PSS-T:
PortoSystemic Shunt-Treatment

Synopsis-- Anatomy and the Disease

A simplistic picture: The liver receives blood from two distinct circulations, one provides the typical oxygen, and the other provides blood that needs the liver's deft cells to "clean up" the fallout from the GI tract. The more nuanced picture finds the hepatic artery only providing 20% of total blood to the liver and the portal vein the remaining 80%; each of these provides half of the oxygen delivery to the liver. When an aberrant vessel connects the portal circulation in the abdomen with the caudal vena cava as it enters the chest and bypasses the liver (and all of the work the liver does) and robs it of necessary vascular nourishment, varying degrees of hepatic failure develop.

Only the congenital PSS are considered surgical candidates (versus acquitted PSS). Congenital PSS anatomy is divided into extrahepatic and intrahepatic locations; both groups are considered to develop out of embryologic misadventure in circulatory development. Broadly speaking, the majority of extrahepatic shunts occur in small/toy breed dogs and cats, and the majority of intrahepatic shunts occur in large breed dogs.

Poor hepatic portal circulation results in pathophysiologic changes to several systems:

- CNS—hepatic encephalopathy (hyperexcitability/seizures and/or comatose; psychogenic polydipsia; abnormal behavior; ptyalism.
- Immune system—reduced immunoglobulin production
- Circulatory system—reduce albumin production; ascites; microcytosis; anemia; leukocytosis
- GI system—hepatopathy; vomiting; inappetence; weight loss/failure to thrive

Surgical Overview:

Extraheptic shunts are typically solitary, though, advanced imaging continues to define and broaden the abnormal anatomic characteristics of these cases, and more congenital multiple shunts are being described. The most common type is a vascular connection between the portal vein and the vena cava near to the hilus—portocaval shunt. Another variant seen with increasing frequency is the gastrophrenic shunt, defined by a vascular connection between the gastric vein (portal circulation) and the phrenic vein (systemic circulation) just before it enters the caudal vena cava at the level of the diaphragm. A transdiaphragmatic portoazygous shunt, is characterized by an aberrant vessel connecting the portal vein (or one of its tributaries) with the azygous vein in the chest. Other variants or multiples have also been described.

Surgery attempts to attenuate these shunt vessels with devices that create inflammation and fibrosis over several weeks, slowly expanding the portal circulation without an abrupt increase in portal pressure. Amaroid rings and cellophane bands are devices used for this application. Minimal dissection isolates the vessel, the device is applied, and medical management is maintained until liver function suggests improved hepatic circulation.

The **indications & rationale** for surgical treatment are:

- Clinical signs of hepatic encephalopathy are/become refractory to medical management
- Surgical attenuation likely provides longer lifespan
- Reduced incidence of bladder stone development

Other options for treatment (besides surgery) are:

- Medical management of hepatic encephalopathy

Supportive/ancillary options with surgical treatment are:

- Medically manage, well controlled hepatic encephalopathy and good body condition reduce postoperative complications.
- Antiseizure medications may reduce risk of postoperative seizure activity.
- Anesthetic protocols that rely heavily on opioids, propofol and inhalants.
- Intravenous colloid support of blood pressure and oncotic pressure during anesthesia.

The **perioperative experience** for pet and owner includes:

- Daily medications preoperatively and postoperatively until evidence of improving liver function.
- At-home postoperative care or transport to 24-hr critical care facility.
- Rare, but unpredictable onset of blindness and/or seizures requiring urgent critical care support.

Complications that may arise with this procedure are:

- Portal hypertension (sudden, life-threatening, requiring emergency surgery to release shunt attenuation)
- Poor anesthetic recovery (potentially life-threatening, requiring critical care support)
- Seizures (uncommon, 1-5d postoperatively, require critical care support and 12-24hr Propofol coma)
- Blindness (uncommon, rarely reversible)
- Sudden perioperative death

Postoperative **outcomes may be poor** due to the above complications, and/or:

- Persistent shunting through the original vessel.
- Development of new shunts in response to closure of the original.
- Bladder stone formation.
- Return or persistence of dull mentation, seizures, low blood sugar, vomiting.
- Development of abdominal fluid accumulation (ascites)

What a surgeon needs prior to surgery:

- Diagnostic imaging sufficient to identify extrahepatic vs. intrahepatic location
- Stable, well-fleshed, non-encephalopathic patient controlled on medical management
- Well-informed client with clear surgical expectations consistent with available level of diagnostic imaging and clinical facilities.

General considerations and complications *for PSS surgery/anesthesia procedures are:*

- *Difficult and/or painful anesthetic recovery (variable; may require additional medications, re-hospitalization, and/or re-operation)*
- *Incisional infections (rare, minor; usually require oral antibiotics)*
- *Incisional dehiscence (rare, minor or major; may require surgical revision)*
- *Adverse anesthetic event (occasional, major; may result in serious impairment or death)*

Proper owner expectations are important to a successful experience and patient outcomes. Please discuss this information with your clients while assisting them with decision-making for **PortoSystemic Shunts**.

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