PROLIFERATIVE LESIONS OF THE LIVER

Non neoplastic

- Hepatocellular nodular hyperplasia
- Regenerative nodules
- Biliary hyperplasia

Neoplastic

- Benign
- Malignant
  - Primary
  - Metastatic

Hepatocellular nodular hyperplasia, dog

Cholangiocellular carcinoma, dog
Non-neoplastic Proliferations

Nodular Hyperplasia

- Common in aged dogs
- Single or multiple, yellow to tan, < 3 cm, well delineated nodules
- Histology
  - Disorganized plates of hepatocytes with vacuolar changes
  - Lobular pattern is preserved but a little distorted

Images: PBVD, Zachary 2017
PROLIFERATIVE LESIONS OF THE LIVER

Non-neoplastic Proliferations

- Surrounded by fibrous tissue*
- Necrosis and inflammation are common
- Typically involves the entire organ

Regenerative Nodules
Non-neoplastic Proliferations

Bile duct proliferation

- Non-specific response to biliary or hepatocellular damage
- Often no gross findings unless severe
- Accompanied by fibrosis
Primary liver tumors arise from:
- Hepatocytes*
- Bile ducts*
- Gall bladder
- Diffuse neuroendocrine system
- Mesenchymal tissue

Neoplasia in the liver can cause single or multiple masses or diffuse hepatomegaly.

Neoplasia causes increased liver size.
Cirrhosis causes decreased liver size.
**PROLIFERATIVE LESIONS OF THE LIVER**

**Hepatocellular Tumours**

**Hepatocellular adenoma**

- Dogs and young ruminants
- Not easy to differentiate from nodular hyperplasia in old dogs

**Gross**
- Single, unencapsulated, red-brown, nodular, +/- pedunculated

**Histology**
- Well differentiated hepatocytes
- No portal tracts

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[Image: Hepatocellular adenoma, cat](http://w3.vet.cornell.edu/nst/nst.asp)

[Image: Hepatocellular adenoma, horse](http://w3.vet.cornell.edu/nst/nst.asp)
Hepatocellular Tumours

Hepatocellular carcinoma

- Dogs
- Must differentiate from adenoma

Histology
- Cells in trabecular pattern
- Well-differentiated or anaplastic

Gross
- Often solitary, can involve the whole lobe
- Multilobulated, grey-white to yellow-brown
Cholangiocellular Tumours

**Cholangiocellular adenoma**

- Often cystic
- Common in cats
- May be multiple
Cholangiocellular Tumours

**Cholangiocellular carcinoma**

- Relatively common
- Multilobulated, firm, central areas of depression/necrosis (umbilicated)
- Often metastasize within the liver
Many malignant tumors in the liver are metastases from other organs.
Other Tumours

- Histiocytic sarcoma, dog
- Lymphoma, cat
- Lymphoma, pig
Gallbladder

- Stores, concentrates and releases bile via the cystic duct

Hepatic bile ducts

- Carry bile from different lobules of the liver

Common bile duct

- Carry bile to intestine

Bile = Water, Cholesterol, Bile acids, Bilirubin, Inorganic ions

Secretion provides:
1. Bile acids for digestion of dietary fats
2. Excretory route for various metabolites and drugs
3. Buffers that neutralize acid pH from the stomach
Gallbladder Stones (Choleliths)

- Gallstones are made of:
  - Cholesterol, bile pigments, bile salts, calcium and proteinaceous matrix
  - Supersaturation and precipitation of bile
  - Secondary to ascending bacterial infections?
Gallbladder Stones (Choleliths)

Cholelithiasis, elephant

- Not significant until obstruction occurs
- Icterus, hepatic atrophy, biliary fibrosis
- Fasting / Anorexia*
- Secondary to biliary obstruction
- *Lantana camara* toxicosis
  - Cholestasis, icterus and photosensitization

Gallbladder distension, sheep, *Lantana camara* toxicosis
Cystic Mucinous Hyperplasia

- Cystic proliferation of the mucus-producing glands of the gallbladder and bile ducts
- Old dogs and sheep
- Cause is unknown
- Often associated with GB mucocele*

Pathologic Basis of Veterinary Disease, 5th ed.

http://w3.vet.cornell.edu/nst/nst.asp
Gallbladder Mucocele

- Gallbladder dilation
- Accumulation of mucoid secretion
- Small breed dogs – Shelties, Cocker spaniels
- Cause?
  - Decreased gall bladder motility
  - Abnormal bile composition
  - Bile stasis
  - Cystic mucinous hyperplasia
- Sequelae
  - Extrahepatic biliary obstruction
  - Ischemic necrosis and rupture
• Usually traumatic in origin
• Steady leakage of bile into the peritoneal cavity
• Chemical peritonitis
• May be sterile or infected with enteric bacteria → rapidly fatal
• CAV-1 infection (ICH) in dogs
• *Salmonella* and Rift valley fever in cattle
• Aflatoxicosis and mulberry heart in pigs
• Congestive heart failure and DIC
Gallbladder thrombosis / infarction

Gallbladder infarction, dog
• Inflammation of gallbladder
• Acute or chronic
• Fibrinous cholecystitis
  • Salmonellosis in cattle*
• Hemorrhagic cholecystitis
  • Salmonellosis in cattle*
  • Arsenic toxicosis

Salmonellosis, fibrinous cholecystitis, calf
Cholangitis / cholangiohepatitis

- Inflammation of the bile ducts
  - Can extend into the liver (cholangiohepatitis)
- Portal of entry for bacterial agents:
  - Ascending from the intestine
  - Hematogenous
- Two important entities in companion animals:
  - Suppurative cholangiohepatitis
  - Lymphocytic cholangitis

Suppurative cholangitis

- Older cats > dogs
- Ascending bacterial infection
- Often associated with IBD or pancreatitis in cats
Cholangitis / cholangiohepatitis

Lymphocytic Cholangitis – Feline progressive lymphocytic cholangiohepatitis

- Common in older cats
- Lymphoplasmacytic portal inflammation – may center on the bile ducts
- Slow progression to portal fibrosis/biliary hyperplasia – May become icteric
- Immune mediated disorder?
- Severe cases can look like lymphoma
Gallbladder Neoplasia

- Very rare in animals
- Adenomas (cattle)
- Carcinoma

Gallbladder adenoma, boa constrictor

Gallbladder carcinoma with hepatic invasion, dog
Questions?