GENERAL ABDOMINAL IMAGING

PERITONEAL SPACE, PANCREAS, & SPLEEN

VMB 960
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REFERENCE

- Chapters 35-36
  - Pages 650-678

- Chapter 37
  - Pages 694-701

- Chapter 3
  - Pages 38-49
OBJECTIVES

- Radiography and Ultrasound of the Abdomen
- Peritoneal & Retroperitoneal Spaces
- Specific Organ Evaluation
  - Pancreas
  - Spleen
- Patterns of Disease – Mass Lesions
NORMAL ABDOMEN
NORMALLY NOT SEEN...

- Abnormal enlargement
  - Mass effect on adjacent organs

*Don’t forget lymph nodes!*
NORMAL CAT

- Same organ pattern
  - Spleen smaller
- Often better serosal detail
  - Increased fat
ULTRASOUND

- Pros (compared to Radiographs)
  - Great for evaluating soft tissue changes
  - Real-time imaging

- Cons
  - Does not provide global picture
  - Highly dependent on user

- The two modalities complement each other
ULTRASOUND PHYSICS

- US probe emits sound waves into tissue
- US probe also listens for echoes
  - Echo VOLUME (how loud?)
  - Echo TIMING (how long?)
Acoustic Impedance
- Inherent property of a substance
- Determined by
  - Physical Density
  - Speed of Sound in the tissue

Two tissues with large difference in AI
- Creates interface
- US waves are reflected (an echo)
ULTRASOUND PHYSICS

- **Frequency**
  - Measured in MHz
  - Range 1-18 MHz

- **Lower Frequency**
  - Better Penetration
  - Worse Resolution

- **Higher Frequency**
  - Better Resolution
  - Worse Penetration
Multifrequency probes

For canine abdomen
- Average size dog
  - Use a 5-8 MHz probe
- Deep-chested/Large dog
  - Use a 3-5 MHz probe

For feline abdomen
- Can use 10-12 MHz probe
ULTRASOUND TERMINOLOGY

- Hyperechoic
- Hypoechoic
- Anechoic
- Isoechoic
  - Relative comparison
SPACES OF THE ABDOMEN

- **Retroperitoneal**
  - Dorsal to colon
  - Kidneys, ureters, adrenal glands, lymph nodes...
  - Continuous with the mediastinum

- **Peritoneal**
  - Surrounds visceral organs
  - A potential space
PERITONEAL SPACE

- **Serosal detail**
  - Dependent on normal abdominal fat

- **Poor serosal detail**
  - Poor radiographic technique
  - Young animal
  - Peritoneal fluid
  - Emaciation (no fat)
  - Peritonitis
  - Carcinomatosis
POOR SEROSAL DETAIL

- Young animals
  - Less fat
  - Brown fat

- Lack of fat
  - Emaciation
  - Chronic cachexia
Disease of the peritoneum
- Peritonitis
- Carcinomatosis
POOR SEROSAL DETAIL

- **Peritoneal effusion**
  - Often accompanies other problems (peritonitis)

- **Fluid and soft tissue are the same opacity**

- **Radiographs less sensitive to detection vs. US**
  - US good to determine cause for loss of detail

- **Fluid type cannot be specified**
  - For radiographs or US
PERITONEAL FLUID

- **Effusions**
  - Heart failure (↑ hydrostatic pressure)
  - Hypoproteinemia (↓ colloid oncotic pressure)
  - Capillary permeability (vasculitis)
  - Inflammation
  - Neoplasia

- **Hemorrhage**
- **Urine**
- **Bile**
PERITONEAL FLUID

“Wispy” ST opacity in falciform fat
Emaciation or fluid?
CHOLESTEROL GRANULOMA

- Bates body
  - Dystrophic calcification of necrotic mesenteric fat
- More common in cats
PNEUMOPERITONEUM

- Gas opacity in the peritoneal space

- Abdominal wall penetration
  - Surgery
    - Can persist 10-21 days post-sx
  - Trauma (puncture)

- Rupture of a hollow viscus (GI)

- SURGICAL EMERGENCY!
PNEUMOPERITONEUM

- Sensitivity of ultrasound variable
  - Tend to push superficial gas out of the way
  - May detect if trapped

- Radiographs
  - Large volumes outline the organs
  - Look at liver and diaphragm/body wall
PNEUMOPERITONEUM
POSITIONAL RADIOGRAPHY

- Remember...Gas rises
- Manipulate the patient
- Manipulate the x-ray beam
- Left lateral recumbency to avoid gas in fundus
Pneumoretroperitoneum
- Retroperitoneal space is continuous with the mediastinum
- Rupture of trachea (or esophagus)
- Dorsal to the colon
  - Fluid, mass displaces colon ventrally
RETROPERITONEAL MASS
Colon and SI subject to displacement with mass lesions.

However, they are also variable in normal position.

Must see a mass lesion also (increase in soft tissue opacity).
PANCREAS

Dog

Cat
PANCREATIC ENLARGEMENT

- Caudal deviation of colon
- Lateral and/or ventral deviation of duodenum
- Silhouetting of greater curvature of stomach

- Pancreatitis
  - Peritonitis/fluid
  - Persistent gas distension of the duodenum

- Often difficult to diagnose radiographically!
PANCREATITIS - ULTRASOUND
PANCREATITIS - ULTRASOUND

CLASSIC APPEARANCE:

- Hypoechoic, enlarged pancreas
- Hyperechoic mesentery (inflamed fat)
- Peritoneal effusion
- Dilated pancreatic duct, bile duct obstruction

SENSITIVITY:

- Pancreas can appear normal with pancreatitis

- Dogs
  - US is a more reliable test, especially when acute
  - About 2/3 cases detected

- Cats
  - Less reliable, more often normal in appearance
  - About 1/4 to 1/3 cases detected
SPLEEN

- Typically surrounded by fat
- Usually easily seen on rads
  - Head on VD
  - Tail on Lateral
    - Not in cats

- Sedation effects
  - Phenothiazine tranquilizers
  - Anesthetic gases & barbituates
- Tail on lateral
- Head on VD
- Tail can be variable in position
- Head less mobile
- Breed variants
  - German Shepherd Dog, Retrievers, Sighthounds
DIFFUSE (Splenomegaly) or FOCAL (Mass)

Radiographs
- Diffuse changes and large focal disease

Ultrasound
- Can better identify small parenchymal lesions

Specificity of imaging changes are often nonspecific
DIFFUSE SPLENOMEGALY

- Neoplasia
  - Lymphoma
  - Mast Cell
- Congestion
  - Sedation
  - Right heart failure
- Splenic Torsion
- IMHA
- Inflammation
- Infarction
- Hyperplasia
- Extramedullary hematopoiesis
FOCAL SPLENOMEGALY

- Neoplasia
  - Hemangiosarcoma
  - Hemangioma
  - Lymphoma (less common appearance)

- Nodular Lymphoid Hyperplasia

- Hematoma

- Abscess
FOCAL SPLENOMEGALY

Head

Tail
QUESTIONS?