Portosystemic Shunts

A PowerPage Presented By

A portosystemic shunt is an abnormality in blood flow which results in deviation of blood that is meant to go to the liver from the portal circulation into systemic circulation. Basically, the plumbing is bad. There are a several categories that portosystemic shunts can be categorized into. These include congenital vs. acquired, single vs. multiple, and intrahepatic vs. extrahepatic. The majority of portosystemic shunts are **single, congenital, and extrahepatic**. This is likely what you will be tested on. This PowerPage will primarily focus on these shunts.

Anatomy

- All blood from the gastrointestinal tract drains into the portal vein for detoxification in the liver
- The liver receives up to 2/3 of its bloodflow from portal circulation
- A shunt usually involves an aberrant vessel from the portal, left gastric, or splenic vein draining into the vena cava or azygous vein

Signalment

- Small breed - **Yorkshire terriers**, Maltese, Pugs, Miniature Poodles etc.
    - Congenital, extrahepatic, single
- Usually less than 1 year of age
- If large breed, there may be higher likelihood of an intrahepatic shunt
- Cats with shunts may have classic "Copper" colored eyes (iris)

Clinical Signs

Clinical signs vary:

- Can range from apparently normal to comatose or seizuring
- Frequently undersized for breed or compared to littermates
- Polyphagia
- Vomiting, diarrhea, PU/PD
- May have neurologic deficits or inappropriate behavior such as head pressing or star gazing, especially after eating
    - **Hepatic Encephalopathy**

Diagnosis

CBC:

- May see normocytic normochromic anemia

Chemistry:

- Liver enzymes are variable. ALP may be elevated, commonly from the bone isoenzyme
- ↓ BUN
- ↓ albumin
- ↓ glucose
- ↓ cholesterol
- Seeing all or several of these should raise your index of suspicion

Bile Acids:

- ↑ Pre- and post-prandial **bile acids**
  - **Dramatically elevated post-prandial bile acids should make you highly suspicious of a shunt**
- ↑ Fasting Ammonia Level

Ammonia Levels:

- Will be elevated
- More sensitive test than Bile Acids; however, must perform immediately after blood draw, and analyzers are too expensive and not widely available, so not performed as often as bile acids

Urinalysis:

- May have **ammonium biurate crystals**

Imaging:

- Radiographs
  - **Microhepatia**
- Ultrasound
  - May see aberrant vessel, but only 60% of time if you are a good ultrasonographer
  - May also find urate stones in the bladder
- Transcolonic scintigraphy
  - In a dog with normal vasculature, contrast absorbed through colon will go directly to liver first via portal circulation. In an animal with a shunt, it will bypass the liver and contrast will be seen in the heart first.
- Transplenic scintigraphy
- Mesenteric Portovenogram

Treatment

Medical Management:

- **Metronidazole or Neomycin**
  - Decreases urease-producing bacteria in colon
  - Neomycin is unique in that it is not absorbed through GI tract
- **Lactulose**
  - Decreases colonic pH which results in a decrease ammonia absorption (ion trapping)
- **Low protein diet**
  - Decreases substrate for ammonia production.
- **KBr if seizuring and/or Lactulose enemas**

- Patients managed medically will likely have a shortened lifespan
  - Surgery is recommended. Patients thought to live normal lifespan if surgery is successful.

Surgical Management:

Surgical closure of the aberrant shunting vessel

- **Ameroid constrictor**
  - Results in gradual occlusion of shunting vessel
  - Most commonly used
- Cellophane band
  - Results in gradual occlusion of shunting vessel
- Partial or complete ligation
  - Used to be done more commonly. Causes greater portal hypertension and higher complication rate than other techniques

- Overall there is an approximately 20% mortality rate with surgery
- You always want patient as stable as possible prior to surgery so if seizuring or showing clinical signs, medically manage first and then perform surgery once patient is stable 1-2weeks later
- Post-op, need to monitor carefully for hypoglycemia, seizures and excruciating pain
    - Pain would indicate a complete occlusion of the vessel and potentially life-threatening portal hypertension requiring further surgery
- **Always obtain liver biopsy**
    - Rule in or rule out microvascular dysplasia which will help you decide if you need long-term post-op medical therapy
    - **Microvascular dysplasia** is thought to be shunting at the level of the hepatocyte, although poorly understood. There is no cure for this.