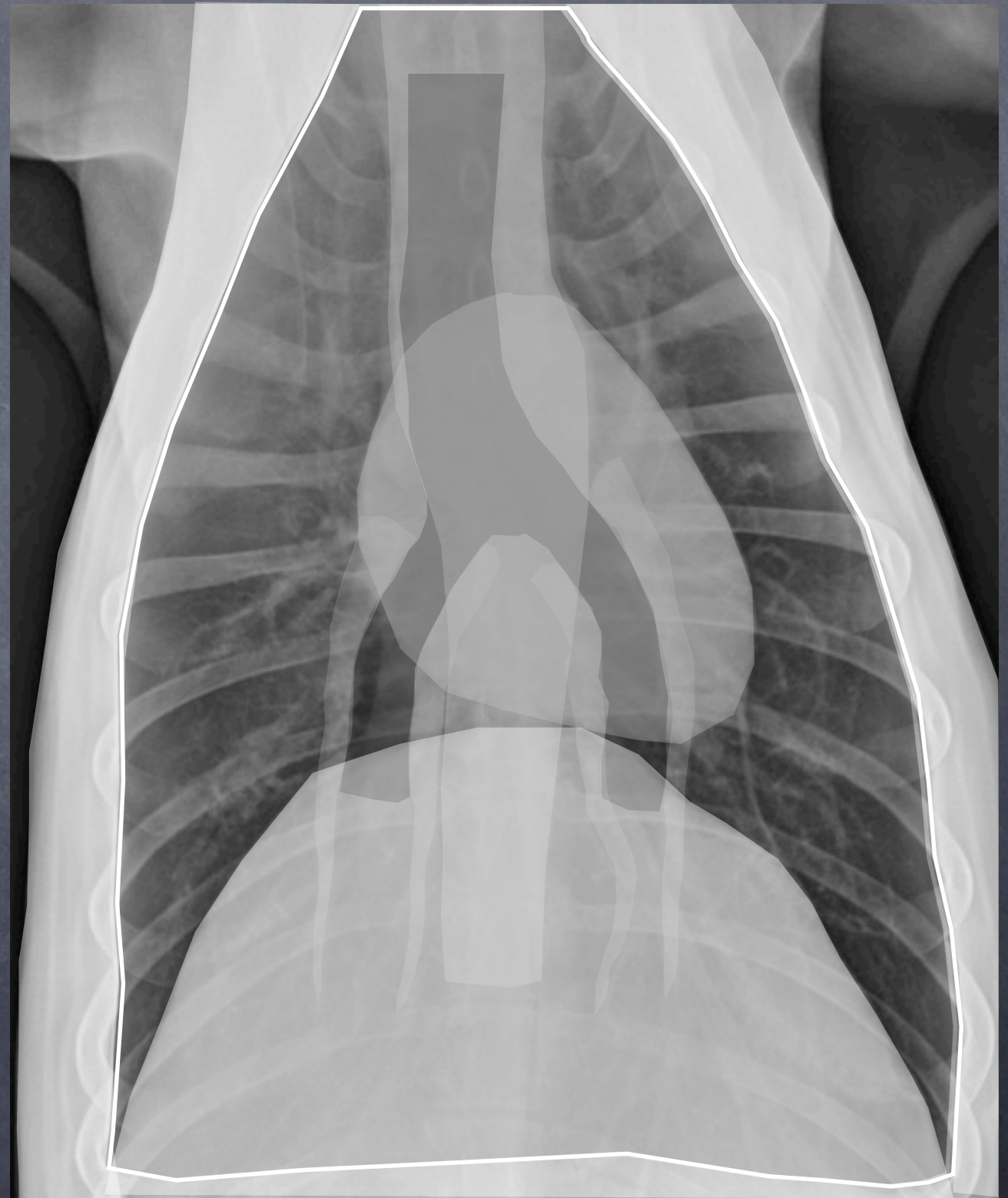


Radiographic Lung Patterns

Systematic approach

- heart
- mediastinum
- vessels
- lungs
- pleural space
- thoracic wall
- diaphragm/abdomen



Lung pathology

- Most cause
INCREASED OPACITY

- patterns

- INTERSTITIAL

- ALVEOLAR

- BRONCHIAL

- VASCULAR

- NODULAR

- Some cause
DECREASED OPACITY

- emphysema, air
trapping

- hypoperfusion

- PTE

Approach

- Is there increased opacity?
- What is the pattern(s)?
- What is the distribution?

DISTRIBUTION

PATTERN

FOCAL/MULTIFOCAL ----->

NODULAR

ALVEOLAR

INTERSTITIAL

DIFFUSE ----->

INTERSTITIAL

BRONCHIAL

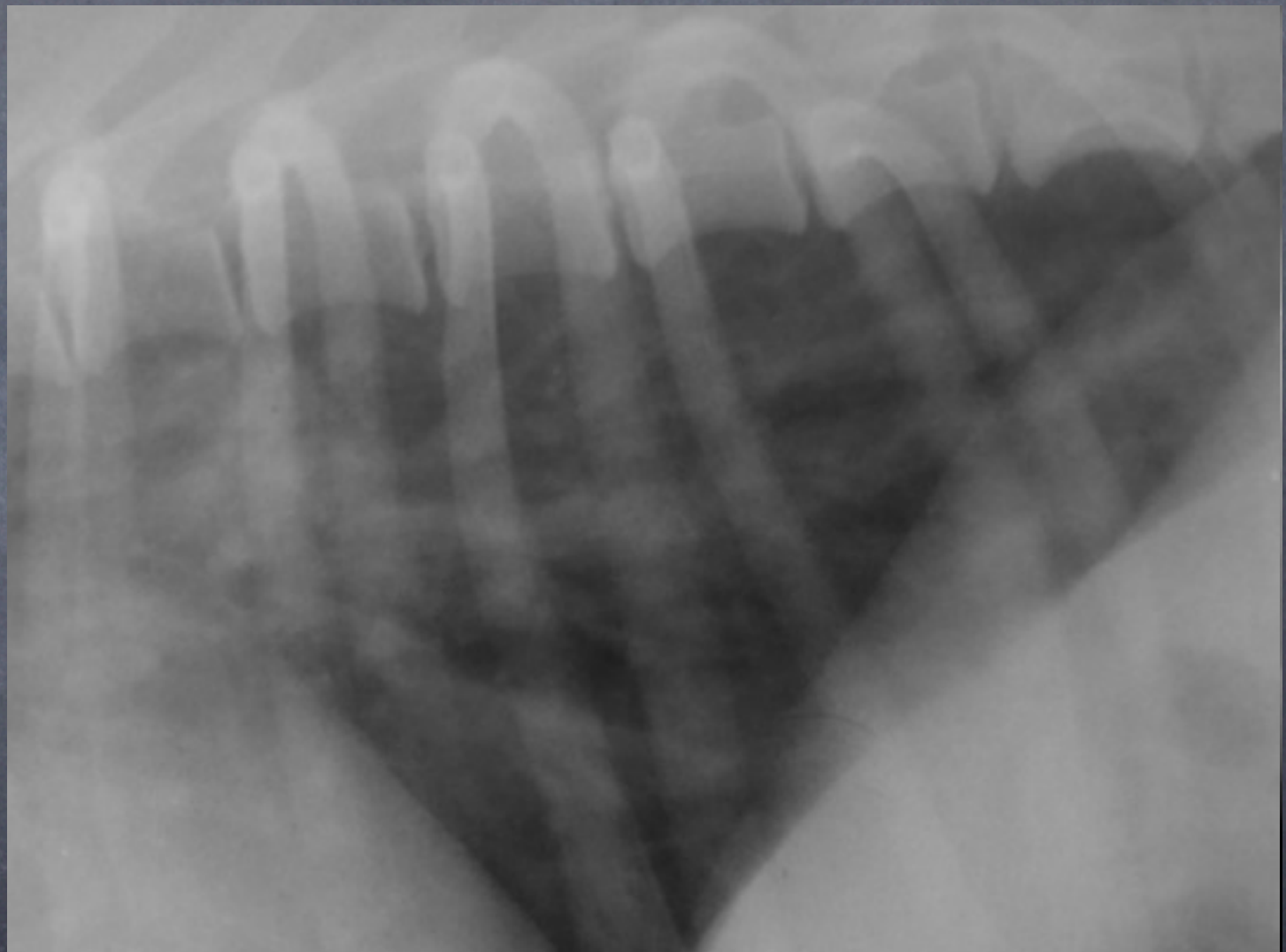
VASCULAR

A close-up photograph of a tree's root system. The roots are dark, gnarled, and spread out across the ground. They are surrounded by a thick layer of fallen yellow and orange flower petals, some of which are still attached to small green leaves. The word "VASCULAR" is written in a large, white, sans-serif font across the center of the image, partially overlapping the roots and the petals.

VASCULAR

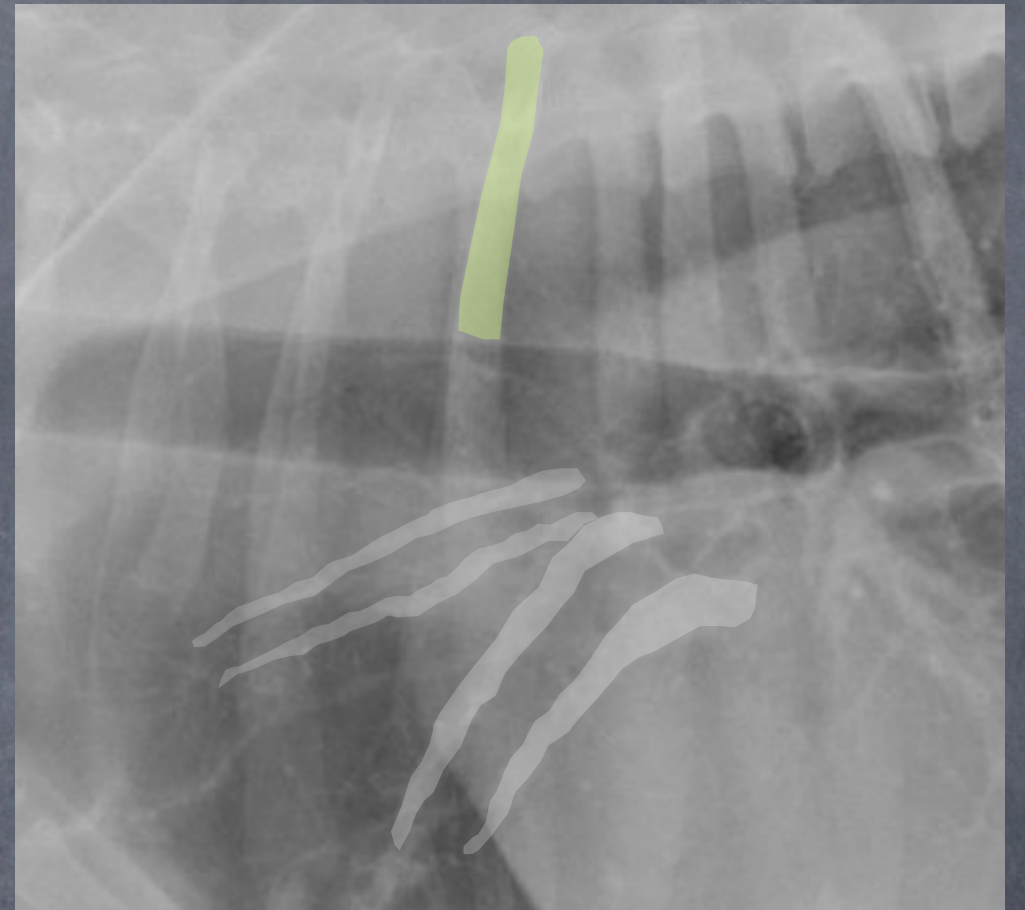
Vascular pattern

- What you will see...
 - DIFFUSE increased opacity
- Due to:
 - Multiple enlarged pulmonary vessels
 - Veins
 - Arteries
 - BOTH



