Ultrasound Imaging the Jaundiced dog

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Preparation

Withhold food to allow stomach to empty

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Normal Gallbladder
Biliary Sediment/Sludge

- Amount within the GB is variable
- Seen in healthy, non fasting dogs.
- Considered an incidental finding
- Seen with biliary stasis from fasting or illness
- Usually does not shadow
- Sludge balls
  - Round, mobile, nonshadowing structures
  - Uncertain cause and significance

Courtesy Dr. H Thode
Cystic Mucinous Hypertrophy or Hyperplasia of the Gall Bladder
• Not associated with obstruction of CD
• Not associated with any clinical findings
• Considered an incidental finding
• Histologically
  – No evidence of inflammation
  – Serosal, muscular, and vascular structures appear intact and normal
  – Mucosal surface irregular; polypoid cystic lining
• Ultrasound
  – Thickened, irregular GB wall
  – Biliary sludge usually observed

Clinical Icterus
- CBC, SADP, UA
- PCV < 15
  - Nucleated RBCs
  - Bilirubinuria
- PCV > 20
  - Abnormal liver enzymes
- Hemolytic Disease
- Hepatitis
- Toxins
- Cirrhosis
- Neoplasia

Normal Anatomy
Echogenicity comparisons
- Renal Medulla < Renal Cortex < Liver < Spleen < Renal Pelvis
- My Cat Loves Sunny Places
  - Blacker Whiter
  - Hypoechoic Tissue
  - Hyperechoic Tissue
  - Least Echogenic Tissue
  - Most Echogenic Tissue

Courtesy Dr H Thode, CSU
Extrahepatic Biliary Tract Disease

- Pancreatic diseases
- Cholelithiasis/choledocholithiasis
- Acute Cholecystitis
- Chronic cholecystitis
- Gallbladder Mucocele
- Trauma, rupture

Anatomy

- Bile produced by hepatocytes -> bile canaliculi -> interlobular ducts -> lobar ducts -> hepatic ducts
- Cystic duct (from Gall Bladder) joins with hepatic ducts to form Bile Duct (CBD)
- CBD enters dorsal or mesenteric wall of duodenum -> major duodenal papilla

Clinical Signs of Extrahepatic Biliary Tract Obstruction (EHBO)

- Nonspecific
- Mimic other abdominal disorders
- May wax/wane for several weeks prior to presentation
- Most patients not likely to be examined until clinical signs of icterus develop
- May see acholic feces

Diagnostic Evaluation

- Animals may not demonstrate clinical signs or hematologic abnls for weeks to months after the obstruction
- CBD obstruction
  - Increased total serum bilirubin (>90% conjugated)
  - Bilirubinuria
    - renal excretion becomes important for elimination of the pigment
    - may precede the development of jaundice

Experimental Bile Duct Ligation in the Dog

- CBD surgically ligated in 5 nl adult dogs
- US exams performed pre-op and at 24 hour intervals post-op
- Sequence of biliary system dilation was from CBD to peripheral intrahepatic ducts
- GB, cystic duct, and CBD enlargement evident in 24 – 48 hours
- Peripheral bile duct dilation recognized by 5 – 7 days after obstruction

*Nyland TG, Gillett NA. Sonographic evaluation of experimental bile duct ligation in the dog. Vet Rad, 1982; 23: 252-260*
Pancreatic Diseases

- Most common cause of EHBO in dogs
- Scar tissue can form in/around CBD
- Duct can be compressed by
  - Inflamed pancreatic tissue
  - Fibrotic pancreatic tissue
  - Pancreatic neoplasia
  - Pancreatic abscess/cyst (rare)
Cholelithiasis/Choledocholithiasis

- Account for < 1% of patients with liver dz
- Believed to be typically clinically silent
  - Common, incidental postmortem findings
  - Up to 75% of reported cases of choleliths have been diagnosed at necropsy with no reported associated clinical signs
- Clinical signs associated with cholelithiasis thought to be more commonly related to cholecystitis
**Acute Cholecystitis**
- May have a variety of sonographic appearances
- GB wall thickening usually a consistent finding
- Pain may be detected in region of the GB during scanning
- Emphysematous cholecystitis
  - Gas formation in wall/lumen of GB
  - Usually combination of GB wall ischemia and proliferation of gas-forming bacteria

**Chronic Cholecystitis**
- Usually presents in a less acute form than acute cholecystitis
- Can see GB wall thickening due to inflammation and fibrosis
- Fibrosis/inflammation may prevent even normal distention of the GB
- Mineralization of the GB wall may occur with chronic inflammation
Liver disease is common in cats
- Cholangitis/cholangiohepatitis: 20-30%
- Ascending bacterial infection
- Biopsy and culture needed for diagnosis
- Specific long-term antibiotic therapy

Percutaneous ultrasound-guided cholecystocentesis - Considered routine in humans

Methods - PUC
- Ketamine/valium sedation
- 22 gauge/1.5 inch with 12 ml syringe
- Right transhepatic approach (1 cat)
- Right ventral direct puncture (11 cats)

Results - PUC
- Right transhepatic approach – immediate mild effusion, hemorrhagic bile (1 cat)
- Right ventral direct approach – no complications (11 cats)
- 1.8ml +/- 0.8ml (range 0.9 – 3ml)

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- Direct proportional relationship between weight and volume of bile.

Results
- 4 cats had mild transient hyporexia
- 4 cats had mild abdominal discomfort
- No U/S changes for direct approach
- Necropsy – no abnormalities noted
- Cytology – 11 cats - just bile
- Cultures
  - No growth
  - One contaminant

Finish by emptying the gallbladder
Fast for additional 12 hours

**Choledocholithiasis**

- An abnormal accumulation of mucus distending the gallbladder
- Etiology is uncertain
  - ? Bile stasis
  - ? Mucinous hyperplasia of GB mucosa
  - ? Inflammation
  - ? Biliary sludge a predisposing factor
  - ? Altered contractility of the GB wall
  - ? Combination of factors
- Gelatinous bile may extend into CD and/or CBD and cause obstruction

**Gallbladder Mucocele**

- Tendency to affect smaller dogs
- Cocker Spaniels may be predisposed
- More common in older dogs
- Clinical signs nonspecific
- Usually have clinocopathologic evidence of hepatobiliary disease
- 50 – 60% incidence of GB rupture
  - Poor prognosis
  - Cholecystectomy (emergency if GB wall rupture is suspected)
Bile Patterns with Mucoceles


References