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## **Diffuse Liver Diseases in Dogs and Cats**

### **Diffuse Hepatopathies & Imaging**

A diffusely abnormal liver is commonly identified on ultrasound of dogs and cats, especially older pets. That said, diagnosing various types of diffuse liver disease solely based on ultrasonographic liver appearance is ill advised. History, signalment, and biochemical abnormalities are crucial to determining the critical relevance of a sonographically-determined diffuse hepatopathy.

Diffuse changes to the liver are subjective, especially when mild. Livers can be described as either too bright (hyperechoic), too dark (hypoechoic), too small, or too large. The presentation will evaluate 4-5 cases of diffuse hepatopathies, using other clues in the abdomen, history, or bloodwork to help narrow the differential diagnosis.

#### *Normal Liver*

The normal liver is hypoechoic to the spleen, an important comparison to be made in any comprehensive abdominal ultrasound exam. The liver is also described as coarse in echotexture, with chunky areas of portal vessels intermixed with more homogeneously hypoechoic parenchyma. Normal liver margins tend to have triangular or pointed ends, not rounded or blunted edges that could be seen with hepatomegaly. The normal caudate lobe of the liver tends to not extend beyond the cranial pole of the kidney. The left side of the liver tends to remain subcostal.

#### *Hyperechoic Liver*

The most common of all diffuse hepatopathies is a hyperechoic hepatopathy (a 'bright' liver). How do we define hyperechoic or 'too bright'?

- A liver that is similar in echogenicity or more echogenic relative to the spleen
- A liver that loses the detail of the normally hyperechoic portal vein walls (a hyperechoic background on normally hyperechoic walls will make the walls difficult to identify)
- The renal cortex of the DOG tends to be hypoechoic to the liver... but be careful about this distinction. It is not as reliable as the liver/spleen relationship; and a normal fat cat can have very hyperechoic, normal kidneys.

The differential diagnosis list for a hyperechoic liver includes:

- Vacuolar hepatopathy, most commonly lipidosis, steroid hepatopathy
- Hepatitis
- Round cell neoplastic infiltration of the liver (eg mast cell, lymphoma)
- Cirrhosis

While glucocorticoid administration and hyperadrenocorticism are the most common cause of vacuolar hepatopathy, any illness-invoked physiological stress can be associated with vacuolar hepatopathy (as well as high ALP activity). So, it stands to reason that a diffusely hyperechoic liver is the most commonly described diffuse hepatopathy in dogs and cats. In many cases of a diffusely hyperechoic liver secondary to steroid hepatopathies in dogs, the hyperechoic liver will outline multifocal homogeneously hypoechoic nodules (nodular hyperplasia) that are small and do not deform the capsule.

A hyperechoic liver in an obese cat that becomes anorexic will certainly raise concern for hepatic lipidosis. However, obese cats tend to ALL have hyperechoic livers (often hyperechoic to regional falciform fat as well as the liver). These cats may also have hyperechoic renal cortices and echogenic urine associated with renal fat infiltration and lipiduria, respectively.

Vacuolar hepatopathy, hepatitis, and round cell infiltration of the liver tend to be associated with a normal or large liver. Cirrhosis/fibrosis of the liver is generally associated with a normal to small liver. Many cases of cirrhosis tend to also have capsule deforming nodules giving the liver rounded margins.

### *Hypoechoic Liver*

A hypoechoic liver is much rarer compared to hyperechoic liver. A hypoechoic liver is generally seen with a normal to large liver. The determination of the liver being hypoechoic relies on even more subjective criteria. In general, a hypoechoic liver tends to make the portal walls appear thicker and brighter, especially towards the porta hepatis. The contrast between portal walls and the hypoechoic liver parenchyma tends to be remarkable.

The differential diagnosis for a hypoechoic liver is limited and includes:

- Hepatitis (especially acute hepatitis like Leptospirosis)
- Round cell neoplasia (especially lymphoma)
- Congestion (A “nutmeg” liver as seen with post-sinusoidal congestion, like right-sided heart failure)
- Amyloidosis

Supportive findings for an acute hepatitis include peritoneal effusion and hyperechoic fat around the liver. Of course, abnormalities in serum biochemistry are crucial to determine clinical relevance. Supportive findings for round cell neoplasia of the liver (whether hypoechoic or hyperechoic) tend to include concurrent splenomegaly and regional lymphadenopathy. Congestion of the liver tends to be seen with concurrent distention of the caudal vena cava and hepatic veins.

### *Mixed Hepatopathies*

As we will see in our examples, purely hyperechoic or hypoechoic hepatopathies are not always the case. A mix of nodules, masses, cysts and other abnormalities to the liver can complicate our imaging conclusions. It is important to evaluate liver-adjacent structures in our assessment, including hepatic (porta hepatis) lymph nodes, the gallbladder, and the pancreas.

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