Vascular pattern

- Remember compare:
 - cranial vessels to: **4th rib**
 - caudal vessels to: **9th rib**
- Artery and vein should be:
 - same size or smaller than rib
 - similar size to each other



Vascular

BIG ARTERIES
normal VEINS

BIG VEINS
normal ARTERIES

BIG VEINS
BIG ARTERIES

Pulmonary
hypertension

Left heart
failure

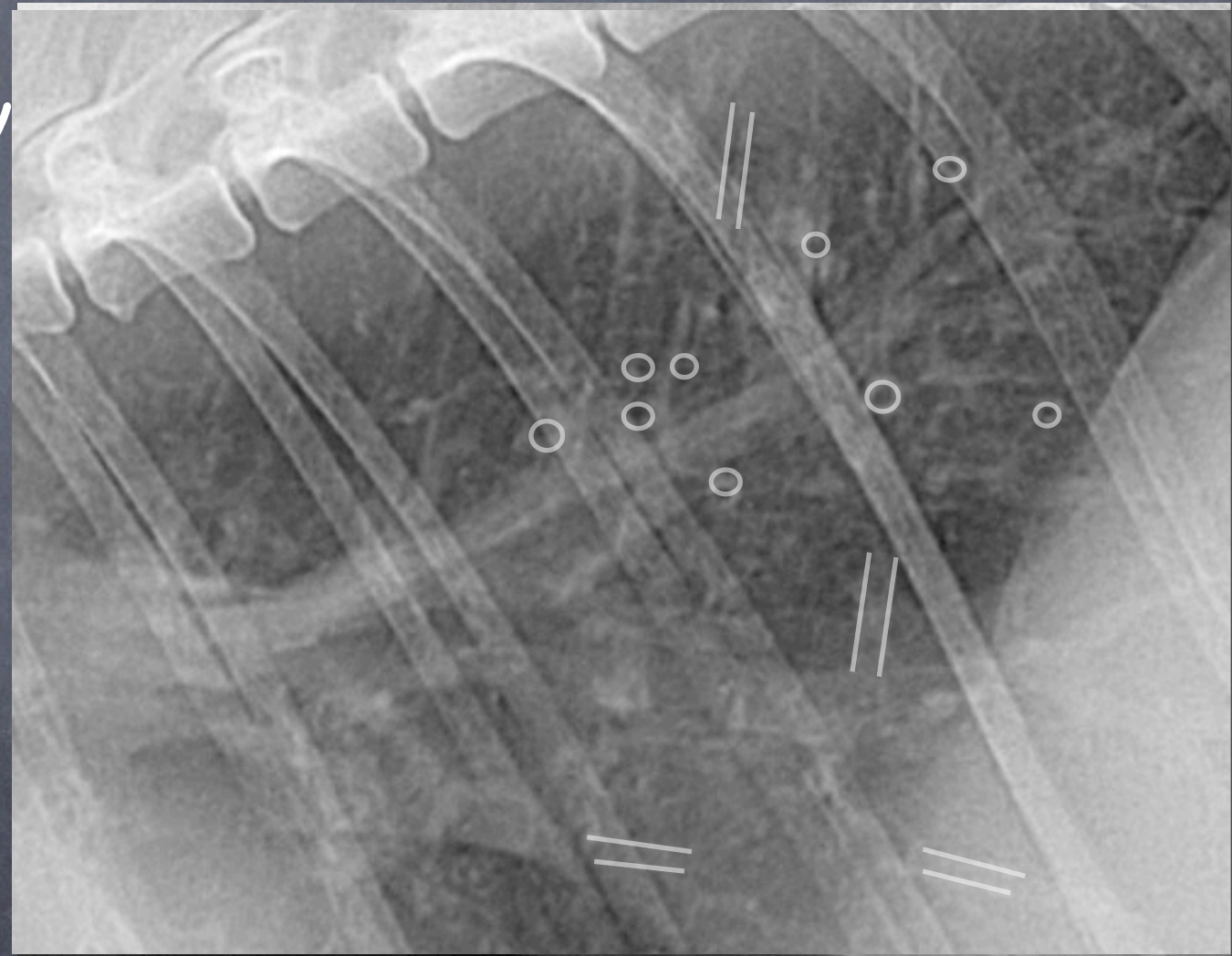
Overcirculation



BRONCHIAL

Bronchial pattern

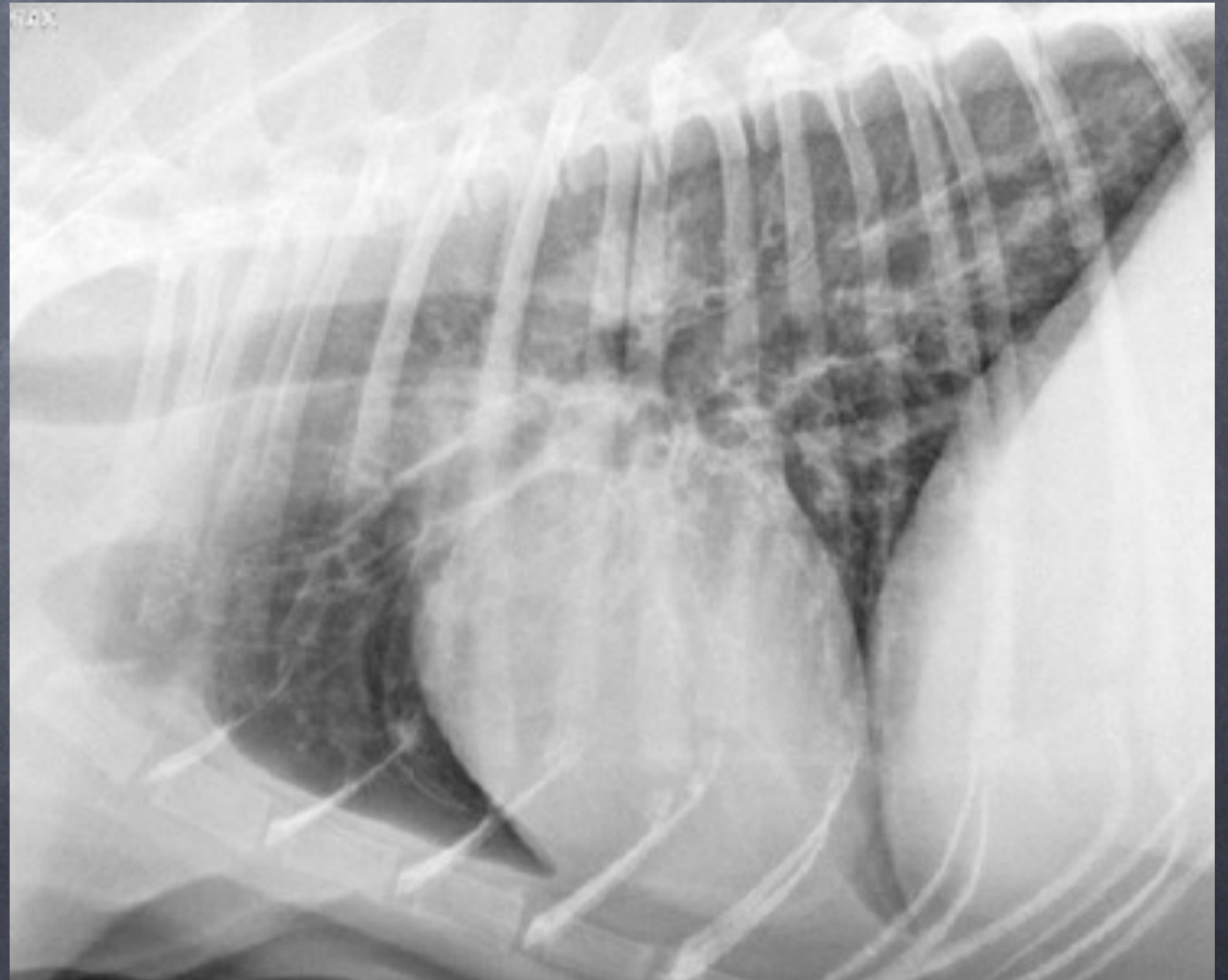
- What you will see...
 - DIFFUSE increased opacity
- Due to...
 - Prominent bronchial walls
 - "RAILROAD TRACKS"
 - "DONUTS"
 - out to PERIPHERY



Bronchial pattern

• DIFFERENTIALS

- Chronic bronchitis
 - allergic, irritant
- Feline asthma
- Infectious bronchitis
- Lungworms
- Heartworm disease



A photograph of a beach at low tide. The foreground and middle ground are filled with dark, smooth, rounded stones of various sizes. Shallow pools of water are scattered among the rocks. In the background, the ocean stretches to the horizon under a bright, hazy sky. A single palm tree is visible on the right side of the frame. The word "INTERSTITIAL" is overlaid in white, bold, sans-serif capital letters across the center of the image.

