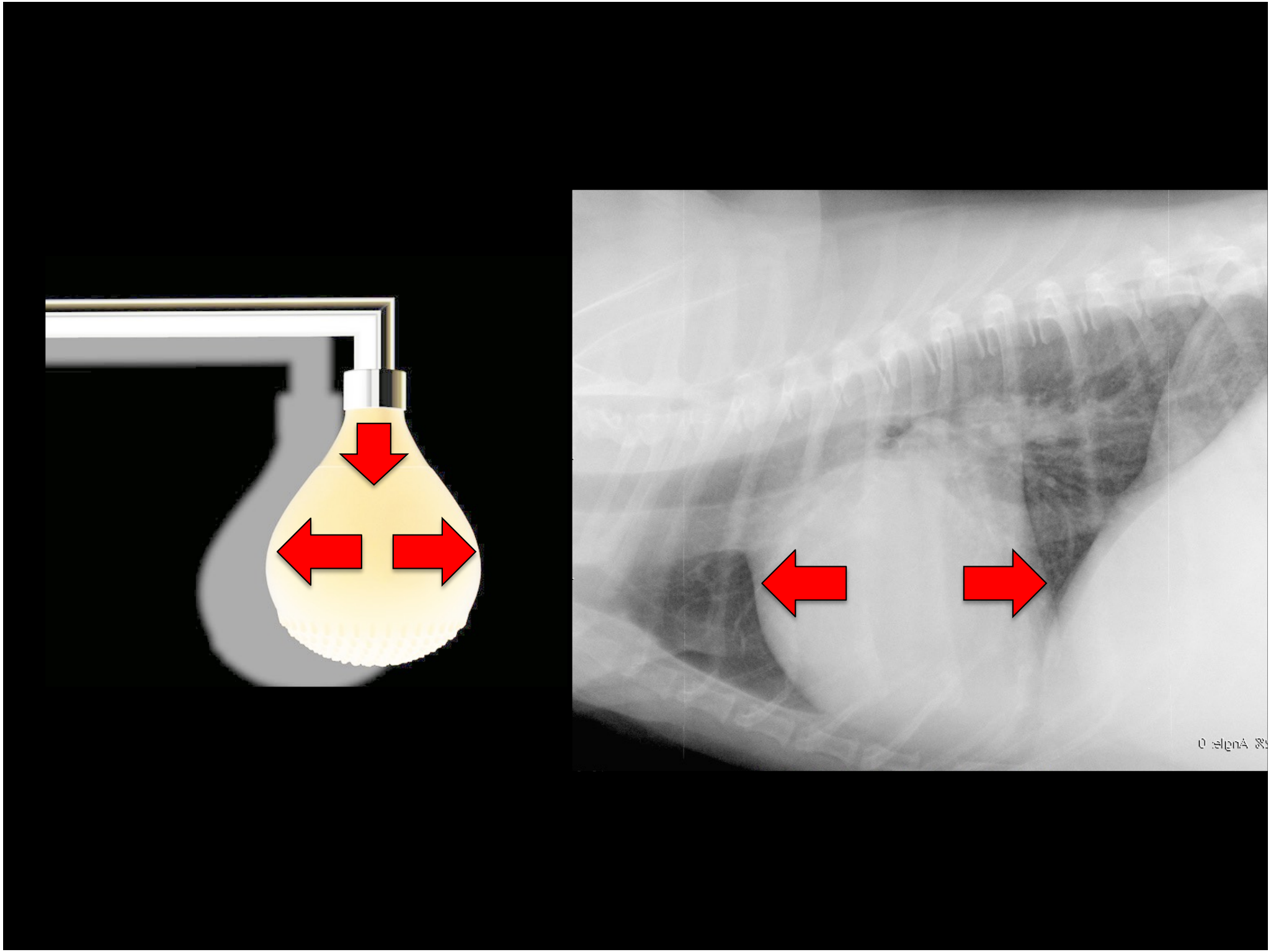
The vertebral right heart index: A new radiographic method to assess right heart enlargement in dogs

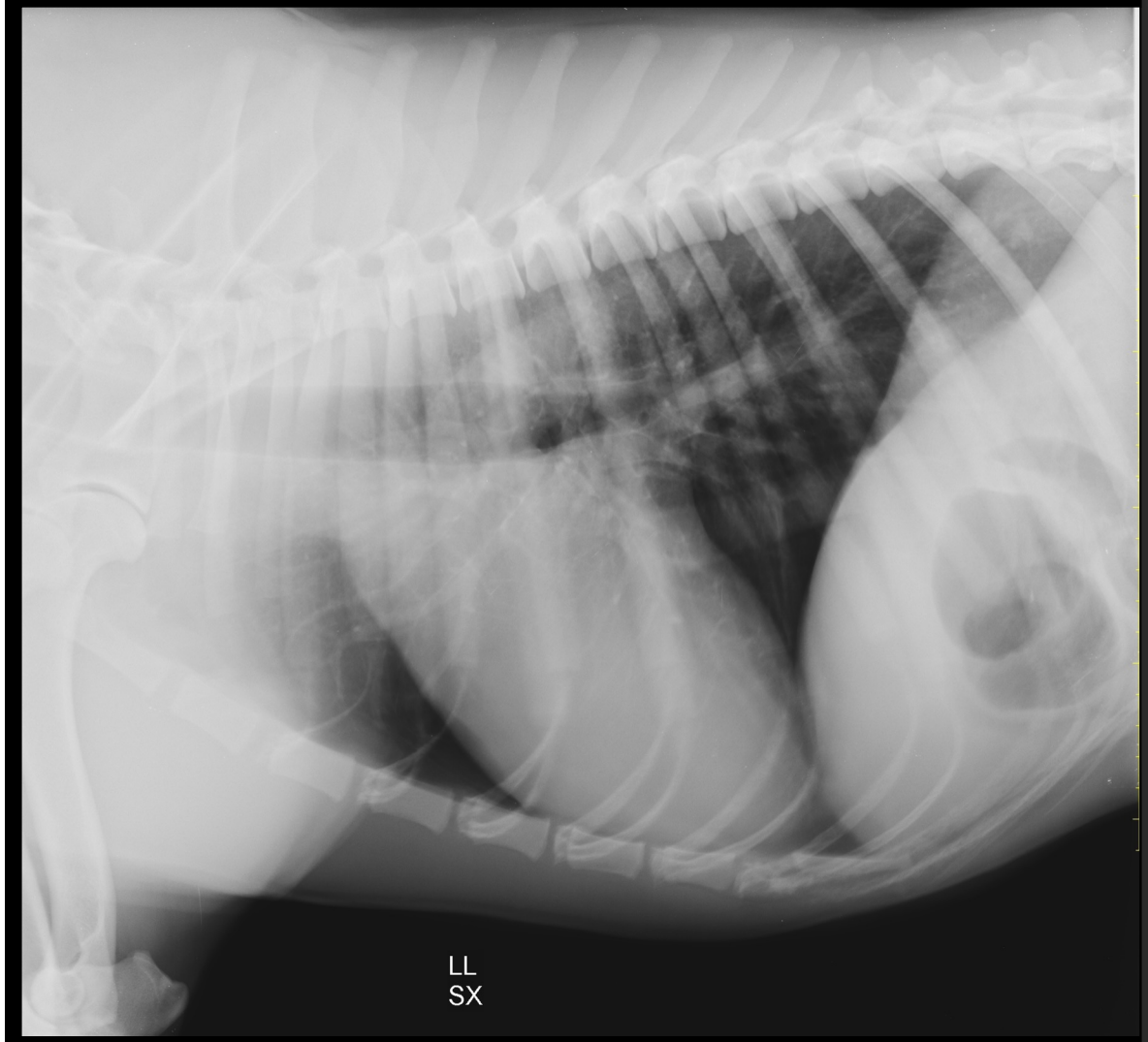
Caterina Puccinelli[1] | Tommaso Vezzosi[1] | Giovanni Grosso[1] | Rosalba Tognetti[1] | Edoardo Auriemma[2] | Oriol Domenech[2] | Simonetta Citi[1]

Cardiac silhouette

- “Cardiomegaly”

- True cardiomegaly
- Pericardial effusion
- Peritoneo-pericardial hernia

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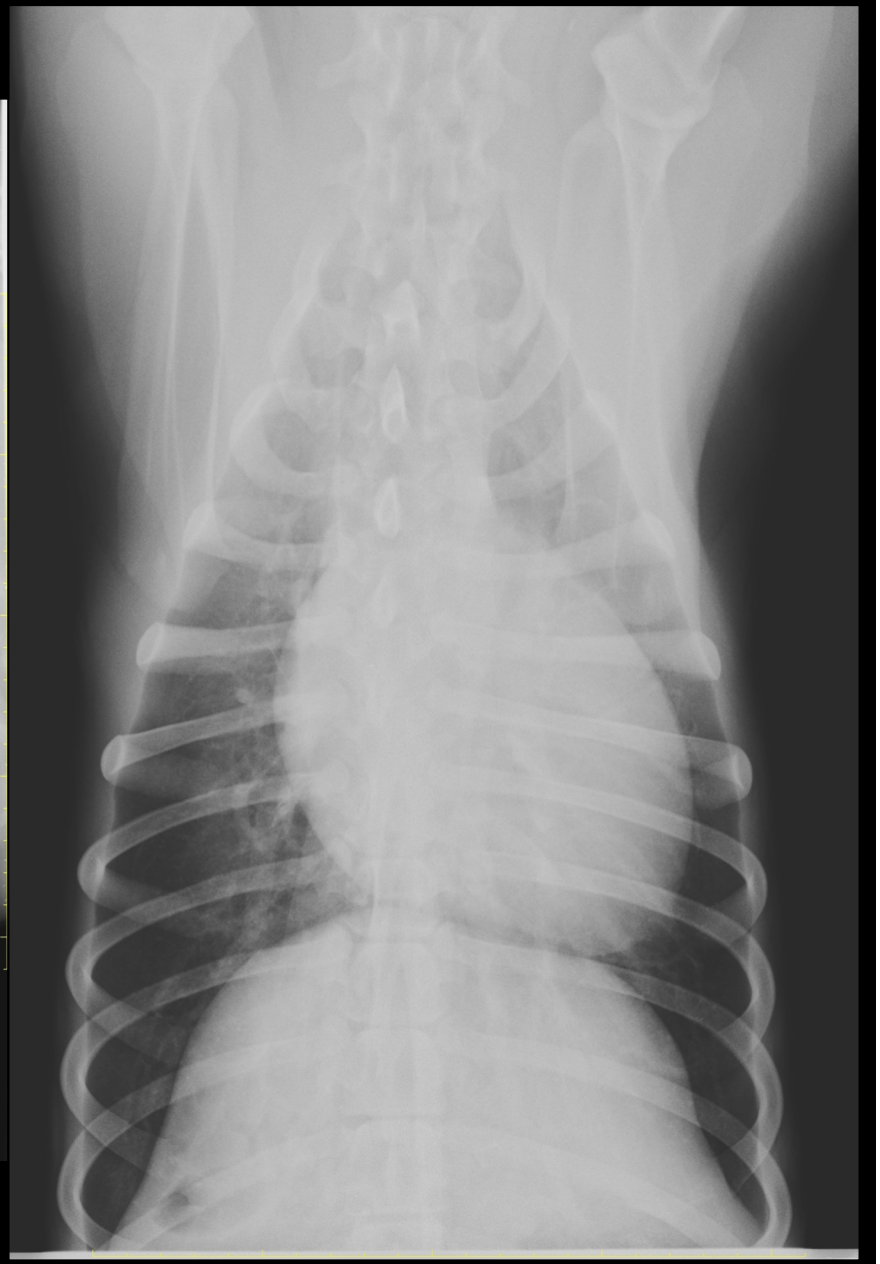

