



**Veterinary Emergency
+ Referral Center**
of Hawaii

**Ettinger: Textbook of
Veterinary Internal Medicine, 7th Edition
Portosystemic Shunts
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What is a portosystemic shunt?

Portosystemic shunts are caused by abnormalities of the veins in the abdomen. In normal animals, blood from the stomach, intestines, spleen, and pancreas drains into the liver through a large vein called the "*portal*" vein. Blood is detoxified in the liver from the portal vein before it passes into the general circulation. In animals with portosystemic shunts, blood draining from the portal system bypasses ("shunts" past) the liver and directly enters the general circulation.

There are a number of portosystemic shunts. Most are "congenital," which means that the abnormality was present at birth. Dogs and cats that have portosystemic shunts should not be bred.

The most common types of shunts are the following:

1. **Single extrahepatic shunt:** a single shunting vessel that is not within the substance of the liver. This is the most common type and is usually congenital.
2. **Single intrahepatic shunt:** a single shunting vessel within the liver. These are most commonly seen in large-breed dogs and are usually congenital.
3. **Multiple extrahepatic shunts:** multiple shunting vessels that are not within the substance of the liver. These are caused by underlying liver disease and are usually not present at birth (they are usually not congenital).

What are the symptoms?

Portosystemic shunts can cause a variety of symptoms. The most common include the following:

- **Nonspecific signs**, including lethargy, failure to grow, and weight loss
- **Gastrointestinal signs**, including poor appetite, vomiting, diarrhea, and excessive salivation
- **Urinary tract signs**, including excessive drinking and urinating, difficulty passing urine, and urine that may appear bloody
- **Neurologic signs**, including lack of coordination, head pressing, aimless walking and seizures. These signs are often intermittent.
- **Poor recovery** from anesthesia (e.g., after spay or neuter surgery)

What treatment is needed?

Surgery is the preferred method of treating most dogs and cats with portosystemic shunts. The aim of surgery is to close down the shunting vessel as far as possible. Medical therapy is used to stabilize the pets prior to surgery and for long-term management in which either surgery is not

performed or surgery cannot completely close down the shunting vessel. Medical therapy is tailored based on the individual patient's condition and the response to treatment.

Therapy can include the following:

- Low-protein diet to reduce the nitrogen content of the diet (nitrogen is one of the toxins that a liver normally breaks down)
- Antibiotic therapy to reduce the number of bacteria in the gut and treat any bacteria that are absorbed into the blood stream
- Lactulose to reduce the absorption of compounds rich in nitrogen. The dose is adjusted to produce soft stools.

Debilitated dogs or cats may also require fluid therapy, enemas, and other treatments.

At surgery, the abdomen is explored to locate the portosystemic shunt(s). The surgical procedure performed depends on the type of shunt. Single extrahepatic shunts are treated by either tying the shunt shut (suture ligation) or placement of a device that slowly closes the shunt. Suture ligation is the traditional method. A suture is placed around the shunting vessel and temporarily tightened to look for signs of portal hypertension. Portal hypertension is caused by an unacceptable increase in the pressure in the veins draining the portal system and is a severe and often fatal complication after surgery. If no signs of portal hypertension are present, the shunt can be completely ligated. If signs of portal hypertension are observed, the shunt is partially ligated so that the flow of blood through the shunt is reduced but some flow remains to prevent portal hypertension.

More recently, portosystemic shunts have been treated by placing a device around the shunting vessel that slowly constricts the vessel and attenuates blood flow. These devices are designed to reduce the chances of severe portal hypertension. Two devices have been used: the ameroid ring constrictor and the cellophane band. These gradual occlusion devices attenuate blood flow through the shunt over a number of weeks. In rare cases no portal vein (portal atresia) exists; no surgical treatment has been established for this condition.

Surgery for **single intrahepatic shunts** is similar. Because the abnormal vein is inside the liver, it is more difficult to visualize and therefore the surgery is more difficult. Most intrahepatic shunts are too large to completely "ligate" (close or tie off).

No surgical treatment exists for **multiple extrahepatic shunts**. A liver biopsy should be obtained to try and diagnose the underlying liver disease. Results may help the appropriate medical treatment and long-term outlook.

Complications of surgery are uncommon but can be severe. Specific complications of portosystemic shunt surgery include the following:

- Portal hypertension. Severe portal hypertension causes rapid, progressive shock and bloody diarrhea within a few hours of suture ligation of a shunt. The only treatment is surgical removal of the ligature. The outlook is extremely guarded. Moderate portal hypertension can occur with gradual occlusion devices resulting in distension of the

abdomen with fluid within days to weeks after surgery. Fluid distension generally resolves within a few weeks.

- Seizures. These are often severe and can be continuous. They generally develop within 3 days after surgery. Pets that do not have seizures before surgery can develop seizures immediately after surgery. These seizures are difficult to control. The outlook is poor and many dogs and cats with seizures die or have permanent neurologic problems.
- Generalized bleeding
- Systemic infection (sepsis)

What is the prognosis?

The long-term outlook for dogs and cats with portosystemic shunts that are treated medically and in which surgery is not performed is poor, and most "medically treated" dogs and cats continue to have symptoms or eventually develop recurrent symptoms. The mortality rate during surgical treatment of dogs with single extrahepatic portosystemic shunts is low. The mortality rate in dogs with intrahepatic shunts and in cats is higher, regardless of the shunt type. The long-term outlook for pets in which the shunt was completely closed down successfully is excellent. Good quality of life and normal life expectancy are anticipated. The outlook for pets in which the shunt was partially closed down is more variable and probably depends on the amount of blood still bypassing the liver via the shunt. Medical therapy is used in dogs and cats with continued shunting after surgery that experience clinical signs.

Dogs and cats in which the shunt was partially ligated with suture may do well long term, either because the shunt eventually completely occludes (is shut off) or low blood flow occurs through the shunt. Others may have persistent clinical signs or may experience recurrence of signs months to years after surgery. A second surgery can be performed to further attenuate a partially ligated shunt. Dogs and cats treated by placement of a gradual occlusion device appear to have an increased chance of complete shunt occlusion, though some will experience continued shunting after surgery. Dogs and cats with continued shunting after placement of a gradual occlusion often appear healthy, although a risk of recurrence of symptoms exists months to years after surgery. Continued portosystemic shunting in dogs and cats after placement of a gradual occlusion device is most likely to be a result of the development of multiple extrahepatic shunts, and no surgical therapy exists for these pets.