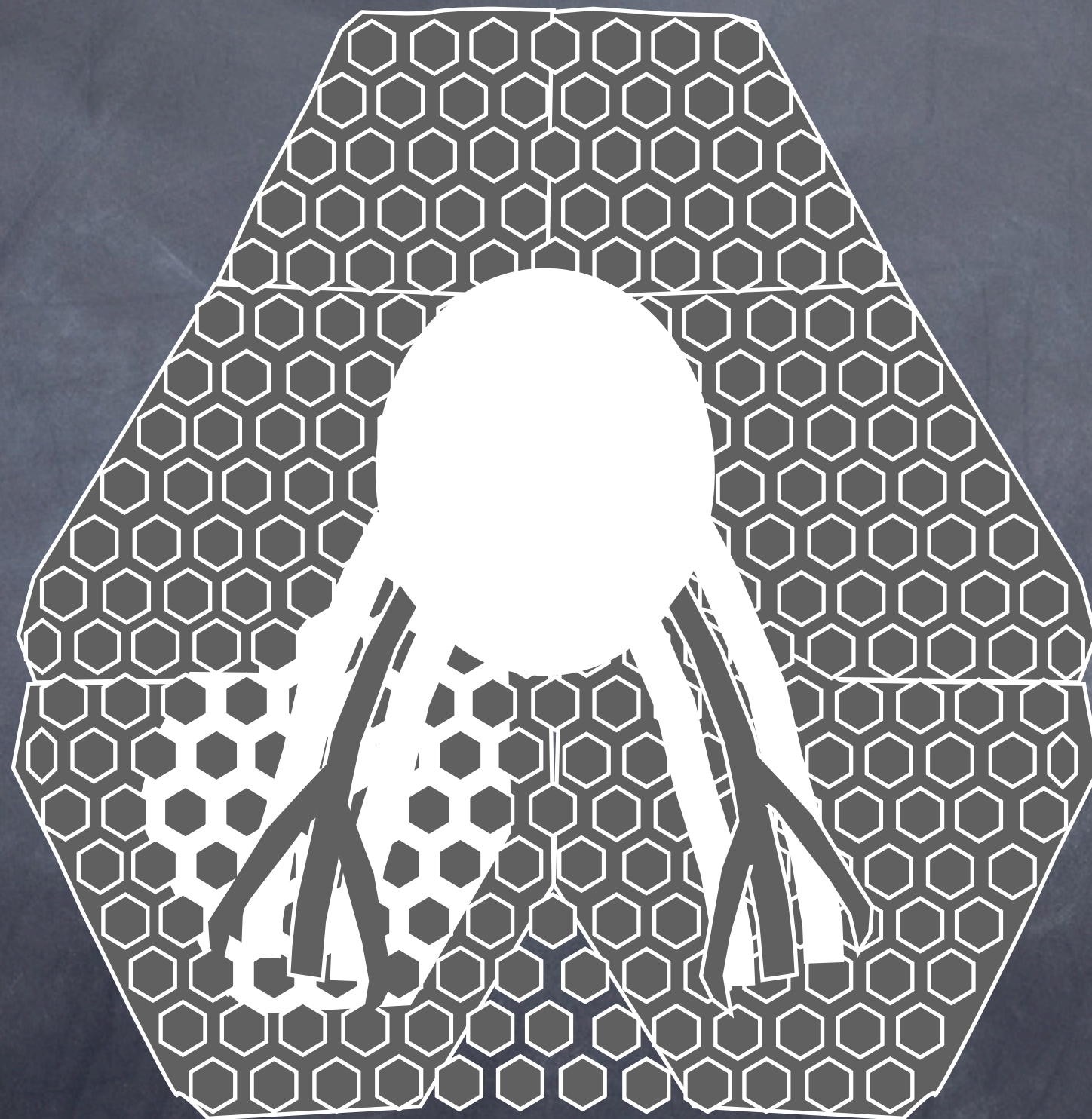
INTERSTITIAL

Interstitial pattern

- What you will see...
 - DIFFUSE or FOCAL
 - UNSTRUCTURED haziness
 - BLURRING of vessel margins
- Due to:
 - interstitial fluid or cells
 - ARTIFACT