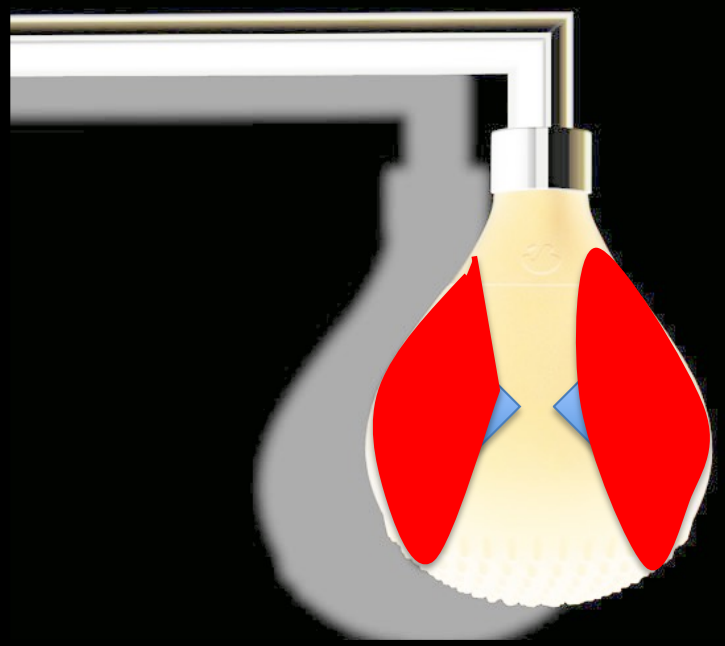

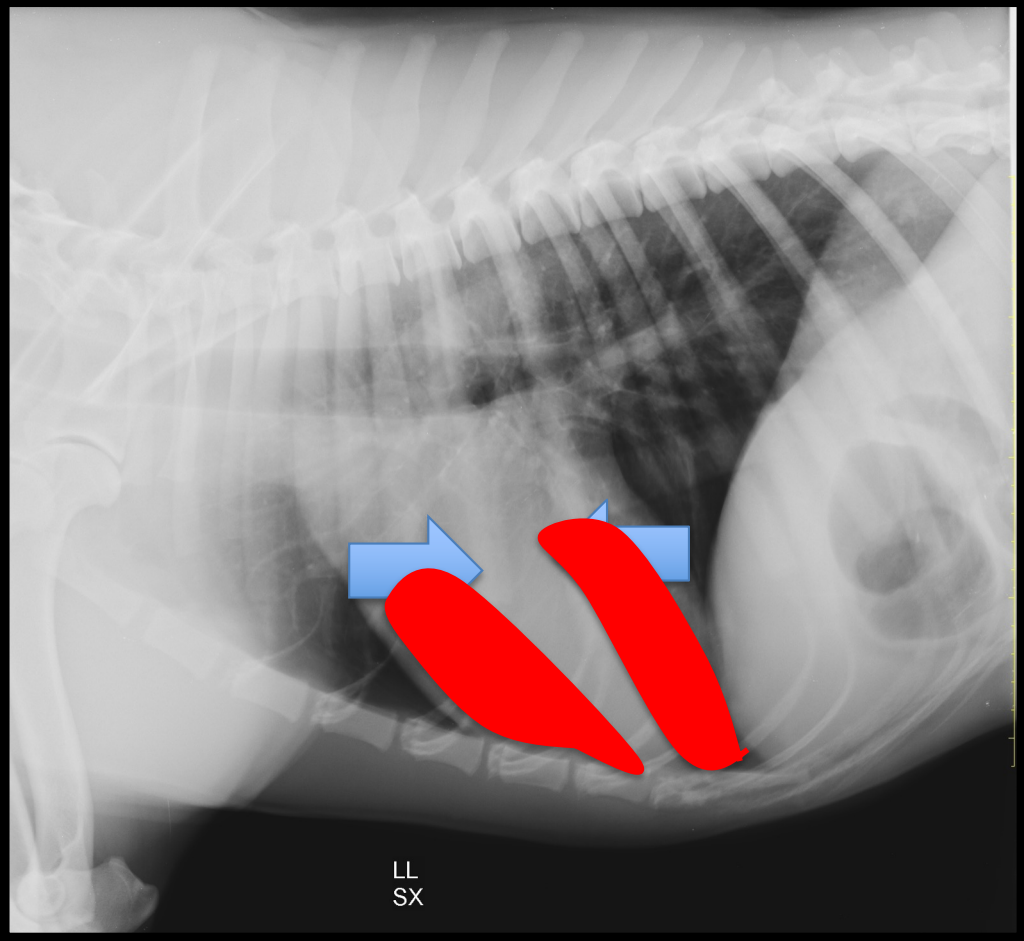
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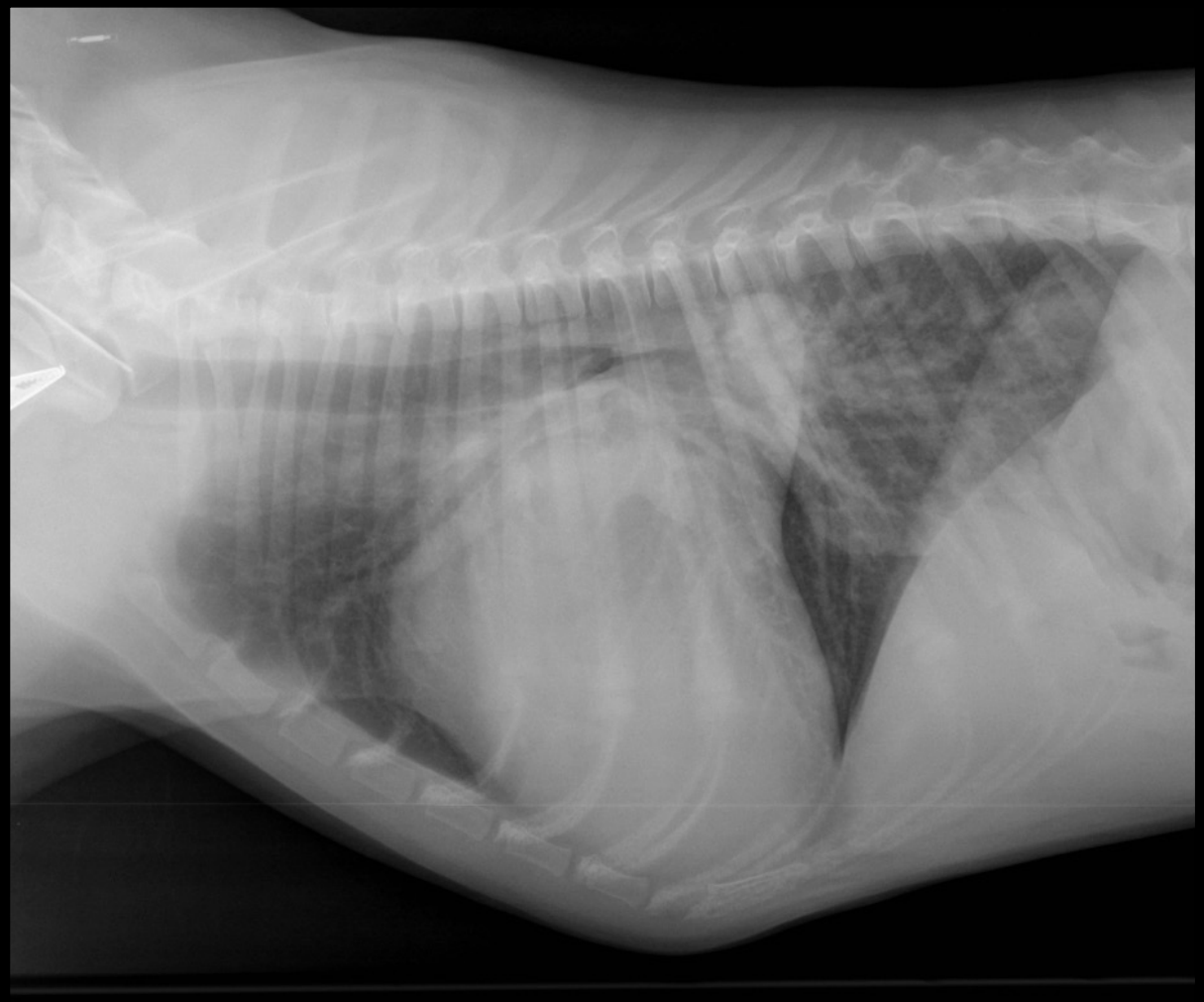
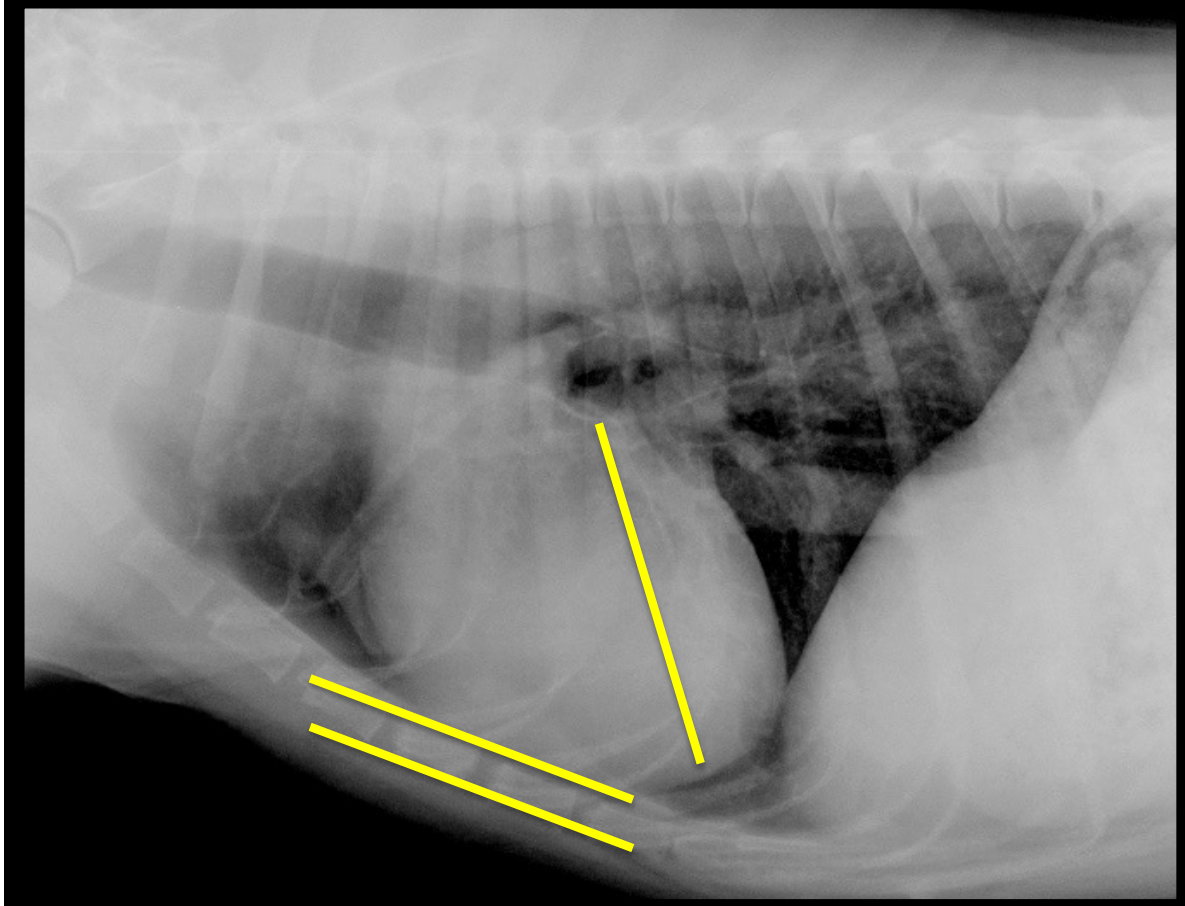
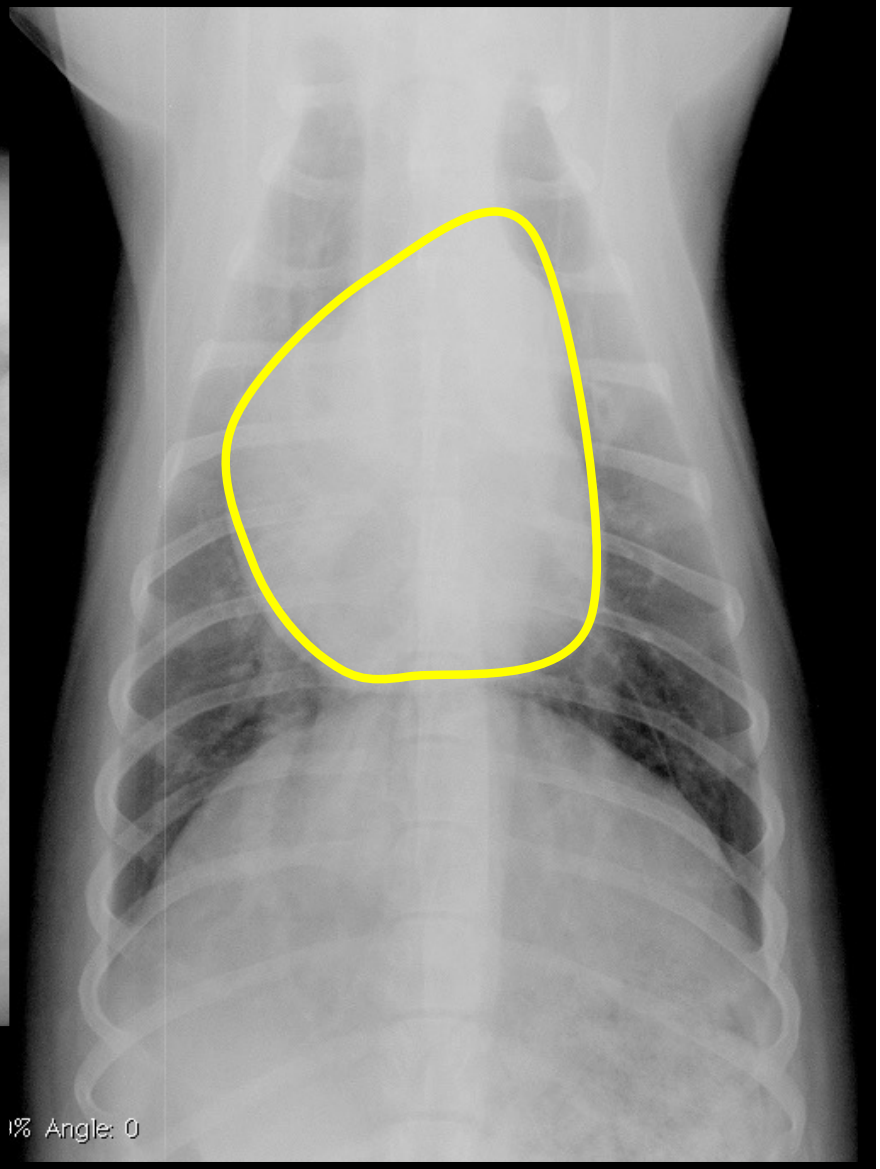
Right, left or generalized?



