**Surgery of Liver and Biliary System**

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anatomy

Surgery of the liver and extrahepatic biliary tract is challenging areas in small animal surgery because : *organs are highly vascular, access is poor because of limited mobility, and hepatic parenchyma is often friable and difficult to suture.*

**Biliary System**

Within the liver, canaliculi drain bile into interlobular ducts. These converge further into lobar ducts that become known as *hepatic ducts* as they exit the liver parenchyma and form part of the extrahepatic biliary tract

***Species Differences***

**Regenerative Capacity After Hepatic Resection or Injury**

Fortunately, the normal liver has an incredible regenerative capacity.

Normal dogs tolerated acute removal of 65% to 70% of total liver volume, but they did not tolerate 84% removal.

Several factors have been identified that reduce hepatic regeneration

Biliary obstruction

Diabetes mellitus

Malnutrition,

older age

**PREOPERATIVE CONSIDERATIONS FOR HEPATIC SURGERY**

Hemorrhage

Hypoglycemia

Glucose supplementation should be considered in these patients and for those undergoing extensive hepatectomy.

Hypoglycemia was not associated with liver resection of approximately 50% but can occur when 70% of the parenchyma is removed.

**Anesthesia**

Drugs undergoing hepatic metabolization should be avoided when possible.

 The most common isolate was *Clostridium perfringens* followed by *Staphylococcus* spp.

Postoperative broad-spectrum coverage should continue until antimicrobial changes can be made based on individual patient culture and sensitivity testing.

**3. Cholecystectomy**

***Traditional “Open” Cholecystectomy***

Before cholecystectomy, the patency of the common bile duct must be confirmed. If performed as part of management of a gallbladder mucocele, flushing the common bile duct to ensure that all gelatinous bile is removed from the common

**5. Cholecystoenterostomy**

Cholecystoduodenostomy and cholecystojejunostomy are the most common techniques used to reroute the biliary system in dogs and cats because the common bile duct is usually too small and friable to permit choledochoduodenostomy.

**7. Sphincter-Altering Procedures**

Occasionally, a cholelith lodged in the terminal common bile duct adjacent to the major duodenal papilla can be removed by sphincterotomy.

**1. Traumatic Biliary Tract Rupture**

The most frequent cause of injury to the extrahepatic biliary tract is blunt abdominal trauma after:

 a motor vehicle accident; penetrating wounds from gunshot, stab, or bite injuries have also been reported.

Iatrogenic injury, postoperative leakage from a cholecystotomy, cholecystectomy, or laceration of the common bile duct can also result in leakage and subsequent bile peritonitis.

When leakage occurs as a result of blunt trauma, location of the perforation is almost always within *the common bile duct* or hepatic ducts; rarely, leakage from the gallbladder has been reported.

Tears or transections are usually located within the body of the *common bile duct* or, less commonly, the cystic duct.

Avulsion injuries of *the common bile duct* from the duodenum or avulsions of hepatic ducts from the common bile duct are also common

**2. Extrahepatic Biliary Obstruction**

The most common causes of extrahepatic biliary obstruction in dogs include pancreatitis, neoplasia, gallbladder mucoceles, cholangitis, and cholelithiasis.

**3. Bile Peritonitis**

The most common underlying causes of bile peritonitis in dogs are trauma, necrotizing cholecystitis, and ruptured gallbladder mucoceles.

In cats, bile peritonitis is very rare but is usually associated with trauma.

The release of bile salts into the peritoneum is principally responsible for initial pathologic changes that occur with spillage of bile into the peritoneal cavity.

Bile salts cause inflammation, hemolysis, and tissue necrosis. Their hyperosmolality leads to significant fluid shifts from the vascular space into the peritoneal cavity, resulting in dehydration and eventually hypovolemic shock

Normal canine bile is sterile; blunt trauma–induced bile leakage is initially more likely to result in sterile peritonitis.

Infection, however, can develop as a result of ascending gastrointestinal contamination, intestinal translocation, or colonization by resident hepatic anaerobes

As previously discussed, when bile salts are not present in the lower small intestine to bind endotoxins, systemic endotoxemia may develop, resulting in significant morbidity.

**5. Liver Lobe Torsion**

Liver lobe torsion is another relatively uncommon disease of dogs,. It is reported most commonly in middle-aged to older large-breed dogs\*

Imaging, particularly Doppler ultrasonography, is useful in identifying hepatic vessels with decreased blood flow.

**6. Gallbladder Mucocele**

Gallbladder mucocele may currently represent the most common indication for surgical management of extrahepatic biliary tract disease in dogs. It has not yet been convincingly described in cats.

***Etiology***

The underlying lesion has been described as cystic mucosal hyperplasia. Hypersecretion of mucus leads to an accumulation of thick, gelatinous bile within the gallbladder.

***Diagnosis***

Diagnosis of gallbladder mucocele relies on a combination of clinical signs, laboratory parameters, and imaging studies.

***Treatment***

gallbladder mucoceles should be treated surgically is probably justified by the high morbidity and mortality seen in dogs that develop extrahepatic biliary obstruction or bile peritonitis secondary to gallbladder rupture.

**7. Cholelithiasis**

Choleliths are fewer than 1% of dogs with biliary tract disease

In contrast to humans, canine bile is less saturated with cholesterol. Cholesterol-containing choleliths are much less common in small animals

In small animals, so called “**pigment stones**” are more common.

**In dogs**, they are usually composed primarily of calcium bilirubinate, with bilirubin and cholesterol present in varying quantities.

 **In cats**, most choleliths are calcium carbonate, with calcium bilirubinate and cholesterol reported less frequently.

70% of canine choleliths had positive aerobic culture results and 55% had positive anaerobic culture results in one study.

The most common bacteria cultured were *E. coli*, *Streptococcus* spp., *Enterococcus* spp., and *Klebsiella* spp.

**Hepatobiliary tumors are of four general types:**

1. hepatocellular (adenomas, hepatocellular carcinomas
2. cholangiocellular (adenomas, Cholangiocellular carcinoma)
3. neuroendocrine (*carcinoids* or *amine precursor uptake and decarboxylation* (APUD) cell tumors)
4. mesenchymal (Hemangioma, Primary hepatic hemangiosarcoma, )

Metastatic tumors are more common than primary ones

The most common secondary tumors are hematopoietic and lymphoid tumors followed by epithelial and mesenchymal tumors.

Most animals with hepatobiliary neoplasia are aged 9 to 12 years old at presentation.

Clinical signs, when present, are likely to be nonspecific, with lethargy, anorexia, weight loss, and vomiting being most prevalent.\* Physical examination may reveal a palpable abdominal mass,

Other signs may be secondary to hepatic failure and include icterus, poor body condition, or ascites

Diagnosis

Plain radiography

Abdominal ultrasonography

aspiration or biopsy of masses is required for histologic diagnosis. Diagnosis of specific tissue types requires fine needle aspiration of cells, needle core biopsy, laparoscopic liver biopsy, or “open” surgical biopsy.

The simplest method for obtaining a diagnosis of hepatic neoplasia is ultrasound-guided fine needle aspiration.

Contrast enhanced harmonic ultrasonography increases the ability to differentiate between benign and malignant hepatic nodules