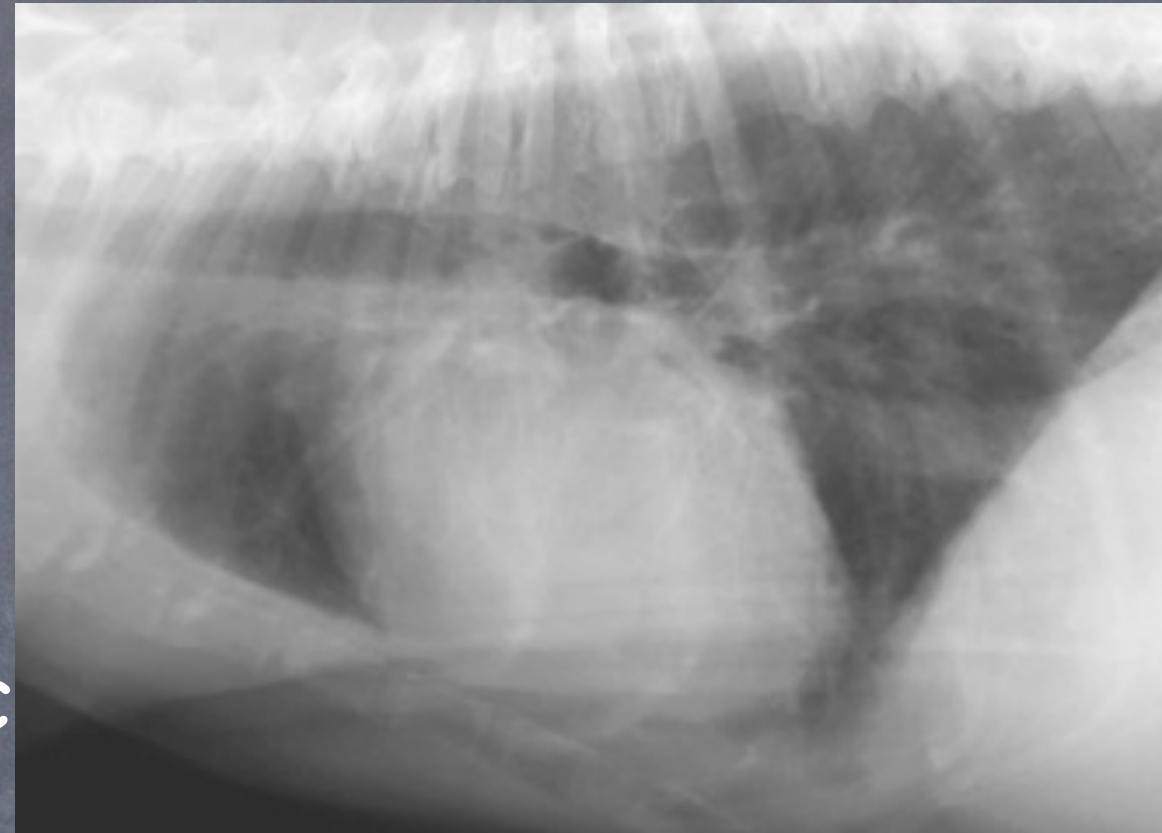


Interstitial pattern

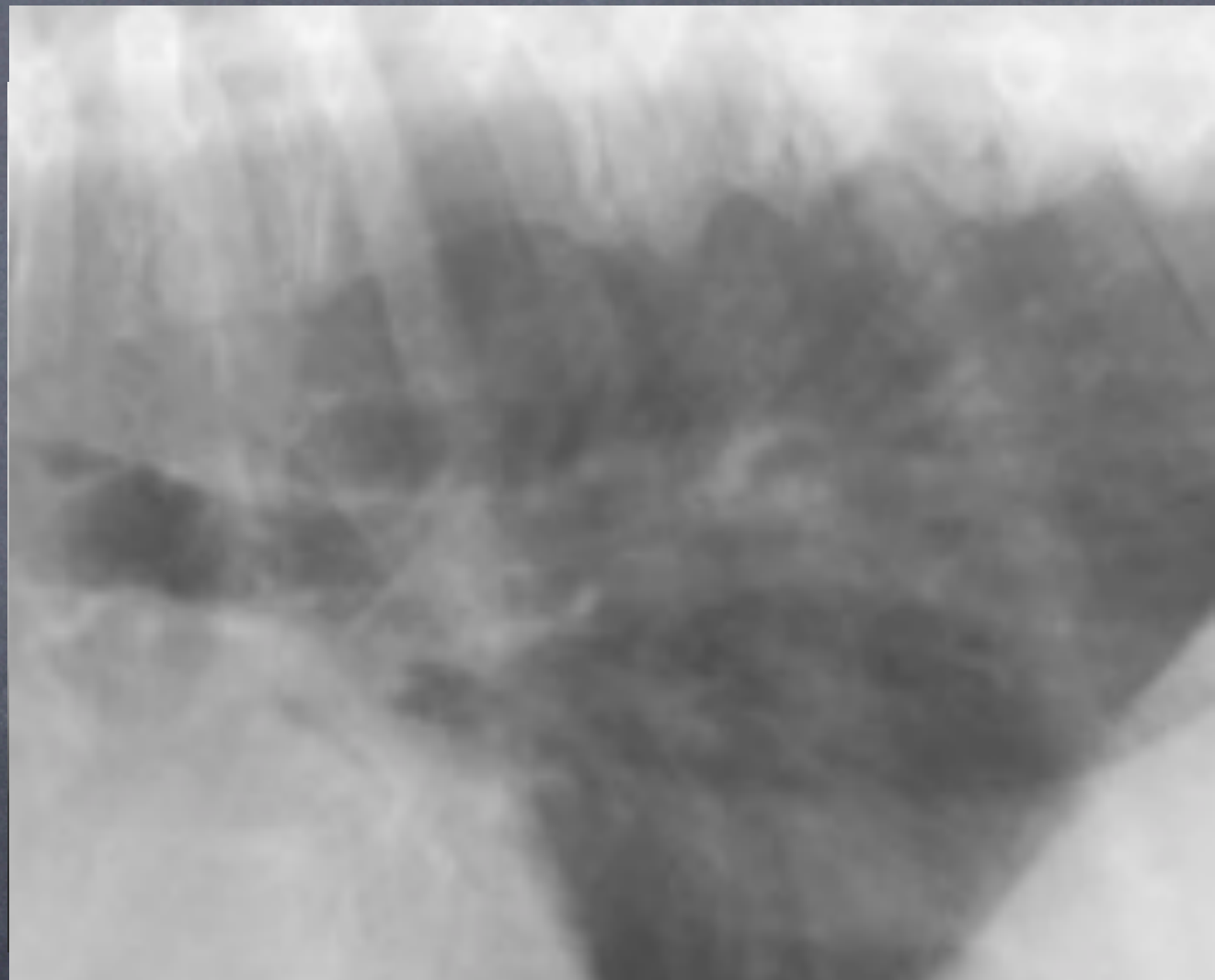


Interstitial Differentials

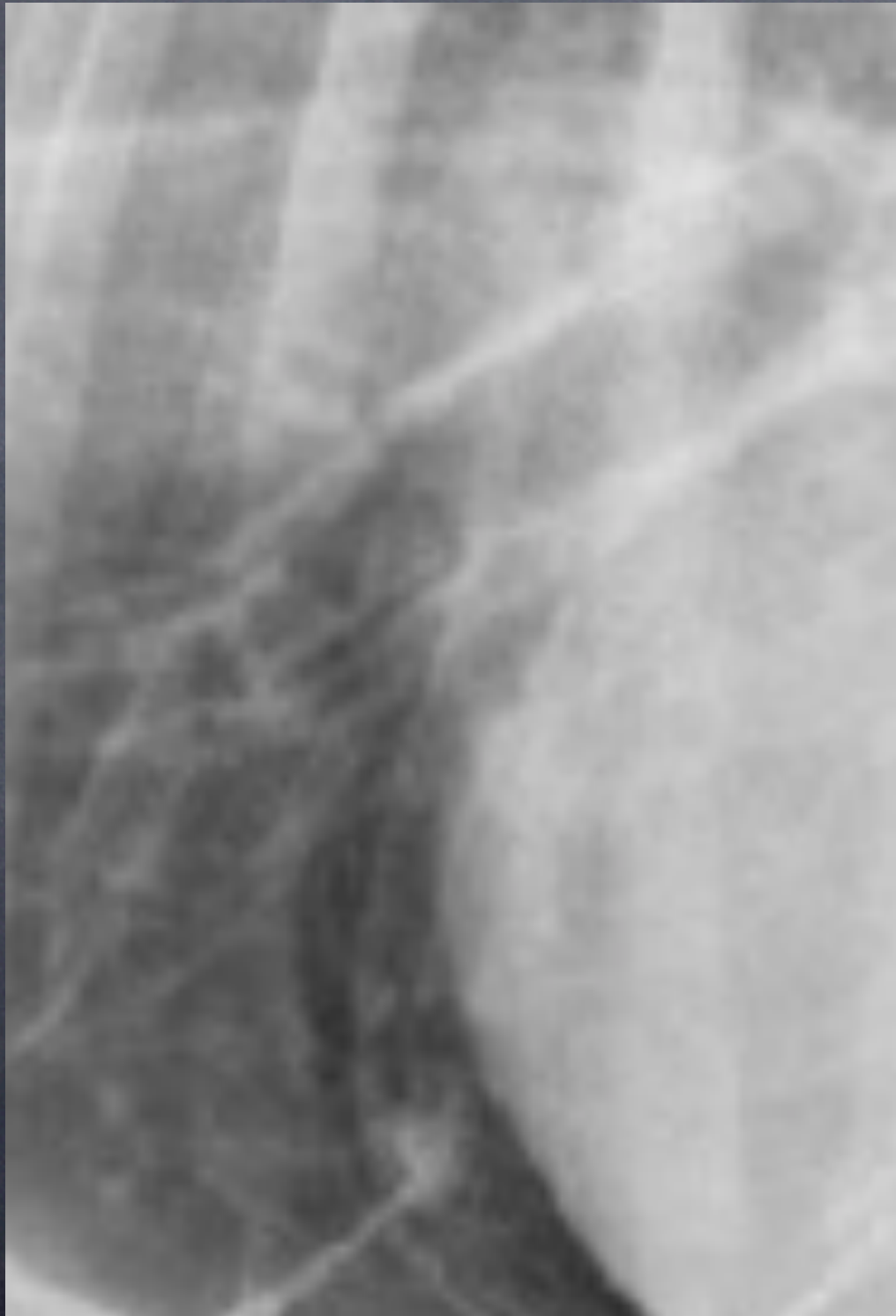
- Artifact – expiratory, obesity
- “old-dog” lungs
- Pneumonitis
 - viral, parasitic, metabolic, toxic
- Alveolar disease in transition
- Pulmonary fibrosis
- ARDS
- Neoplasia – RARE (LSA, mets)



Bronchial vs. Interstitial



Bronchial vs. Interstitial



DIFFUSE increased opacity

Is opacity made up of
STRUCTURES or
MARKINGS?

YES

vessels

VASCULAR

donuts

RR tracks

BRONCHIAL

NO

hazy

blurred vessels

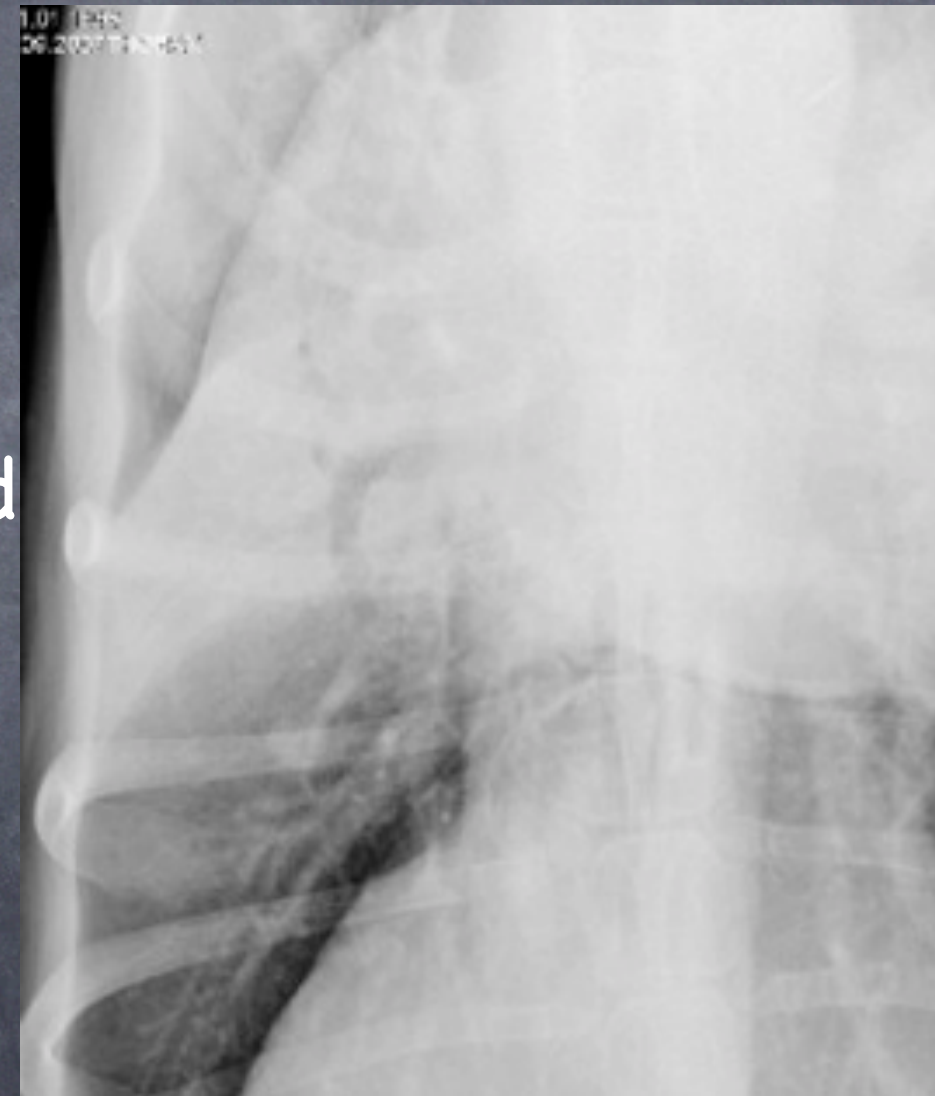
INTERSTITIAL

A close-up photograph of a plant with several clusters of small, round, green, alveolar (honeycomb-like) structures. The clusters are attached to thin, light green stems. The background is a soft-focus green, suggesting foliage. The word "ALVEOLAR" is overlaid in white, sans-serif capital letters in the center of the image.

ALVEOLAR

Alveolar pattern

- What you will see...
 - FOCAL or MULTIFOCAL distribution
 - Uniform fluid opacity – fluffy to solid
- Due to:
 - cells/fluid filling alveoli