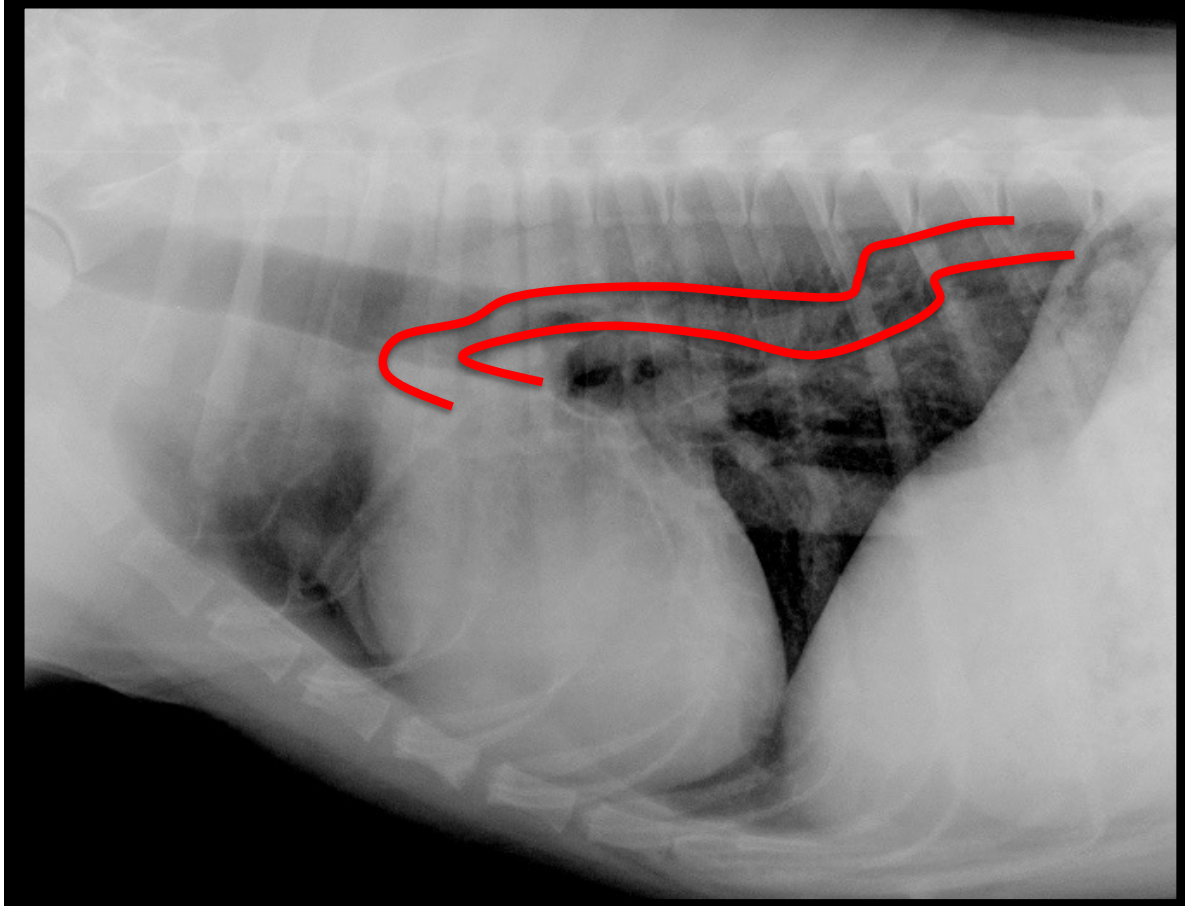
Right cardiomegaly

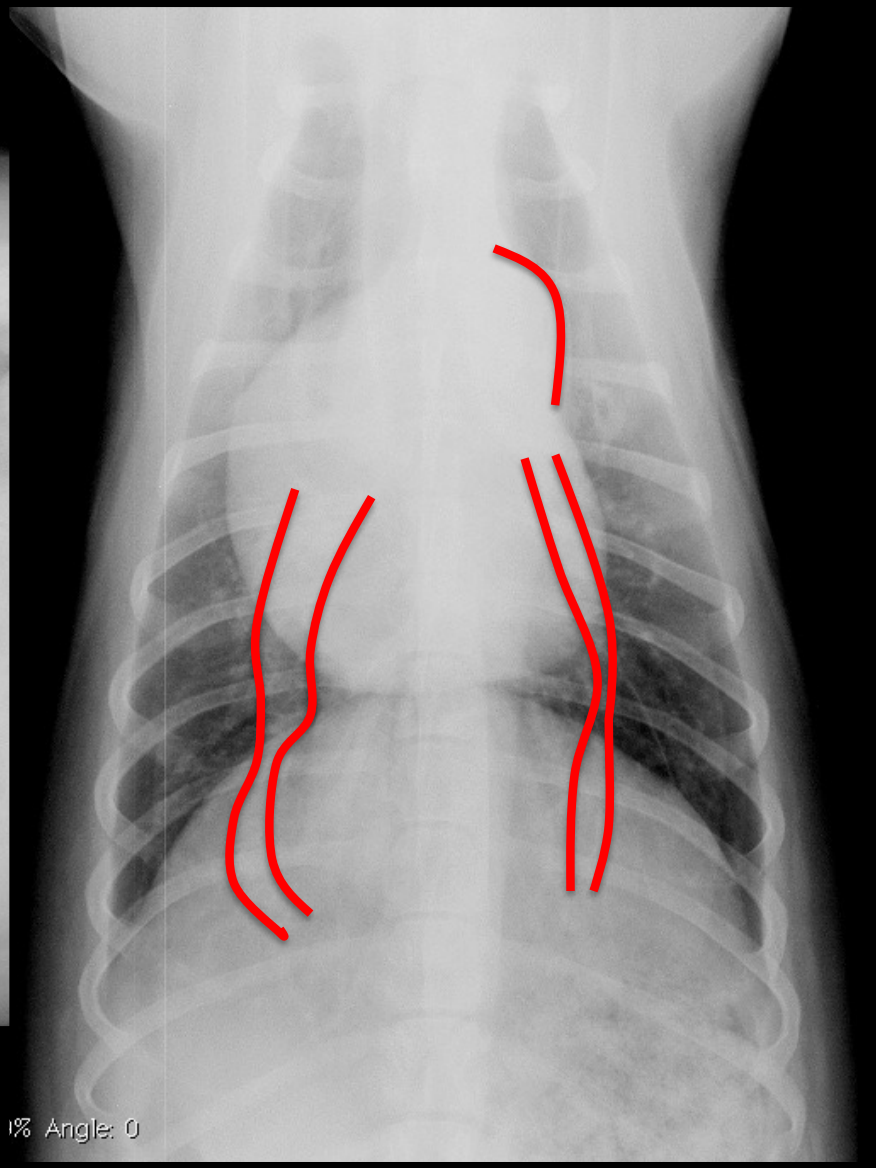




Heart and vessels

Right cardiomegaly





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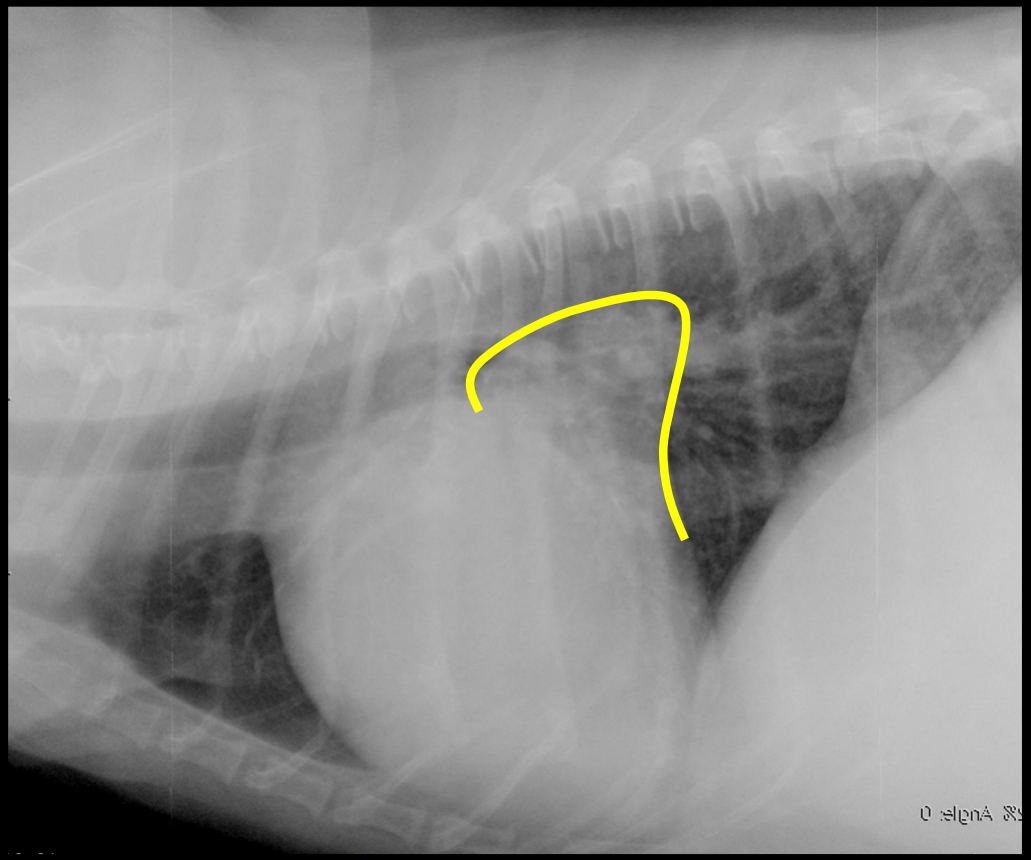

