The Feline Liver and Pancreas: What Can We Learn from Diagnostic Imaging?

Matthew D. Winter, DVM, DACVR University of Florida Gainesville, FL

Early hepatic disease in dogs and cats often yields non-specific signs that are often referable to the gastrointestinal, neurologic system, urinary, or hematopoietic systems. Due to the inherently large reserve capacity of the liver to perform its many functions, signs such as ascites, icterus, hypoglycemia, bleeding tendencies or hepatic encephalopathy often occur later in the disease process. Diagnostic imaging can often aid in the identification of hepatic disease, and the added information can often guide additional diagnostics (fine-needle aspirates or biopsies), or help guide therapeutic intervention (surgery).

The prevalence of pancreatitis in cats is unknown, but diagnostic testing has become more accurate and reliable. Cats with pancreatitis have variable clinical signs, with lethargy and anorexia being most commonly reported. The clinical signs of vomiting and abdominal pain typically seen in dogs and people with pancreatitis are much less frequently reported in the feline population. Serologic testing has become more advanced, and diagnostic imaging can play a role in the diagnosis of feline pancreatitis as well as pancreatic neoplasia. While the left limb of the pancreas may occasionally be visible in cats radiographically, ultrasound is the more commonly applied diagnostic imaging technique applied in cases of suspected feline pancreatitis.

Objectives

- 1. Review common radiographic and ultrasonographic findings associated with diseases of the liver and pancreas in cats
- 2. Understand the normal anatomy associated with the feline liver and pancreas
- 3. Recognize age-related changes associated with the pancreas that should not be confused with signs of pancreatitis
- 4. Understand the differences in findings associated with the biliary tree between dogs and cats

Key Points

- 1. Radiographic signs of hepatic and pancreatic disease in cats are often non-specific, but can support other clinical evidence
- 2. Ultrasonographic signs of pancreatitis in cats are similar to those in dogs, however are not always present
- 3. Even with ultrasonography, hepatic changes are often non-specific; however, identification of masses, cysts, and biliary diseases can often be made
- 4. Common bile duct dilation and the presence of gallbladder sludge is a potentially important indicator of hepatic disease in cats

The feline liver

Feline hepatic inflammation/infection

Correlation of sonographic findings with specific hepatic disease complexes has been largely unsuccessful. Hepatic lipidosis is reported to be the most common disease affecting the liver of cats. Sonographic characterization of hepatic lipidosis typically includes an enlarged liver with hyperechoic parenchyma.

In dogs, the presence of gallbladder sludge is considered to be an incidental finding. This is not so in cats, where gallbladder sludge has been linked to elevations in liver enzymes that suggest the presence of hepatobiliary disorders. Therefore, the presence of gallbladder sludge in cats should not be ignored in cats with non-specific clinical signs of lethargy, inappetance and vomiting.

The feline cholangitis/cholangiohepatitis (C/CH) complex comprises the second most common feline hepatic inflammatory disorder. While hepatic parenchymal findings mimic those of hepatic lipidosis (hepatic enlargement and hyperechogenicity), additional findings include the presence of gallbladder sludge and common bile duct dilation. This constellation of findings may be useful in distinguishing C/CH complex from diseases such as hepatic lipidosis, lymphoma, or other hepatopathies (toxic, vacuolar, storage disease).

Feline hepatic neoplasia

Primary hepatic neoplasms have an incidence of 2.9% in cats. The most common primary hepatic neoplasm in cats is biliary carcinoma, followed by hepatocellular carcinoma. Round cell neoplasia, specifically lymphoma, is far more common. Benign hepatic masses include biliary cystadenomas, myelolipomas, and hepatic carcinoids. Clinical signs, as with other hepatic disorders, are non-specific. Ultrasonographic findings for primary hepatic tumors (benign and malignant) typically include focal mass lesions with can have a variable appearance, and may be hyperehoic, hypoechoic, or heterogeneous. Round cell neoplasia, such as lymphoma, often appears sonographically as generalized hepatic and splenic enlargement, although focal lesions in cats have also been reported. Because of this variation, it is nearly impossible to differentiate benign from malignant hepatic mass lesions. Other features, such as hepatic lymphadenopathy, may aid in this differentiation, however, ultrasound guided sampling is required for definitive diagnosis.

The presence of target lesions in the liver and/or spleen increases the likelihood of malignancy, with an 81% positive predictive value for malignancy when multiple target lesions are identified. This is more commonly seen in cases of metastatic neoplasia, though may also be seen with round cell neoplasms.

The feline pancreas Pancreatitis

For years, the incidence of feline pancreatitis was reported to be low, but research in the last 10-15 years suggests that this disease is merely underdiagnosed. Chronic pancreatitis is reported to be more common in cats than acute pancreatitis, though chronic active pancreatitis has been commonly reported, and acute pancreatitis occurs in a significant number of cases. Recent advancements in diagnostic testing, including serum fPLI, have increased sensitivity and specificity for diagnosis of feline pancreatitis, though this test is most sensitive and specific for moderate and severe forms.

Ultrasonographically, findings associated with feline pancreatitis are similar to those described in the dog, and include increased pancreatic size, irregular pancreatic margins, decreased pancreatic echogenicity, and regional effusion with hyperechoic and hyperattenuating fat. Studies describe enlargement of the pancreatic duct as a potential feature of pancreatitis in cats; however several additional investigations have cited age-related and physiologic dilation of the pancreatic duct in normal cats. While it is possible that pancreatic duct dilation may be a feature of chronic feline pancreatitis, this finding alone should be interpreted with caution. A wide range of sensitivities and specificities have been reported, which likely reflects the extreme operator dependence associated with this test.