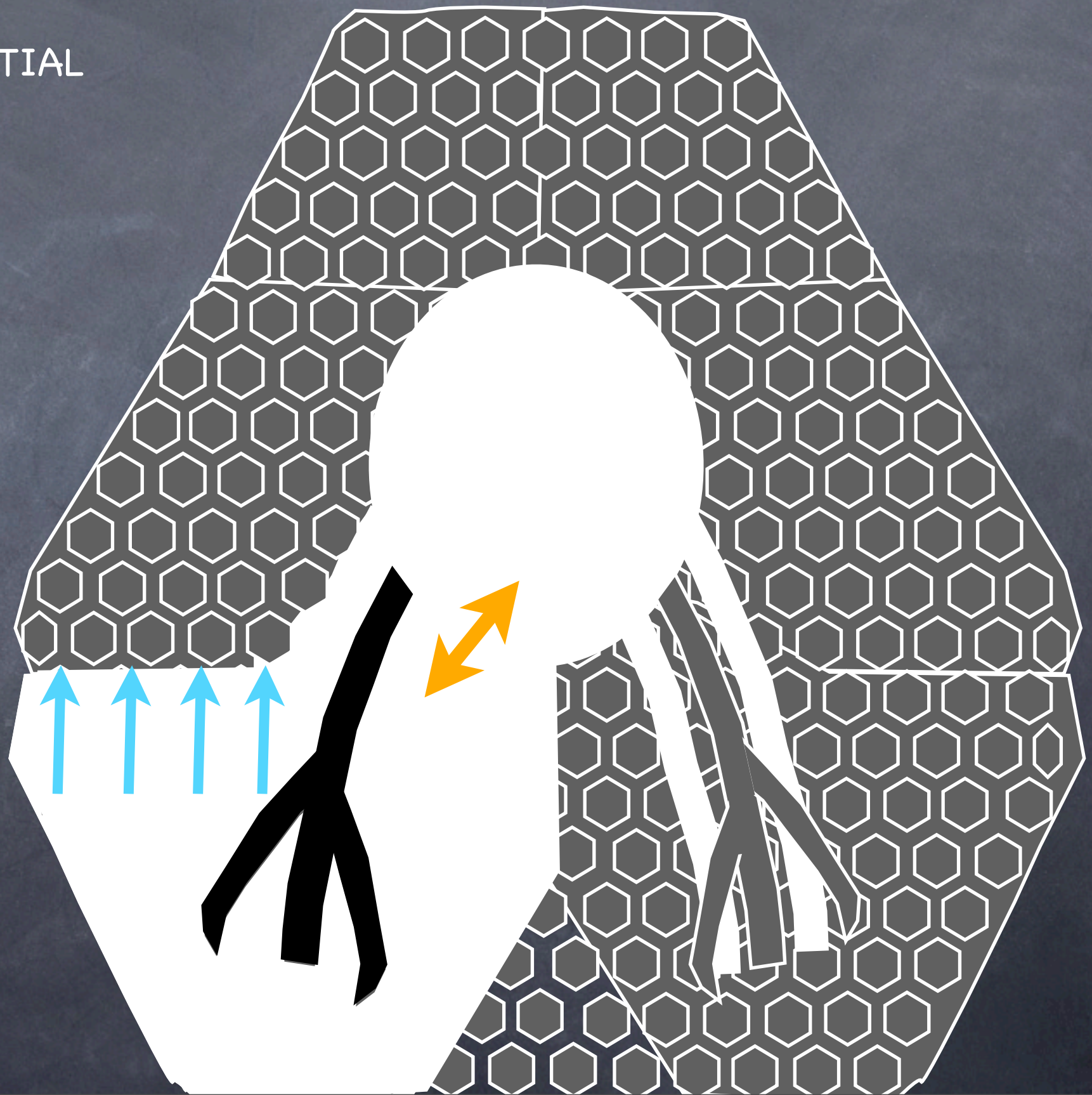
Alveolar pattern

- continuum with INTERSTITIAL

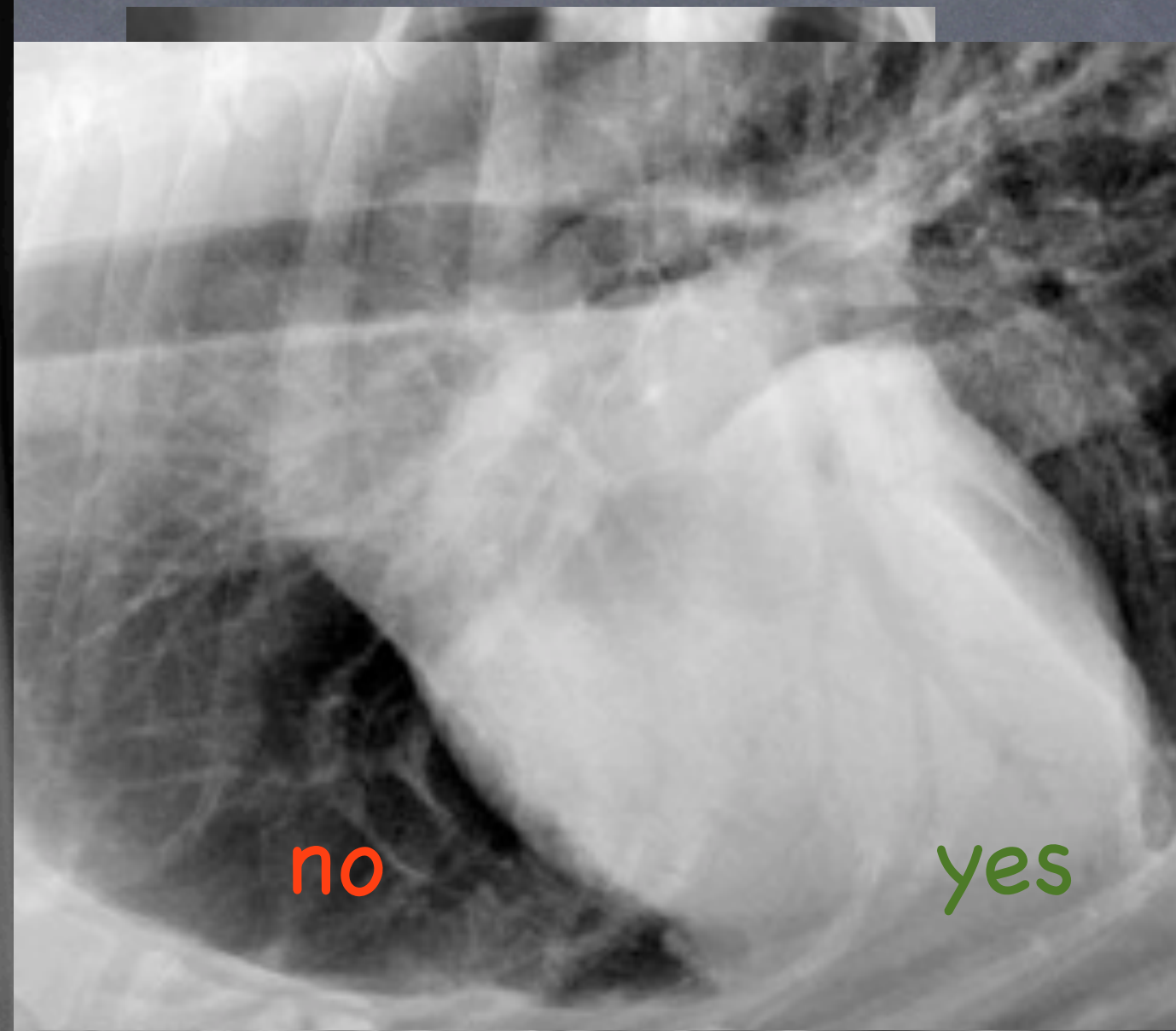
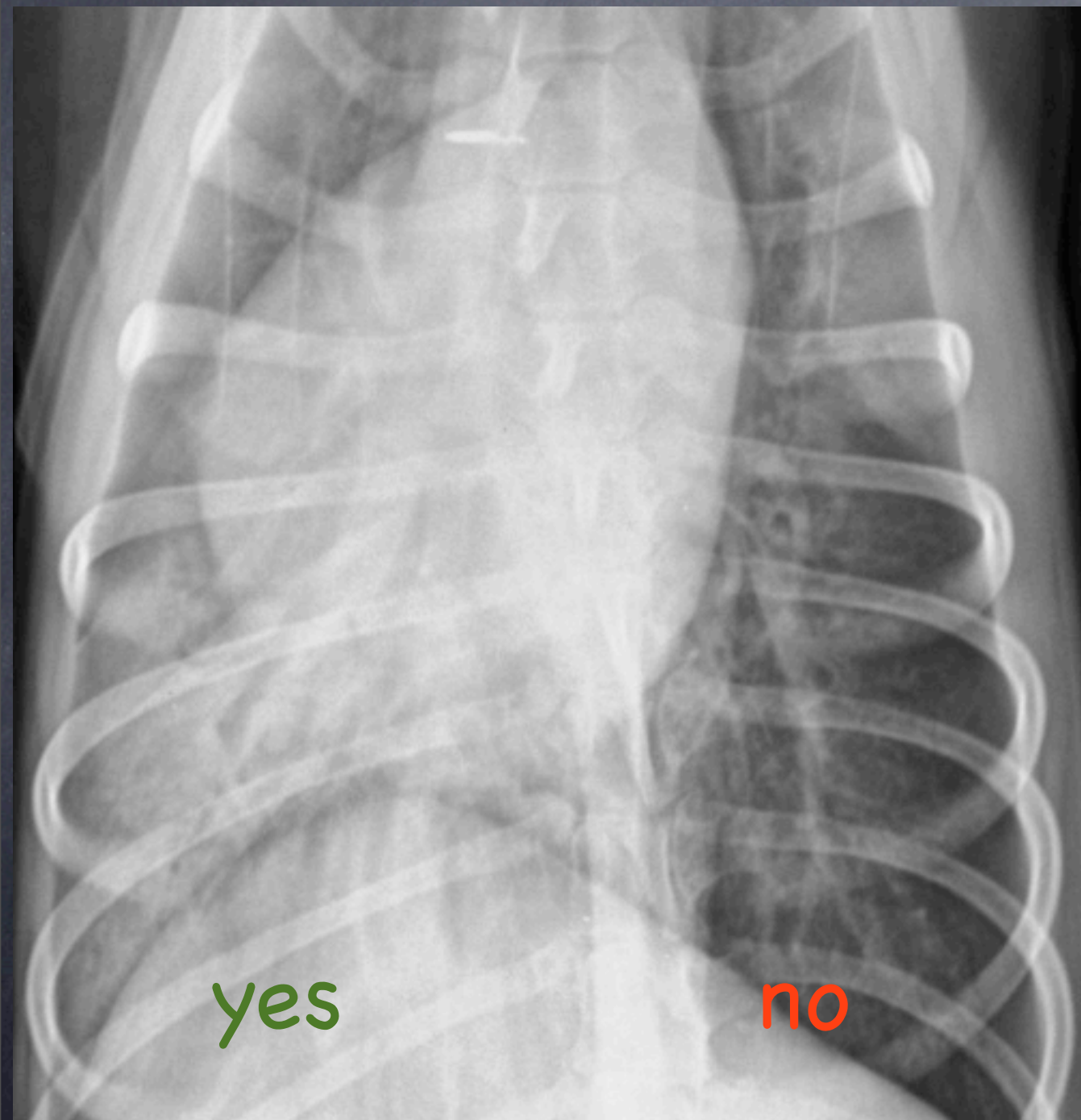
- AIR BRONCHOGRAMS