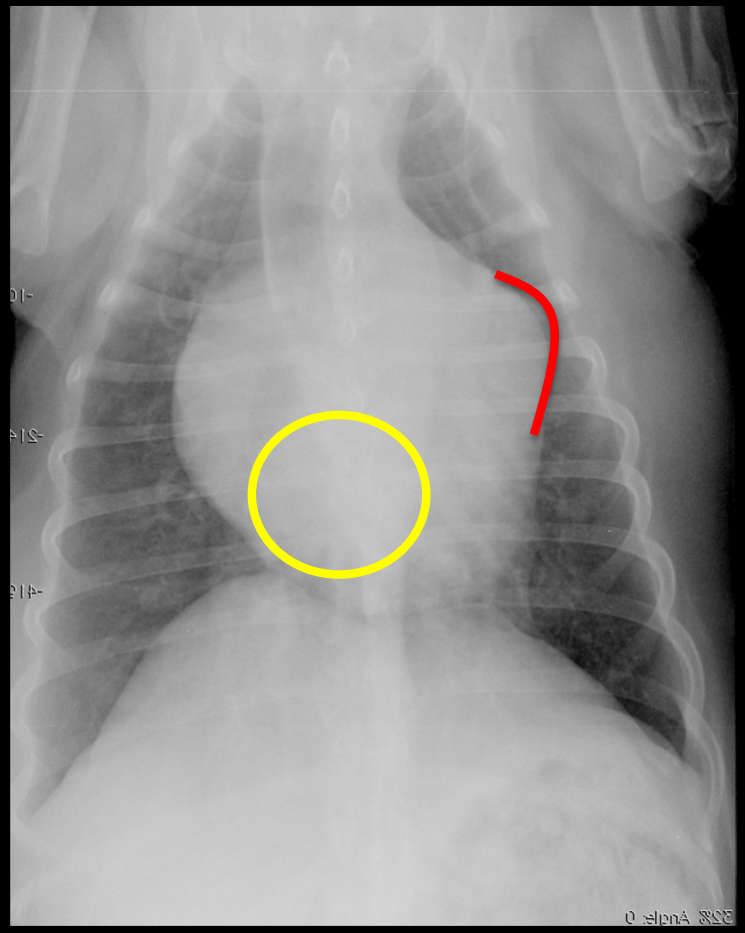

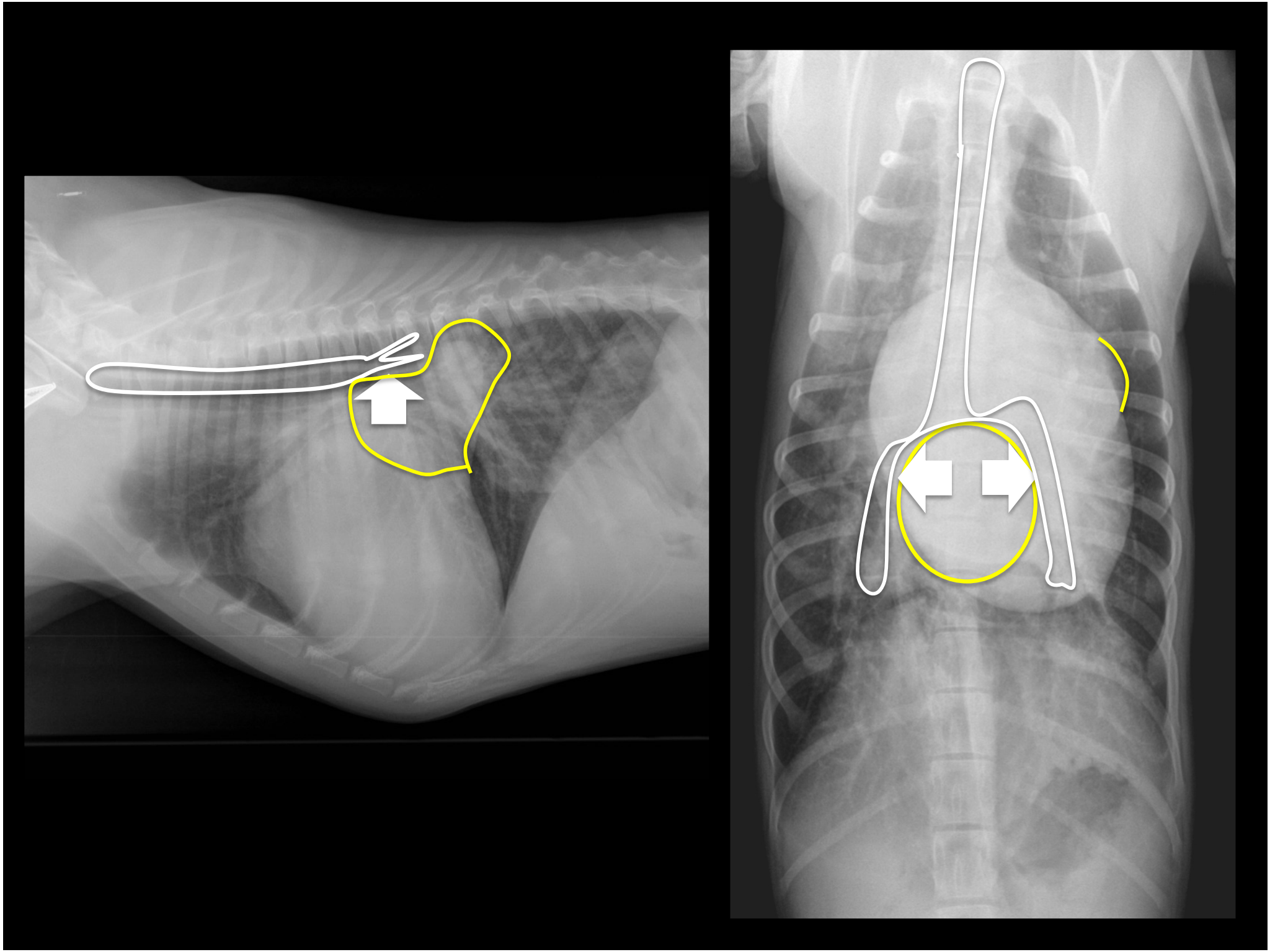

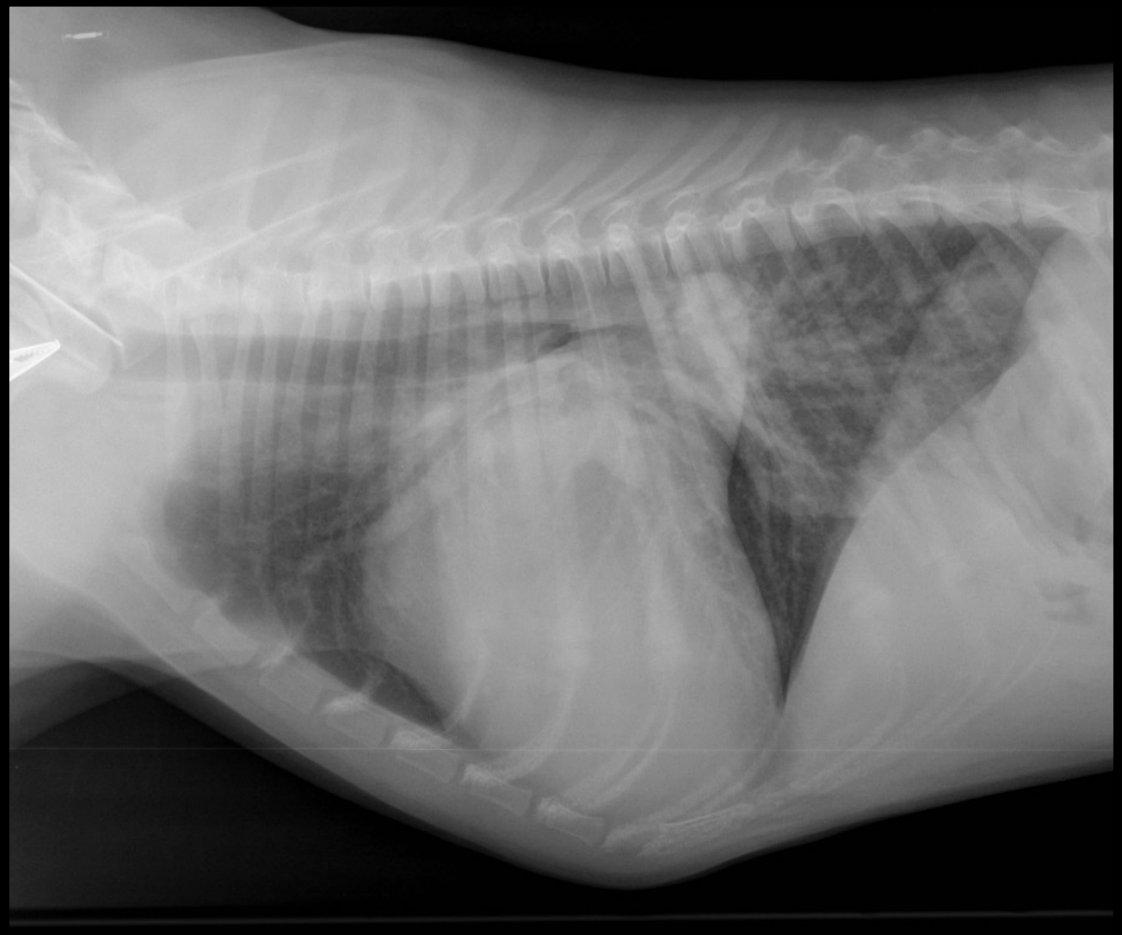

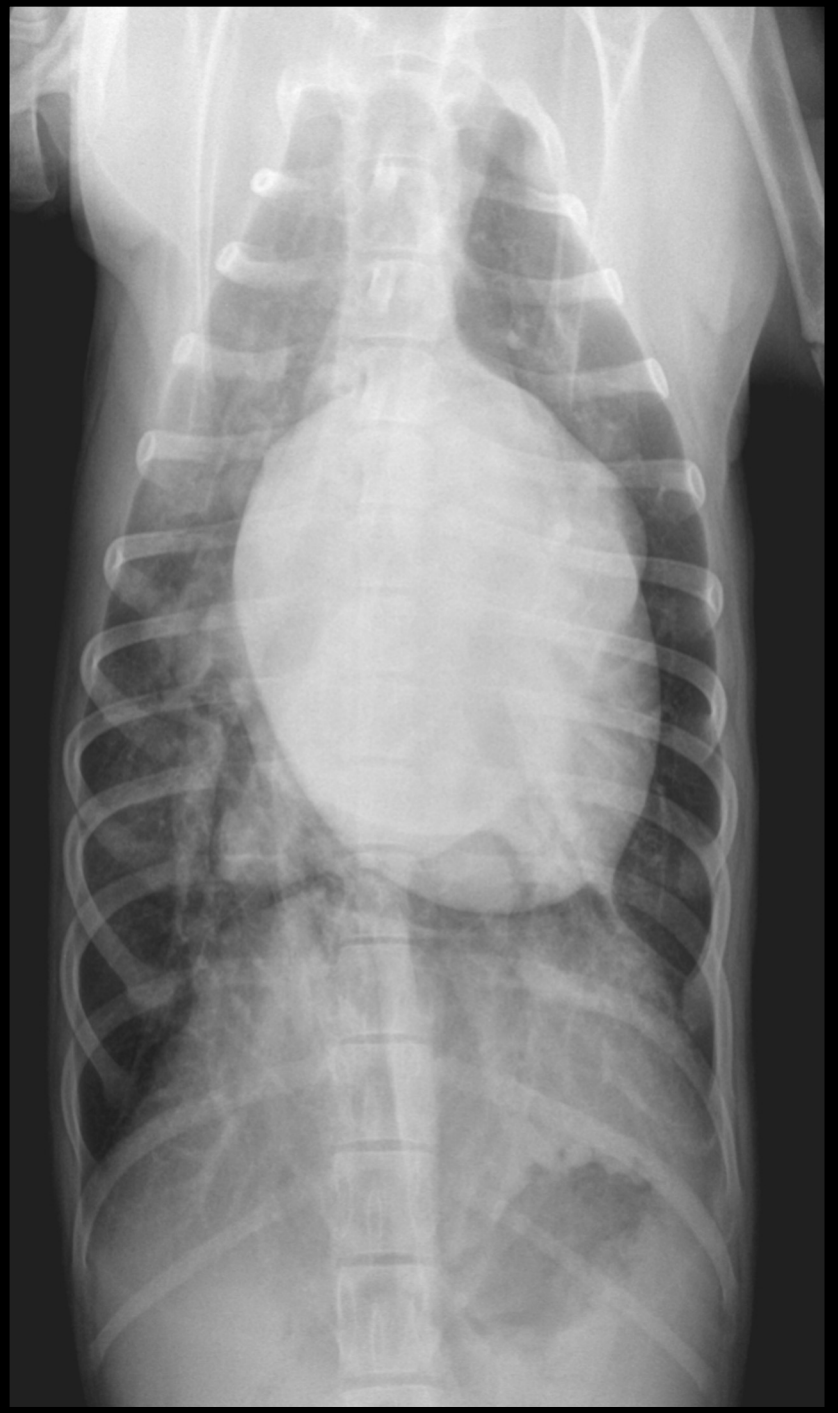

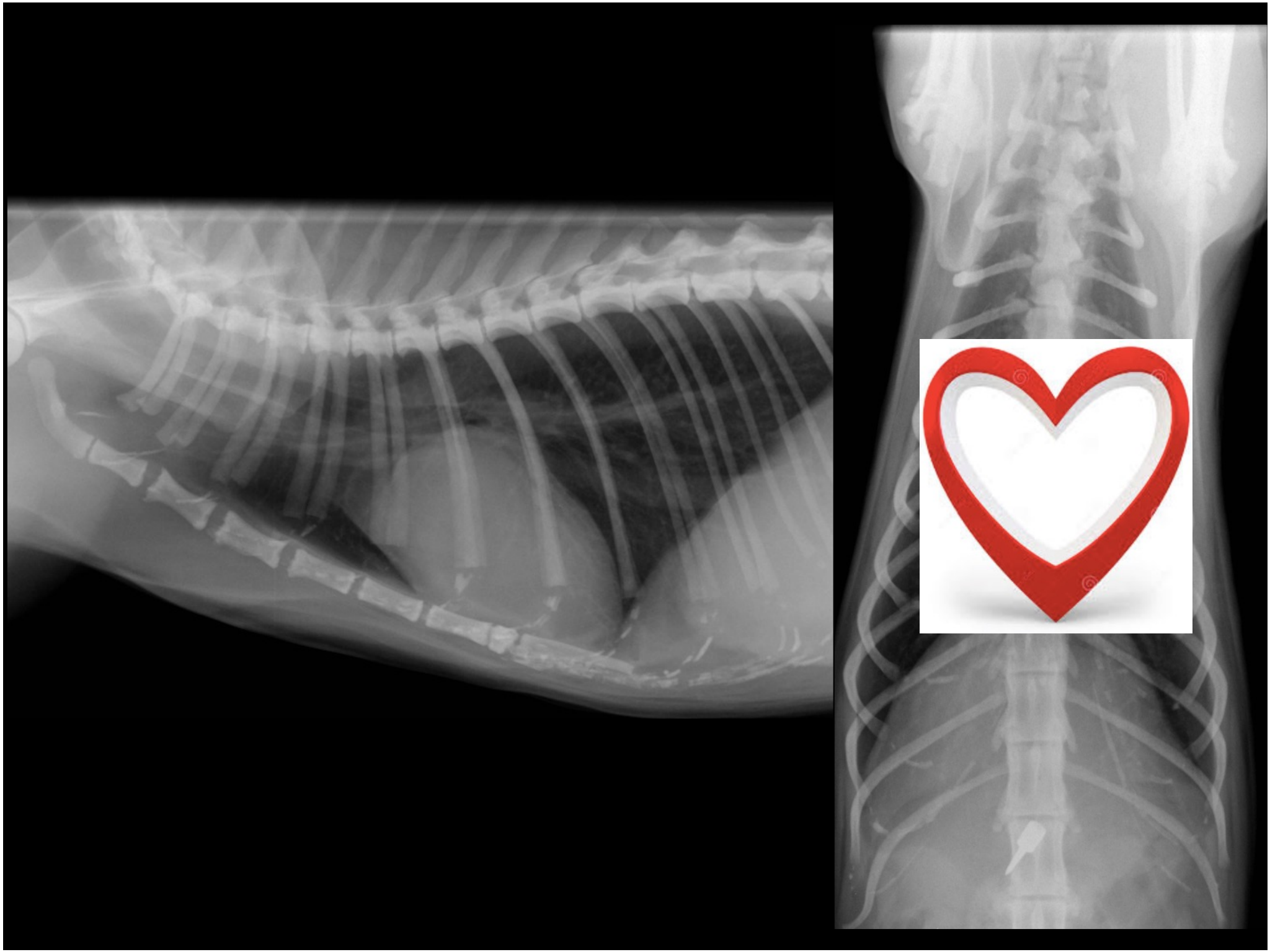

Signs of left heart volume overload in severely anaemic cats

Helen E Wilson BVSc (Hons)*, **Shailen Jasani** MA, VetMB, **Tobias B Wagner** Dr Med Vet, **Livia Benigni** DVM Dip ECVDI CertVDI, **Joanna R Milne** BVMS, **Alison L Stokes** BVetMed, **Virginia Luis-Fuentes** MA, VetMB, PhD, CertVR, DVC, Dip ACVIM, Dip ECVIM-CA

Royal Veterinary College, Department of Veterinary Clinical Sciences, Hawkshead Lane, North Mymms, Hatfield AL9 7TA, UK

Anaemia induces haemodynamic compensatory mechanisms resulting in volume overload and increased left heart dimensions in humans and dogs. The aims of this retrospective study were to investigate the effects of anaemia on echocardiographic left heart dimensions, vertebral heart size (VHS) and radiographic evidence of congestive heart