Pancreatic pseudocysts, or accumulations of pancreatic fluids within an area of fibrosis, can be encountered. These are typically anechoic, and have a thin wall as compared to the echogenic contents and thick-walled appearance of pancreatic abscesses. In these cases, ultrasonography is a useful tool to guide aspirates and therapeutic/diagnostic drainage.

Feline pancreatic neoplasia

Pancreatic neoplasia in cats presents with variable, non-specific clinical signs. There is no breed or sex predilection, and age range of affected cats is broad. Cats with adenocarcinomas typically present with anorexia, vomiting, abdominal pain and a palpable cranial abdominal mass. Cats with adenomas often present with signs referable to other, concurrent diseases such as diabetes mellitus or chronic renal disease. Pancreatic neoplasia may results in the presence of nodules or masses, with pancreatic thickening, effusion, and an irregular pancreatic margin detectable sonographically. The only imaging finding unique to pancreatic malignancy was the presence of a single pancreatic mass exceeding 2 cm in at least one dimension.

The utility of ultrasound contrast power and color Doppler in the investigation of pancreatic disease has also been reported, and suggests that significantly higher Doppler values can be detected with Doppler imaging methods in cats with pancreatic disease (neoplasia, nodular hyperplasia, pancreatitis).

Conclusion

Imaging findings associated with hepatic and pancreatic disease can be non-specific. It is important that one interprets the constellation of imaging findings (mass lesion, lymphadenopathy, effusion, etc.) as well as the clinicopathologic data together, as any one imaging finding alone is typically less useful. The presence of target lesions can aid in the discrimination between benign and malignant processes in the liver and spleen, but may not always be present.

As with any imaging modality, practicing interpretation in a structured manner in a proper environment is of utmost importance, as is a strong knowledge of anatomy.

References

Marolf AJ, Leach L, Gibbons DS, Bachand A, Twedt D. Ultrasonographic Findings of Feline Cholangitis. Journal of the American Animal Hospital Association. 2012 Jan 1;48(1):36–42.

DACVIM SJED, DACVIM ECFD. Textbook of Veterinary Internal Medicine. 6th ed. Elsevier Saunders; 2004.

Brömel C, Barthez PY, Léveillé R, Scrivani PV. Prevalence of gallbladder sludge in dogs as assessed by ultrasonography. Vet Radiol Ultrasound. 1998 Jun;39(3):206–10.

Harran N, d' Anjou M-A, Dunn M, Beauchamp G. Gallbladder sludge on ultrasound is predictive of increased liver enzymes and total bilirubin in cats. Can Vet J. 2011 Sep;52(9):999–1003.

Cuccovillo A, Lamb CR. Cellular features of sonographic target lesions of the liver and spleen in 21 dogs and a cat. Veterinary Radiology & Ultrasound. 2002;43(3):275–8.

Gerhardt A, Steiner JM, Williams DA, Kramer S, Fuchs C, Janthur M, et al. Comparison of the sensitivity of different diagnostic tests for pancreatitis in cats. J. Vet. Intern. Med. 2001 Aug;15(4):329–33.

Xenoulis PG, Steiner JM. Current Concepts in Feline Pancreatitis. Topics in Companion Animal Medicine. 2008 Nov;23(4):185-92.

Hecht S, Penninck DG, Mahony OM, King R, Rand WM. Relationship of pancreatic duct dilation to age and clinical findings in cats. Vet Radiol Ultrasound. 2006 Jun;47(3):287–94.

Saunders HM, VanWinkle TJ, Drobatz K, Kimmel SE, Washabau RJ. Ultrasonographic findings in cats with clinical, gross pathologic, and histologic evidence of acute pancreatic necrosis: 20 cases (1994-2001). J. Am. Vet. Med. Assoc. 2002 Dec 15;221(12):1724–30.

Larson MM, Panciera DL, Ward DL, Steiner JM, Williams DA. Age-related changes in the ultrasound appearance of the normal feline pancreas. Veterinary Radiology & Ultrasound. 2005;46(3):238–42.

Baron ML, Hecht S, Matthews AR, Stokes JE. Ultrasonographic observation of secretin-induced pancreatic duct dilation in healthy cats. Vet Radiol Ultrasound. 2010 Feb;51(1):86–9.

Etue SM, Penninck DG, Labato MA, Pearson S, Tidwell A. Ultrasonography of the normal feline pancreas and associated anatomic landmarks: a prospective study of 20 cats. Vet Radiol Ultrasound. 2001 Aug;42(4):330–6.

Seaman RL. Exocrine Pancreatic Neoplasia in the Cat: A Case Series. Journal of the American Animal Hospital Association. 2004 May 1;40(3):238–45.

Hecht S, Penninck DG, Keating JH. Imaging findings in pancreatic neoplasia and nodular hyperplasia in 19 cats. Vet Radiol Ultrasound. 2007 Feb;48(1):45–50.

Rademacher N, Ohlerth S, Scharf G, Laluhova D, Sieber-Ruckstuhl N, Alt M, et al. Contrast-Enhanced Power and Color Doppler Ultrasonography of the Pancreas in Healthy and Diseased Cats. Journal of Veterinary Internal Medicine. 2008;22(6):1310–6.