- LOBAR SIGN

- SILHOUETTE SIGN

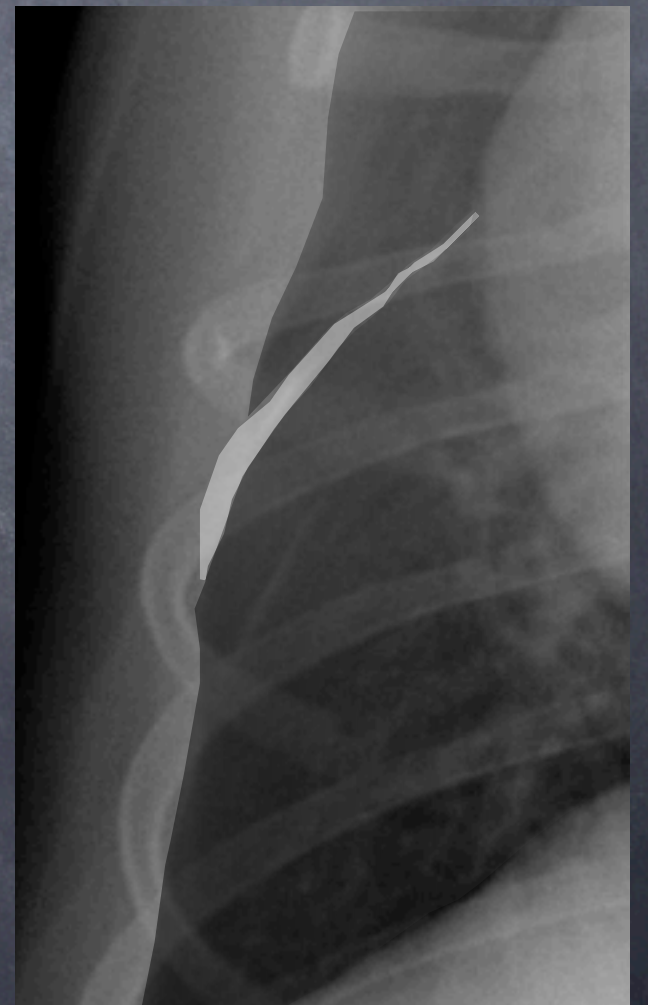
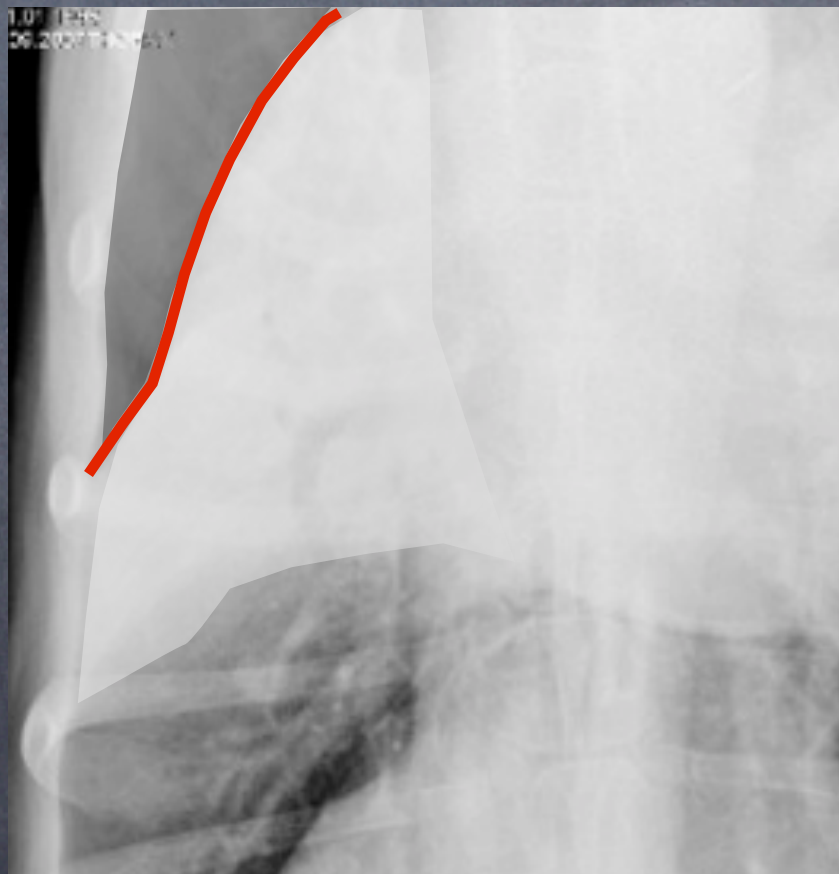
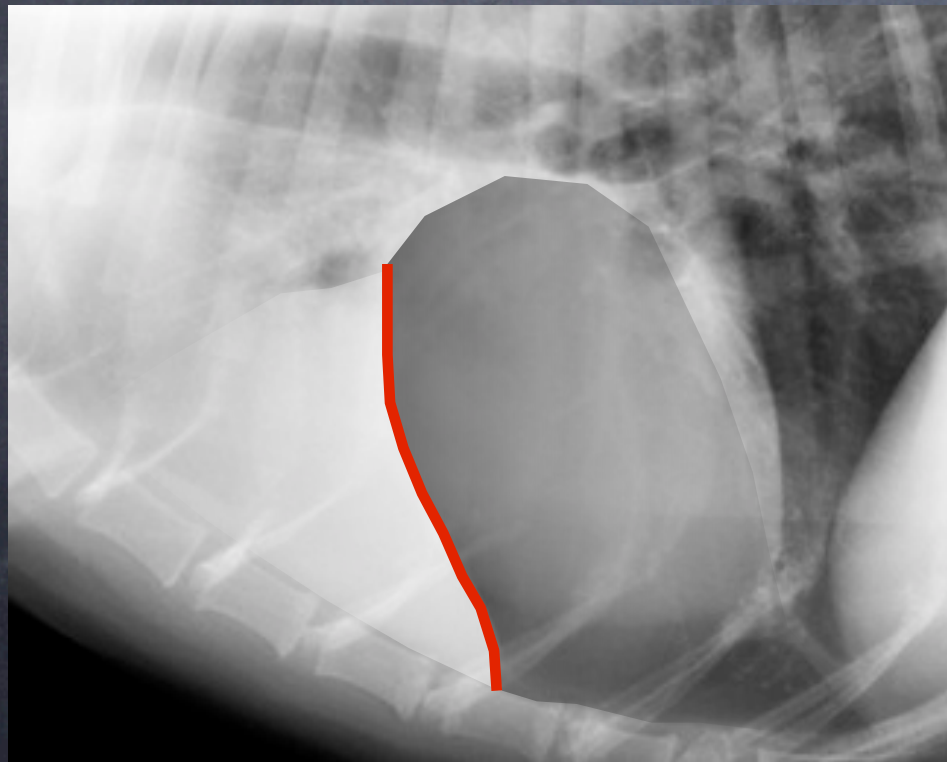


Air Bronchogram



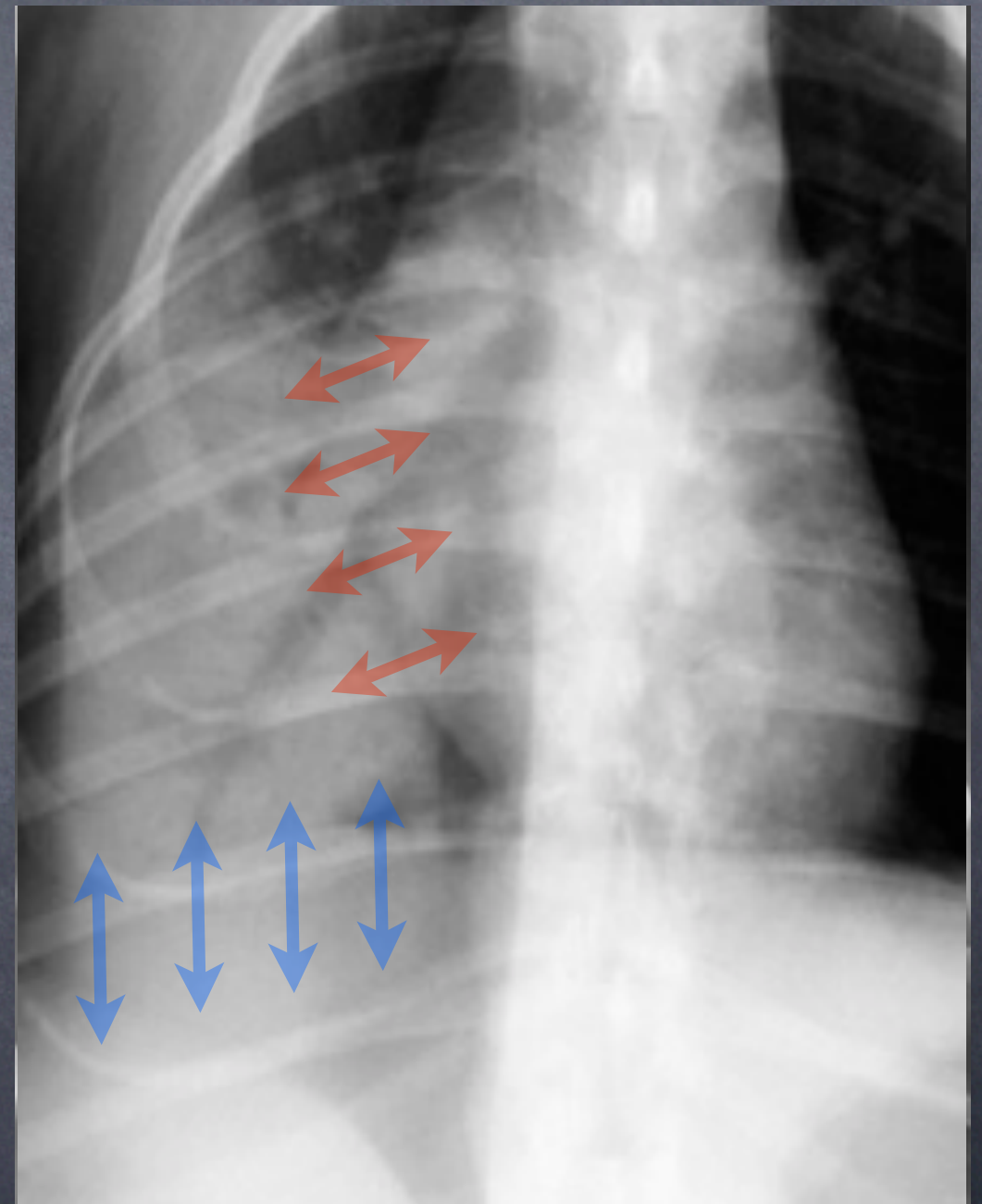
Lobar sign

- Periphery of lobe affected
- Abrupt demarcation between diseased and normal lung
- DON'T confuse with PLEURAL FISSURES



Silhouette sign

- Adjacent to ST structure
 - cardiac silhouette
 - pulmonary vessels
 - diaphragm



Alveolar pattern

• BIG 3 Differentials:

- hemorrhage, contusions

* BLOOD

- pneumonia

* PUS

- edema

* WATER

• Other Differentials:

- Atelectasis

- Neoplasia

- Lung lobe torsion

Alveolar

Location?

