

## BASIC INFORMATION

### Description

Blood leaving the gut passes to the liver through a special system of blood vessels, called the *portal circulation*. In the liver, nutrients and toxic substances are absorbed and processed before they reach the rest of the body. A portosystemic vascular anomaly (shunt) is an abnormal blood vessel that allows blood from the gut to bypass the liver.

There are two major types of portosystemic vascular anomalies, congenital and acquired. A congenital anomaly is one that is present at birth, whereas acquired anomalies develop later in life, usually from liver disease. Congenital anomalies may be intrahepatic (within the liver) or extrahepatic (outside the liver) in location.

### Causes

The cause of congenital portosystemic vascular anomalies is unknown. A genetic component may be involved in certain breeds, such as the Irish wolfhound, pug, Havanese, Maltese, Dandie Dinmont terrier, miniature schnauzer, Cairn terrier, and Yorkshire terrier, because they have a higher risk for developing these anomalies.

Acquired anomalies develop from scarring and cirrhosis of the liver (see the handout on **Chronic Hepatitis in Dogs**), which cause pressure to increase in the portal blood vessels. New, abnormal vessels form that alleviate this pressure as the vessels bypass the liver.

### Clinical Signs

Most animals with acquired shunts have very advanced liver disease, with signs such as poor appetite, weight loss, lethargy, depression, increased water consumption, and fluid accumulation in the abdomen or under the skin (ascites or edema). Young animals with congenital anomalies usually fail to grow properly and are small in comparison to their littermates.

Affected animals become mentally depressed or behave oddly after they have eaten, because of a sudden influx of toxic compounds into the circulation as food is digested. These behavioral changes are a form of hepatic encephalopathy. (See handout on **Hepatic Encephalopathy**.)

### Diagnostic Tests

Routine laboratory tests and abdominal x-rays are often recommended initially. X-rays may show a small liver and kidneys that are larger than normal. Bile acid assays are often run, because with portosystemic anomalies, bile acid levels are typically extremely elevated after a meal, which indicates that blood from the gut is bypassing the liver. An abdominal ultrasound may be used to gauge the size of the liver, to look for evidence of scarring and

shrinkage of the liver, and to search for abnormal blood vessels. Detecting abnormal vessels requires a high level of skill, particularly in very small animals, and sometimes additional tests, such as a nuclear scan or a contrast x-ray procedure (portography) may be needed. In these cases, your veterinarian may recommend referral to a veterinary specialist for further testing. Other tests may also be recommended to rule out other diseases that can cause similar signs.

## TREATMENT AND FOLLOW-UP

### Treatment Options

If a portosystemic vascular anomaly is detected, surgical closure of the vessel is usually recommended, if possible. Depending on the size, complexity, and position of the shunt in the abdomen, surgery may or may not be feasible. Your pet may be referred to a veterinary surgery specialist for the procedure.

If an anomaly is present that cannot be repaired surgically, medical management is started. Medical therapy involves measures to decrease the production and absorption of toxic substances in the gut. Decreasing the amount of protein in the diet lowers the production of these substances and is an important part of therapy. Absorption of toxins can be reduced by making the environment in the gut more acidic with a medication called *lactulose*. Lactulose is also a laxative, so the amount of time that proteins or feces remain in the gut is decreased. It may cause soft stools, mild diarrhea, and excessive gas (flatulence), especially in the first 7-10 days.

Since bacteria are also involved in the production of toxic compounds, broad-spectrum antibiotics are commonly given along with the lactulose and a low-protein diet.

### Follow-up Care

Patients with vascular anomalies that undergo surgery require regular follow-up visits and testing for several months. Animals on medical therapy usually show an improvement in their signs within 1 week. Follow-up visits may be needed at weekly intervals for several weeks until the animal is stable, and then every 2-3 months.

### Prognosis

Prognosis is good for young animals with anomalies that can be successfully treated with surgery. Assuming there are no complications and recovery is uneventful, these animals often go on to lead normal lives. Animals with inoperable anomalies or end-stage liver disease have a more guarded to poor prognosis. They require lifelong treatment, and their clinical signs typically worsen over time.