failure (CHF) in cats. Fifteen cats fulfilled the inclusion criteria and were classified as mildly anaemic (haematocrit (Hct) > 18–24%) or severely anaemic (Hct ≤ 18%). Eight out of eight severely anaemic cats had left atrial enlargement compared with 1/6 mildly anaemic cats ($P < 0.005$) and severely anaemic cats also had a larger median left ventricular end-diastolic diameter (1.80 cm versus 1.27 cm, respectively; $P < 0.05$). No difference was found between the groups in VHS or frequency of radiographic signs of CHF. Despite the small sample size, these preliminary findings suggest that severely anaemic cats are more likely to have enlarged left heart dimensions than mildly anaemic cats.

Date accepted: 22 June 2010

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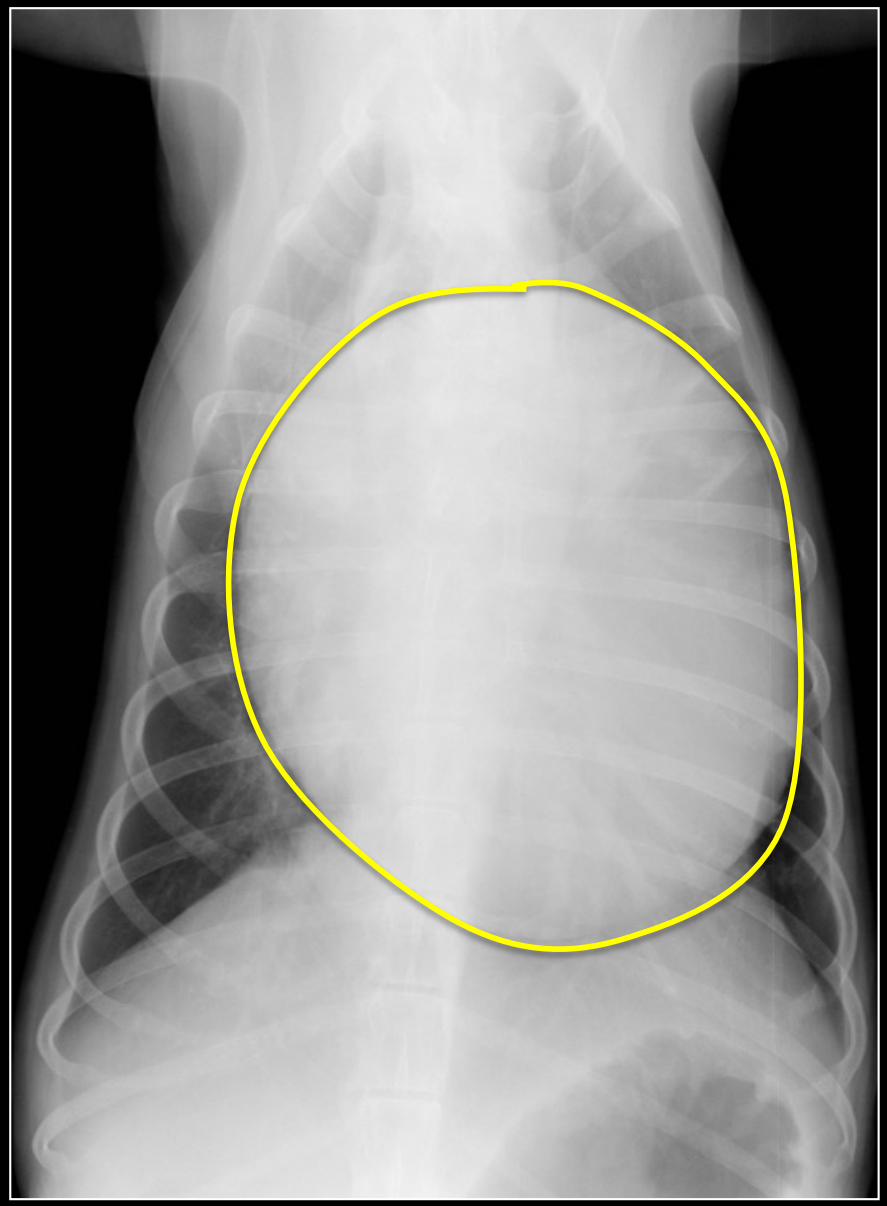
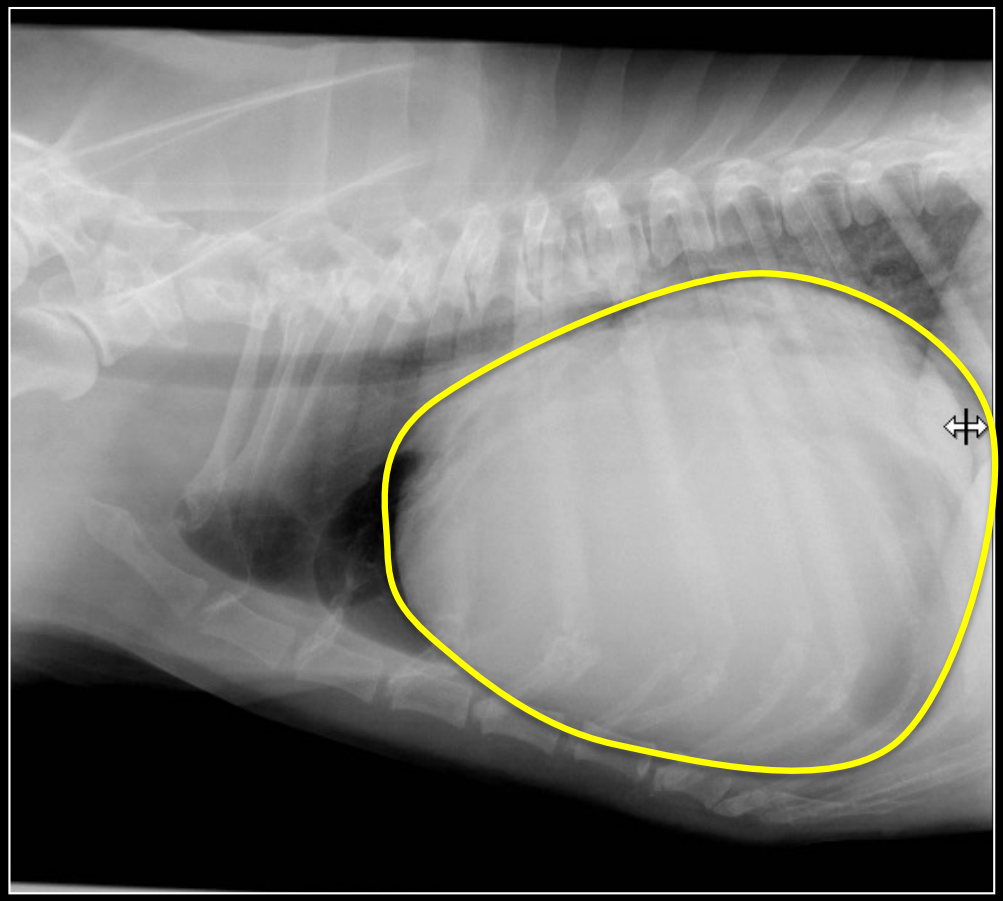
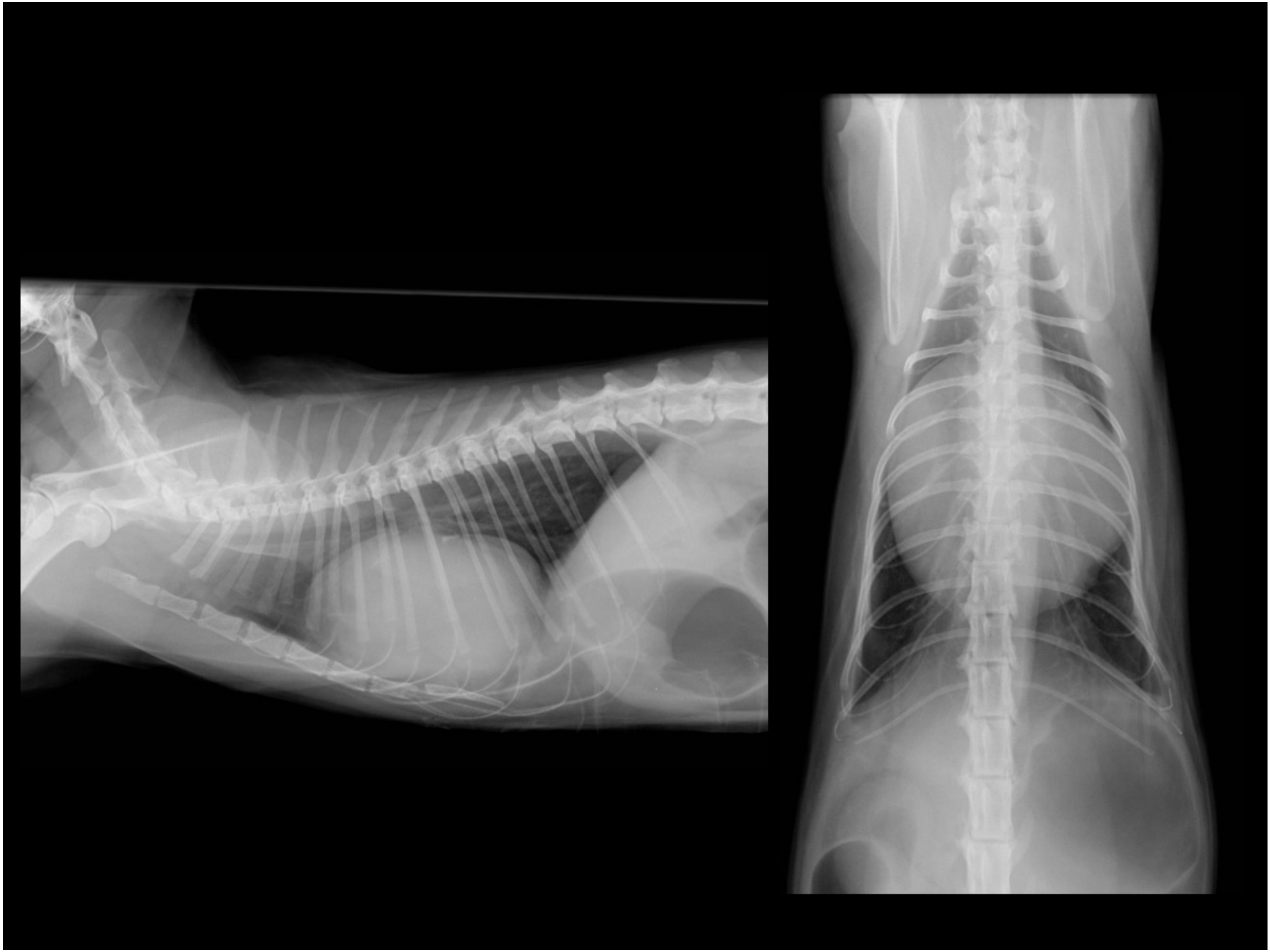
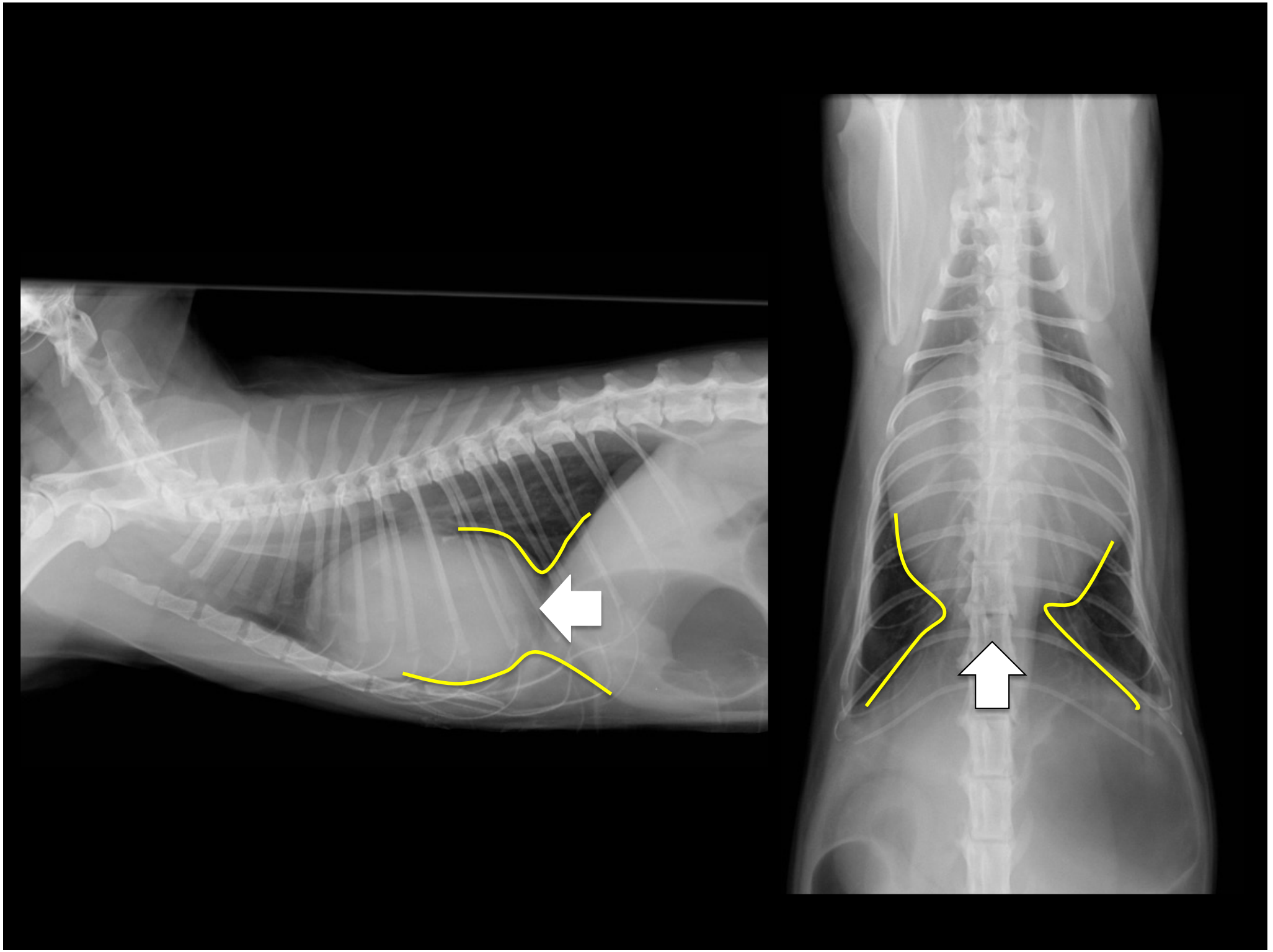
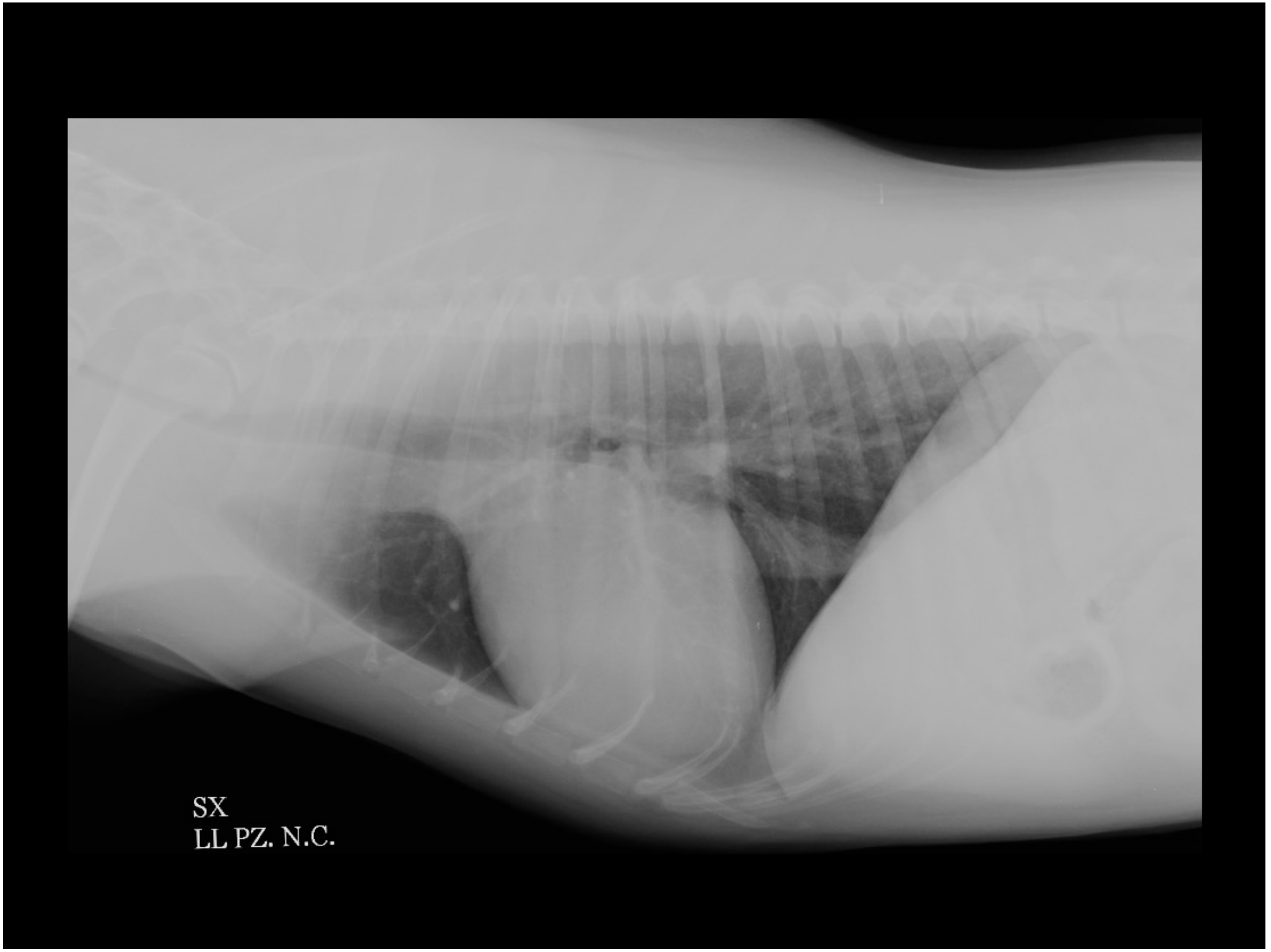