CRANIOVENTRAL

HILAR

CAUDODORSAL

Pneumonia

Hemorrhage

Cardiogenic
pulmonary
edema

Hemorrhage

Non-cardiogenic
pulmonary
edema

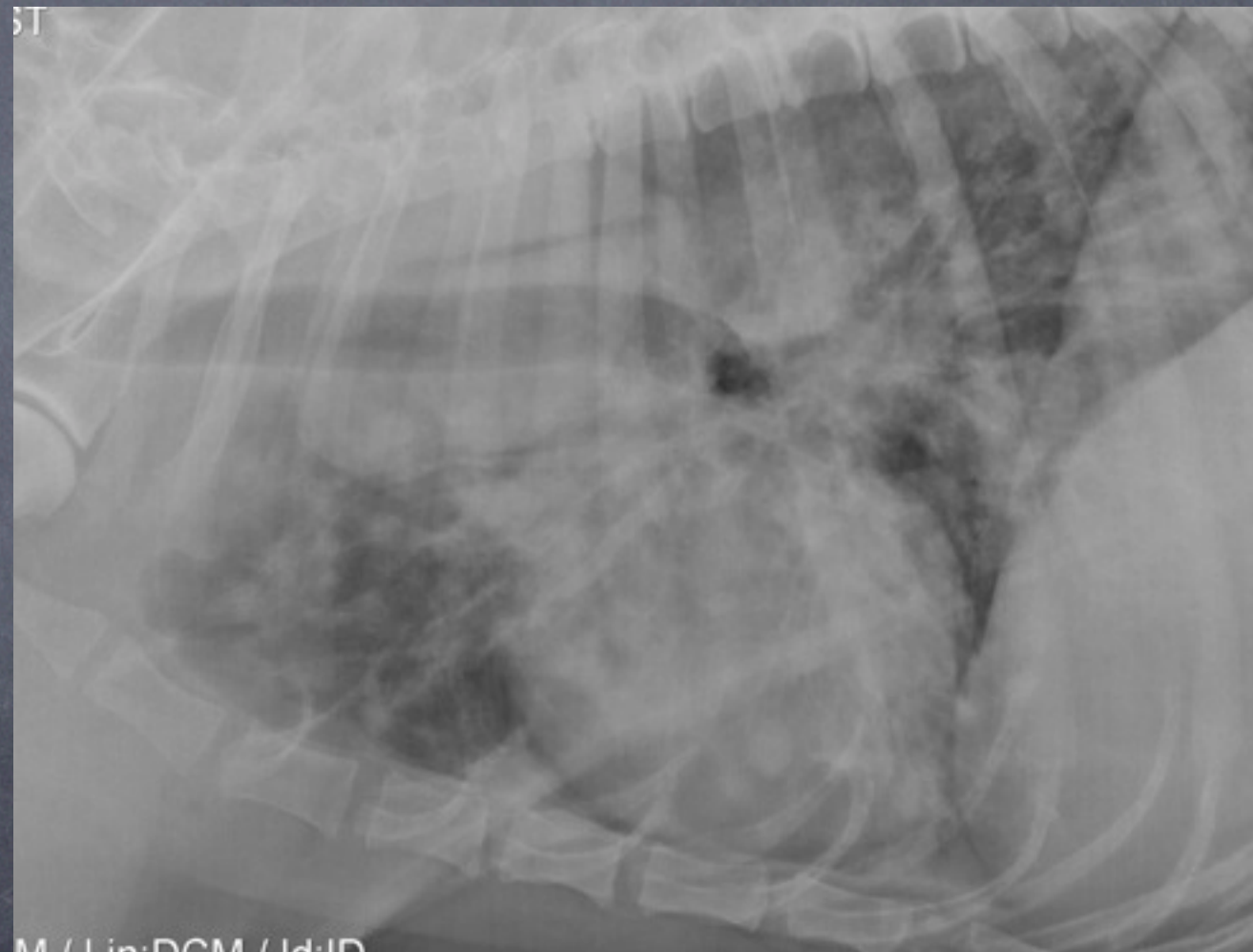
Hemorrhage

The background is a dark gray, almost black, surface covered with numerous overlapping circles and dots of varying sizes and shades of gray. Some circles are large and prominent, while others are small and scattered. The overall effect is a dense, textured pattern that resembles a microscopic view or a complex data visualization.

NODULAR

Nodular Pattern

- AKA = structured interstitial
- What you will see...
 - FOCAL or MULTIFOCAL opacities
- Due to:
 - nodules or masses
- MUST define characteristics of nodule(s)!!



Differentials for nodules

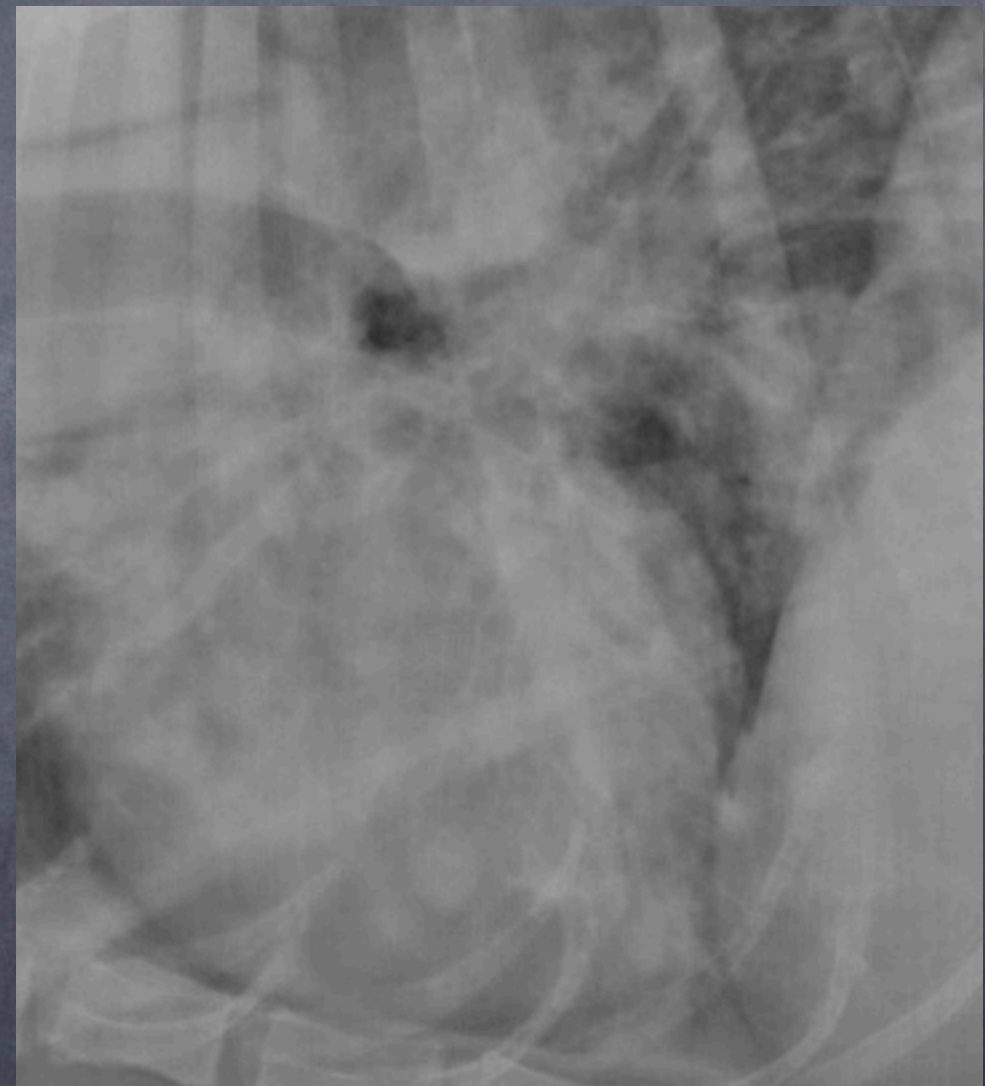
H ematoma – trauma

A bscess – foreign body

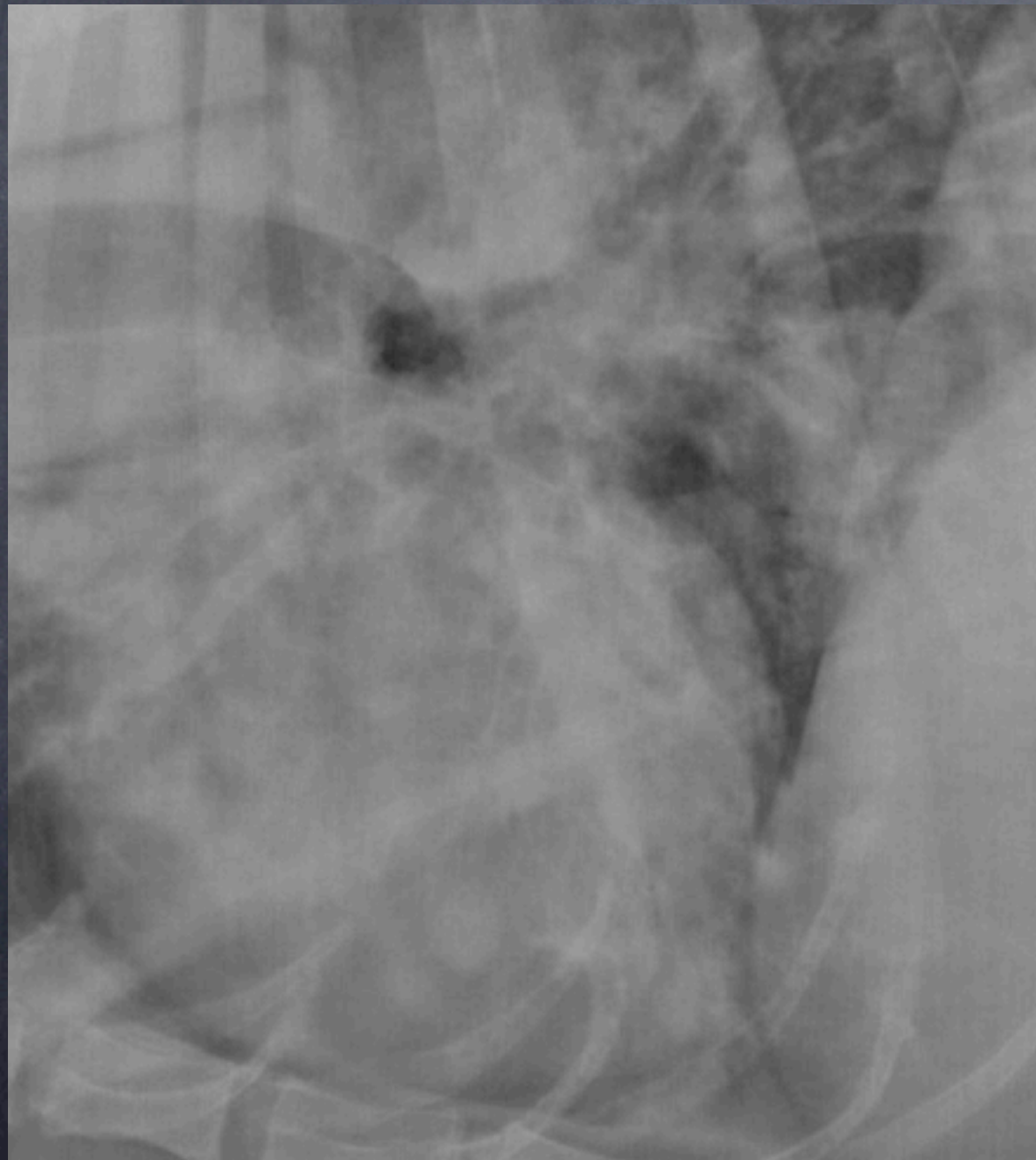
N eoplasia – primary and metastatic

G ranuloma – fungal, parasitic

B ulla – air or fluid filled



Nodule characteristics



- NUMBER – Single vs. Multiple
- SIZE – overall and relative
 - nodule vs. mass (>3 cm)
 - similar vs. variable
- MARGINATION
 - well defined vs. ill defined

Single Nodule/Mass

- WELL-DEFINED margins

- NEOPLASIA!!

