Pulmonary Patterns & Correlated Pathology

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Objective: correlate radiographic findings of common lung diseases to actual lung pathologic features

Improved recognition & understanding of basic “radiographic patterns”

1. Bronchial
2. Interstitial
3. Alveolar
4. Vascular
5. Mixed
Normal Thoracic Anatomy
~ Breed
~ Age
~ Condition
~ Respiration
~ Hair coat
~ Cats
DEEP-CHESTED CONFORMATION
BARREL—CHESTED
CONFORMATION
Fissure approximation
Fissure approximation

Cr

RCd

C

M
Dorsoventral position VS Ventrodorsal position
Inspiration
Inspiration Expiration

~Heart Size
~Lung Volume
~Pulmonary Density
~False Positives
~False Negatives
Normal Thorax

Right Lateral

Ventral Dorsal
Normal Thorax

Right Lateral

Left Lateral
Normal Thorax
Right Lateral
Pulmonary Angiography

Pulmonary Vascular Anatomy

Arterial Phase

Venous Phase

200 mg iodinated non-ionic/iso-osmotic contrast IV
Pulmonary Angiography

Pulmonary Vascular Anatomy

Arterial Phase

Venous Phase

5-10 sec

10 -20 sec
Gross Radiographic Findings

Anatomic Description

Area or Volume Involved

Defines disease according to:

– Focal/diffuse
– Local/systemic
– Dorsal/dependent
– Hilar/peripheral
– Lobar/segmental
Subgross Radiographic Findings

“Pattern” Recognition

Radiographic/Histopathologic Correlation

Defines disease according to:

- Airways (conductive structures)
- Interstitial (matrix or fabric)
- Alveolar (respiratory exchange zone)
- Vascular (pulmonary arteries & veins)
Abnormal Radiographic Findings

Pattern Recognition

Radiographic/Histopathologic Correlation
Normal Pulmonary Parenchyma

Pulmonary vasculature clearly visible!

Fixed normal lung tissue
Normal lung: “leafless Aspen tree branches on a dark night”
“Lung Patterns”

• Bronchial
• Interstitial
• Alveolar
• Vascular
• Mixed
Normal Radiographic Findings

“Bronchial Pattern”
Tracheobronchitis
Pulmonary Large Airway Disease

Airway Thickening

“Donuts & Tram Lines”
Tracheobronchitis
Pulmonary Large Airway Disease

Acute Inflammation  Post-treatment Recheck
Tracheobronchitis
“donuts come in dozens”

Acute Inflammation
Post-treatment Recheck
Chronic Severe Bronchitis
Pulmonary Large Airway Disease
Chronic Bronchitis

Interstitial Disease – Broncho-interstitial Pattern

Radiology

“tubular bronchiectasis”

Histopathology

“peri-bronchial cuffing”
Abnormal Radiographic Findings
Interstitial Pattern Recognition
Radiographic/Histopathologic Correlation

Normal Lung
Loss of vascular interstitial borders & margins
Pulmonary “Fabric or Structural” Disease

Interstitial Pattern = Interstitial Disease
Pulmonary Interstitial Fibrosis

End Pulmonary Airway Disease - respiratory zone

Interstitial Pattern = Interstitial Disease

Radiology

Histopathology
Pulmonary Interstitial Fibrosis

“Unstructured” Interstitial Pattern

Radiology

Histopathology

***often age related finding, not always pathologic finding
Metastatic Pulmonary Disease
Nodular Interstitial Pattern
Mammary Carcinoma

Well established diffuse metastases/granulomas
Metastatic Pulmonary Disease?

Histopathological Diagnosis: Transitional Cell Carcinoma

FNA = interstitial metastatic infiltration
Metastatic Pulmonary Disease

“Unstructured” Interstitial Pattern

Diffuse Septal Metastases

Radiography  Histopathology

Transitional Cell Carcinoma
Abnormal Radiographic Findings

Alveolar Pattern Recognition

Normal lung: “leafless Aspen tree branches on a dark night”
“Dark Night Background”

air-filled bronchiole terminating into air-filled alveoli air sacs

“respiratory zone”
Normal lung: “leafless Aspen tree branches on a dark night”
Air-filled airways surrounded by soft tissue/fluid

Abnormal lung: “dark tree branches in a snowstorm”

ALVEOLAR
WITH AIRBRONCHOGRAMS
Dark air-filled airways surrounded by soft tissue/fluid
Dark air-filled airways surrounded by soft tissue/fluid
Fluid-filled airways surrounded by soft tissue/fluid

Very abnormal lung: “complete whiteout in a blizzard snowstorm”
Abnormal lung: “complete whiteout, consolidation or lung collapsed”
Pulmonary Inflammation

Alveolar Pattern = Alveolar Disease

“Air Bronchogram” Sign
Pulmonary Edema
Alveolar Pattern
“Air Bronchogram Sign”
Lobar Pneumonia

Dependent Right & Left Middle Lobes

Airbronchogram Sign = Alveolar Pattern

“Mixed” Alveolar and Interstitial Disease
Pulmonary Disease
Developing or Regressing?

Radiography

Histopathology
Abnormal Radiographic Findings
Vascular Pattern Recognition

NORMAL
Vascular Patterns

Vessels change in

• Size
• Shape
• Margination
• Density
• Number
Pulmonary Artery size vs Pulmonary Vein size

***should be balanced
Abnormal Radiographic Findings

Vascular Patterns

Radiographic/Histopathologic Correlation

Normal lung: “leafless Aspen tree branches on a dark night”
Large pulmonary arteries & veins

Pulmonary vessel = “less than proximal rib diameter”
Large pulmonary arteries & veins

Pulmonary vessels less than rib diameter at T10

“Overperfusion”
“Underperfusion”
= hypovolemia/dehydration
Pulmonary Venous Congestion
Pulmonary Venous Congestion
pulmonary artery >> pulmonary vein
Thank you for your attention

Questions & Comments?