Cardiogenic pulmonary edema?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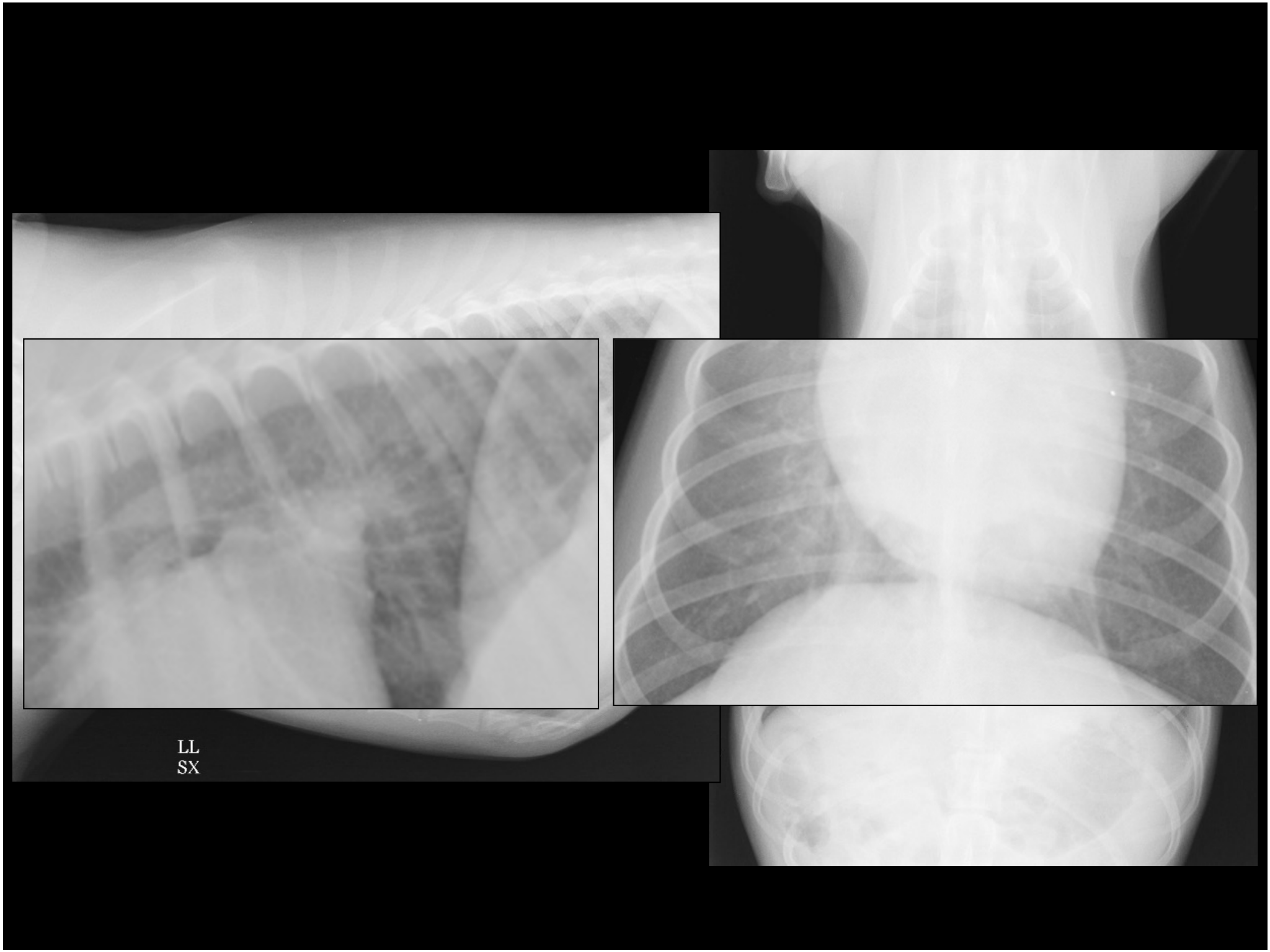
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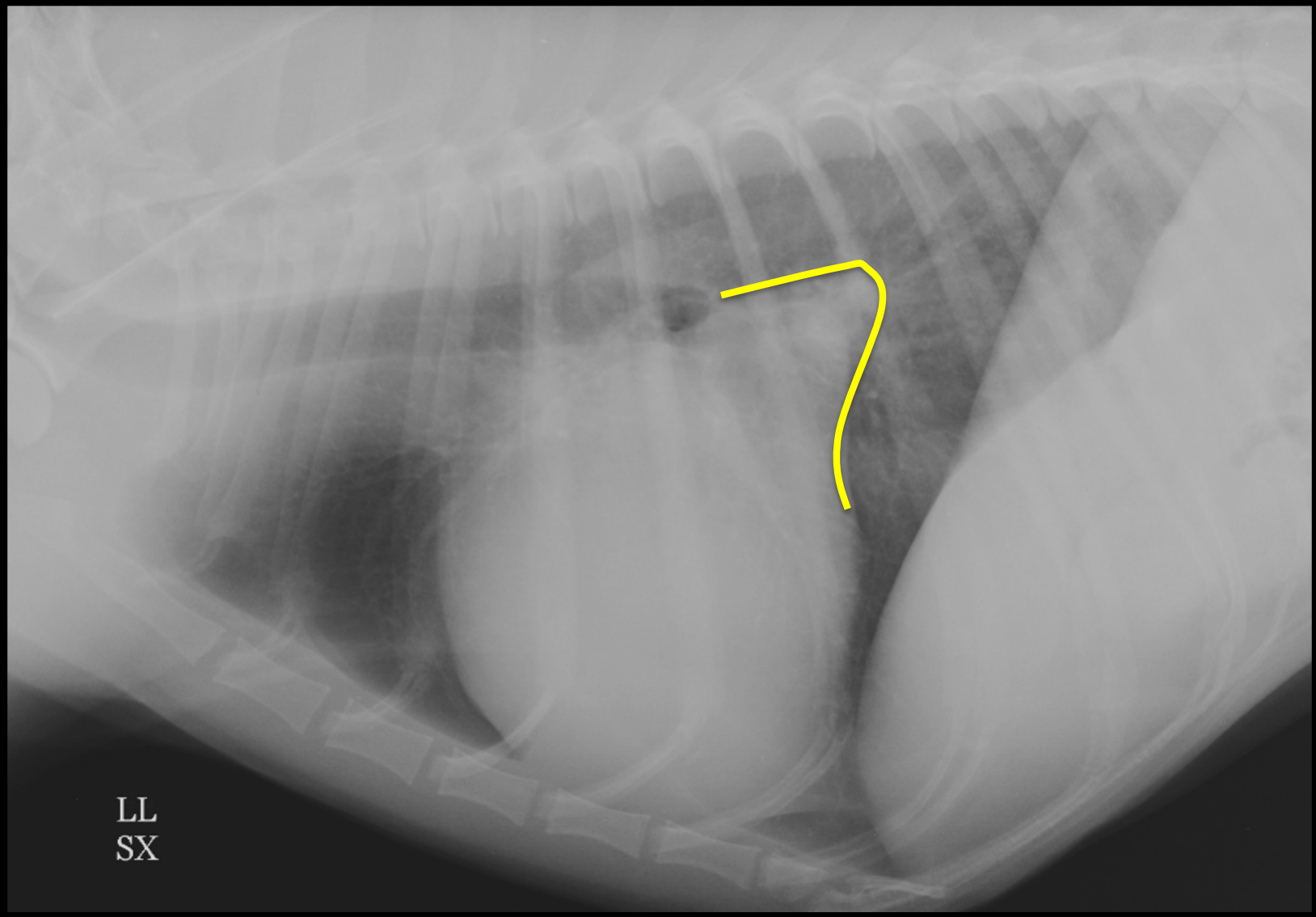
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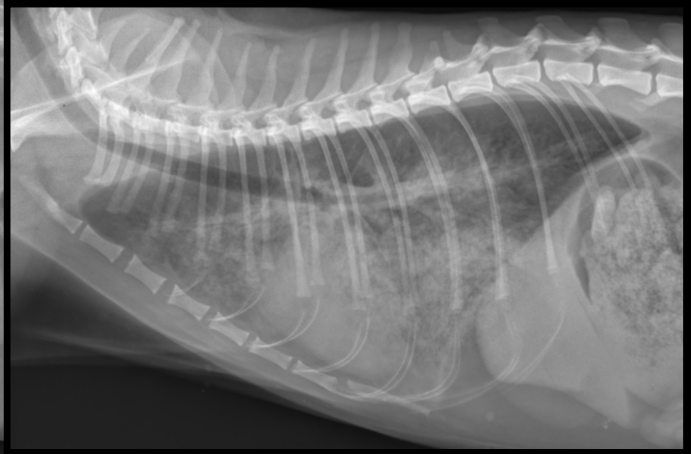
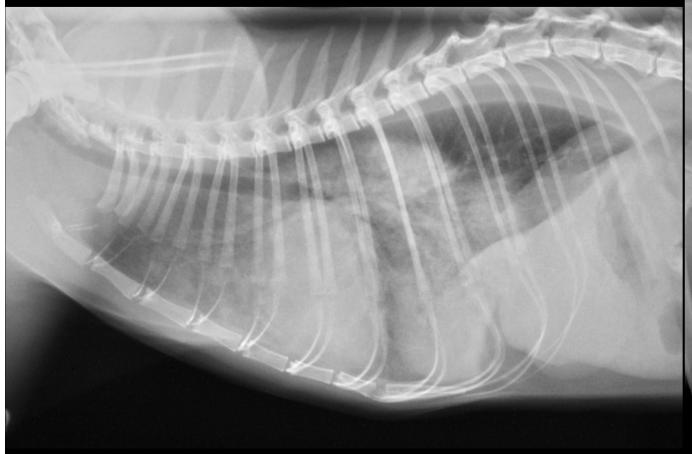
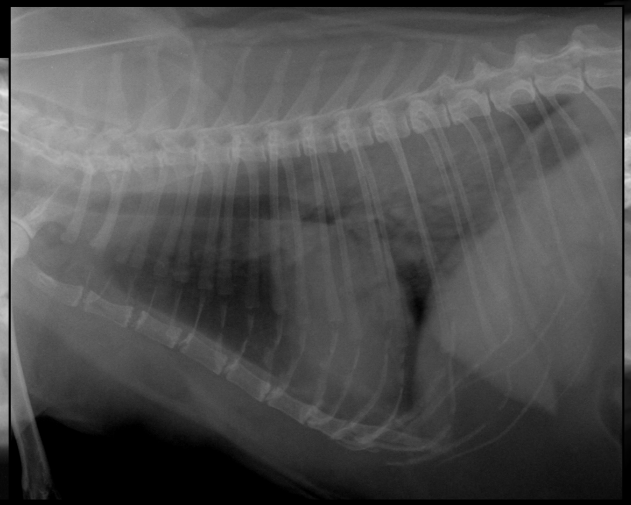
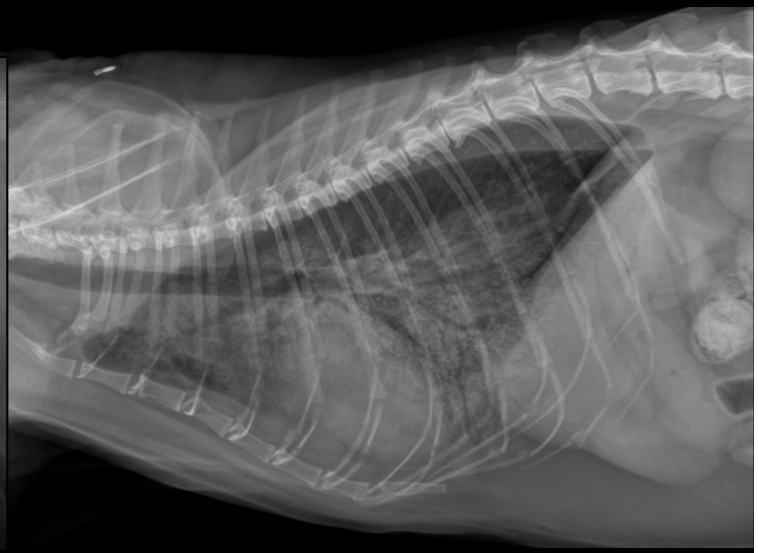