- Primary vs. single metastatic nodule

- > 3 cm more likely PRIMARY tumor

- BULLA, HEMATOMA

- ILL-DEFINED margins

- ABSCESS

- GRANULOMA



Multiple Nodules/Masses



Fungal Pneumonia

ILL-DEFINED

SIMILARLY
small, miliary

LYMPHADENOPATHY
SYMPTOMATIC

MARGINS

SIZE

OTHER



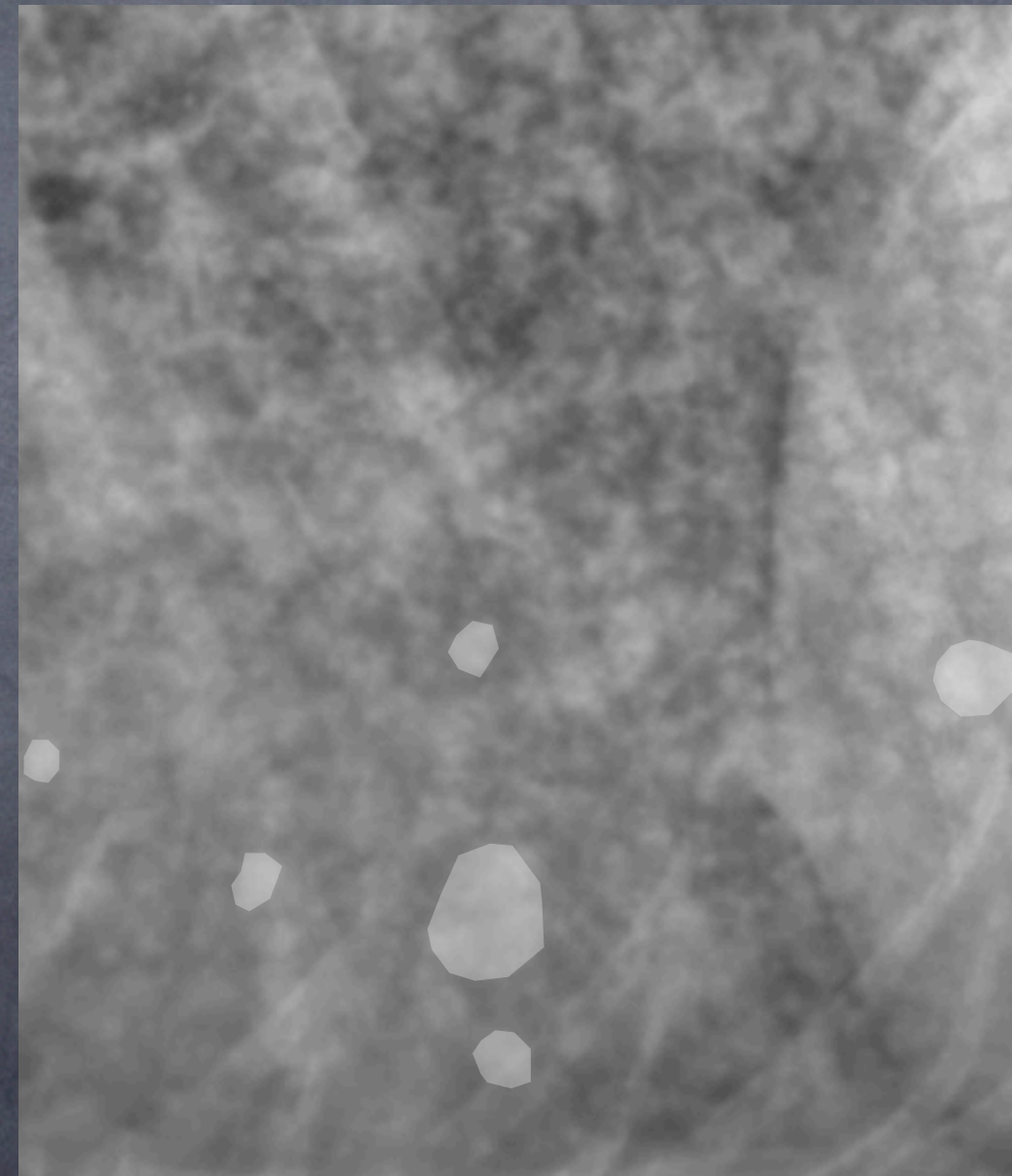
Metastatic Neoplasia

WELL-DEFINED

VARIABLY

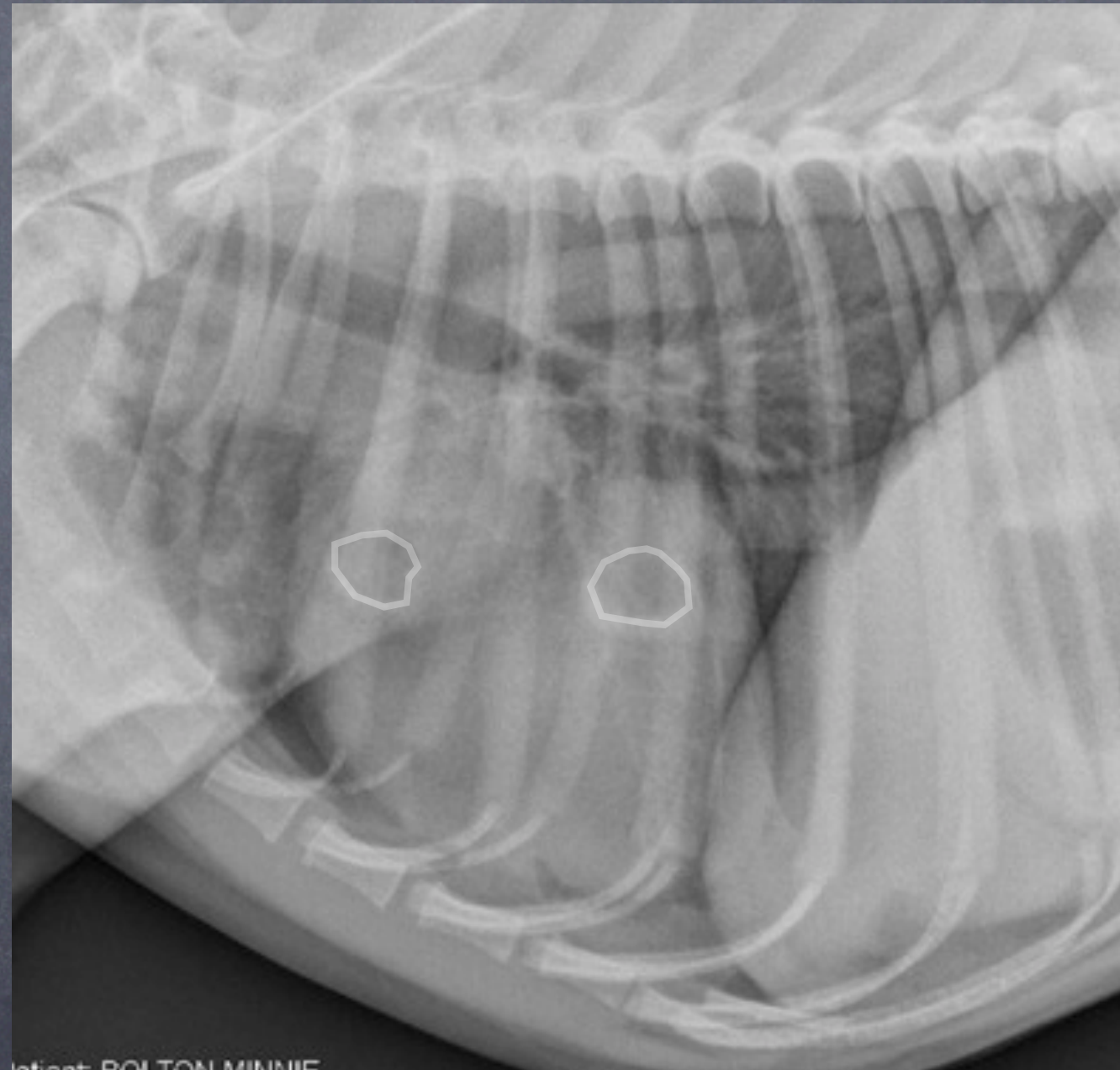
Margination

- If you see both ILL and WELL DEFINED?
- ILL DEFINED won't look WELL DEFINED BUT..
- WELL DEFINED can look ILL DEFINED
 - Due to:
 - respiratory motion
 - silhouetting
 - associated hemorrhage or inflammation



Cavitated Nodules

- Soft tissue and AIR
- WALL THICKNESS!!
- Differentials
 - H A N G with necrosis
 - thick irregular wall
 - Bulla
 - thin wall



Nodular pattern

• BEWARE OF IMPOSTORS... REMEMBER REAL NODULES!

- End on vessels
- Surface structures
- Pulmonary osteomas
- size > 5mm
- on BOTH views
- ST opacity



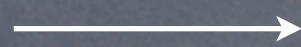
SUMMARY

PATTERN

SIGNS

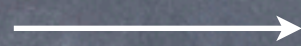
f
o
c
a
l

NODULAR



focal/multifocal nodules

ALVEOLAR

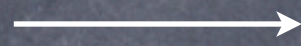


air bronchogram
silhouette sign
lobar sign



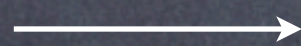
d
i
f
f
u
s
e

INTERSTITIAL



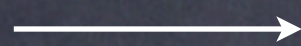
blurring of vessels

BRONCHIAL



railroad tracks, donuts

VASCULAR



enlarged pulm vessels