RADIOGRAPHIC AND ECHOCARDIOGRAPHIC ASSESSMENT OF LEFT ATRIAL SIZE IN 100 CATS WITH ACUTE LEFT-SIDED CONGESTIVE HEART FAILURE

KARSTEN E. SCHOBER, ELLEN WETLI, WM TOD DROST

The aims of this study were to evaluate left atrial size in cats with acute left-sided congestive heart failure. We hypothesized that left atrial size as determined by thoracic radiography can be normal in cats with acute left-sided congestive heart failure. One hundred cats with acute left-sided congestive heart failure in which thoracic radiography and echocardiography were performed within 12 h were identified. Left atrial size was evaluated using right lateral and ventrodorsal radiographs. Measurements were compared to two-dimensional echocardiographic variables of left atrial size and left ventricular size. On echocardiography, left atrial enlargement was observed in 96% cats (subjective assessment) whereas maximum left atrial dimension was increased (>15.7 mm) in 93% cats. On radiographs left atrial enlargement (subjective assessment) was found in 48% (lateral view), 53% (ventrodorsal view), and 64% (any view) of cats whereas left atrial enlargement was absent in 36% of cats in both views. Agreement between both methods of left atrial size estimation was poor (Cohen's kappa 0.17). Receiver operating characteristic curve analysis identified a maximum echocardiographic left atrial dimension of approximately 20 mm as the best compromise (Youden index) between sensitivity and specificity in the prediction of radiographic left atrial enlargement. Left atrial enlargement as assessed by thoracic radiography may be absent in a clinically relevant number of cats with congestive heart failure. Therefore, normal left atrial size on thoracic radiographs does not rule out presence of left-sided congestive heart failure in cats with clinical signs of respiratory distress.
© 2013 *American College of Veterinary Radiology.*

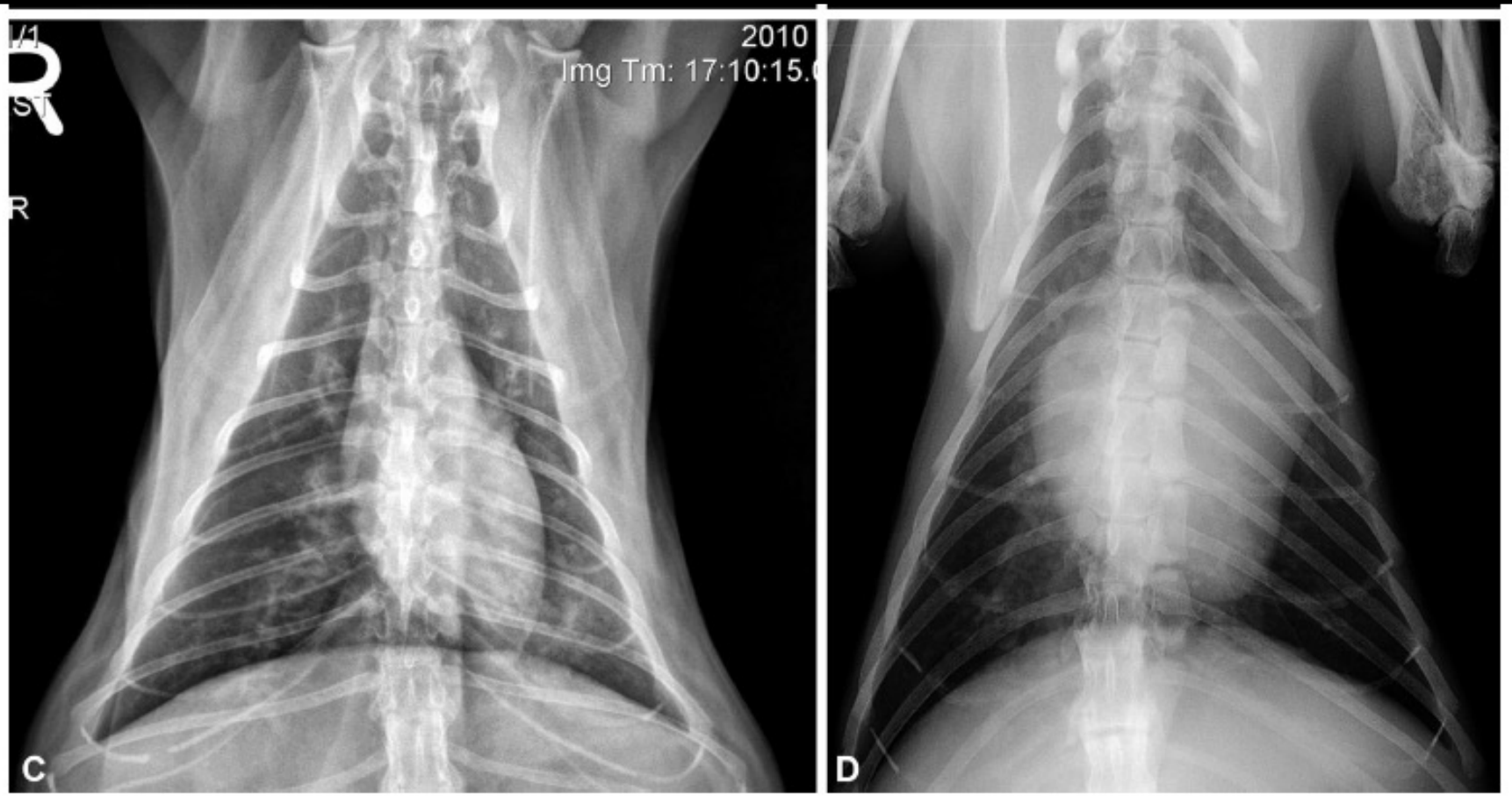
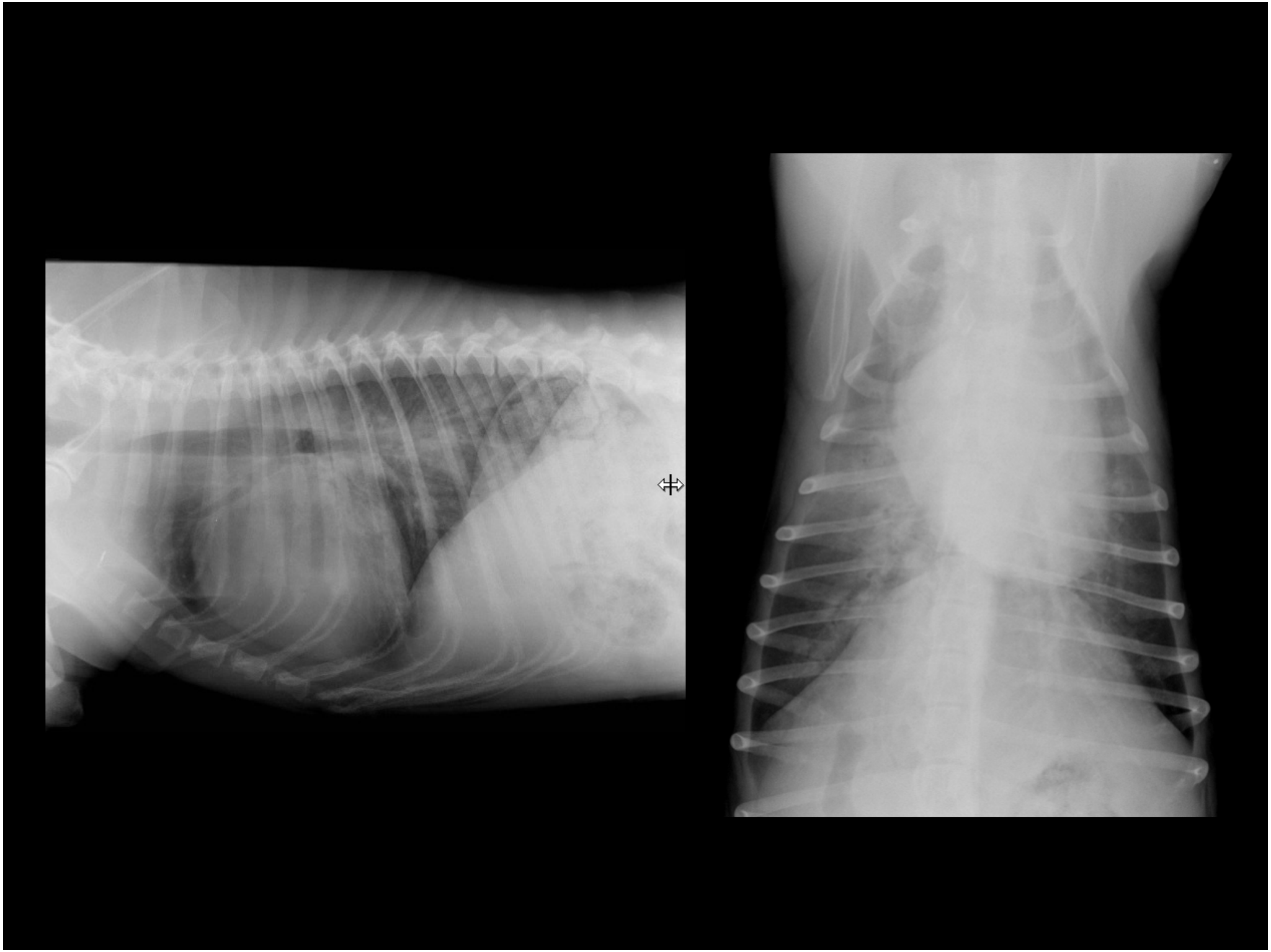


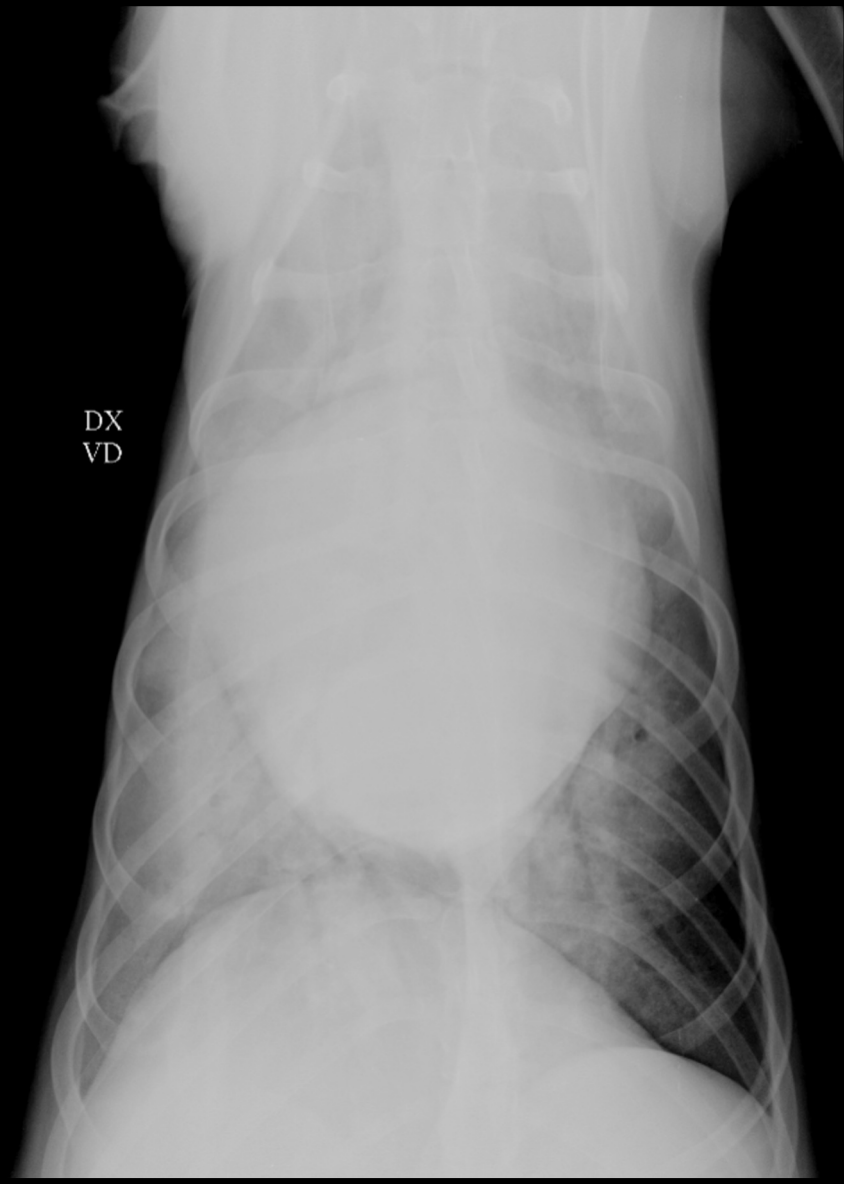
FIG. 1. Composite of examples of radiographic images in cats with acute left-sided congestive heart failure without (panels A and C) and with (panels B and D) left atrial enlargement.

We hypothesized that left atrial size as assessed by thoracic radiography can be normal in cats with acute left-sided congestive heart failure.

genic pulmonary edema and/or pleural effusion; Fig. 1),[2,3] and response to diuretic treatment leading to alleviation of clinical signs. Radiographs were identified by one investigator (E.W.), and presence of findings suggestive of left-



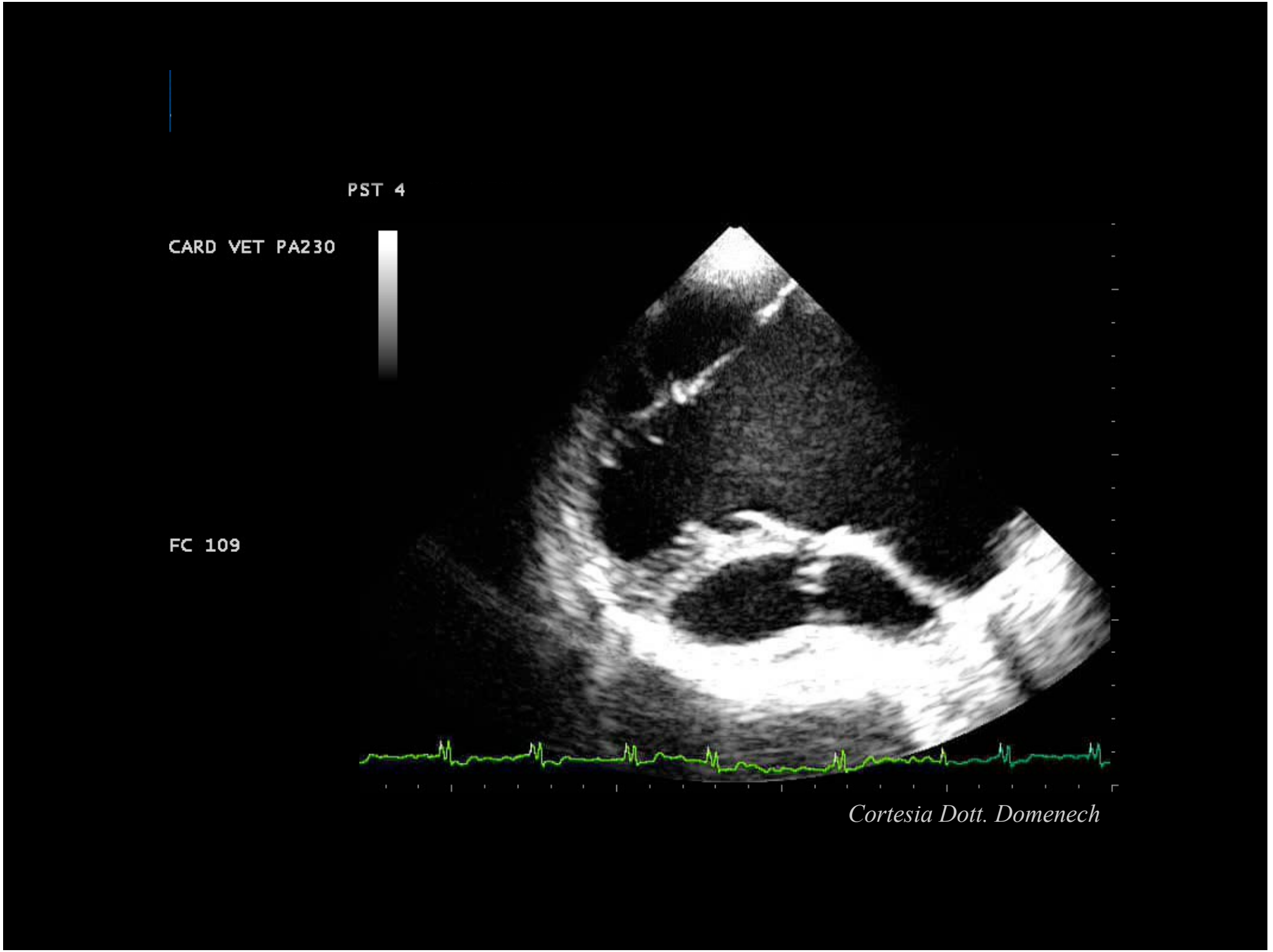
SX
LL


DX
VD

Right heart failure

- Right cardiomegaly
- Pericardial/pleural effusion
- Congested caudal vena cava
- Hepatomegaly
- Ascites

Cortesía Dott. Domenech



Cortesia Dott. Domenech

Take home message

- Type of cardiomegaly (left, right, generalized)
- Volume VS Pressure overload
- Pulmonary vessels
- Pulmonary patterns (dog ≠ cat)
- Look the whole images (abdomen included)
- Differential diagnoses list
- Echocardiography