

# Portosystemic Shunt Intrahepatic & Extrahepatic

## (Liver Shunts)

### Description

Portosystemic Shunts are vascular anomalies that cause portal blood to bypass the liver. These can be either congenital or acquired. The congenital shunts are usually a single vessel that can be either Extrahepatic (EHPPS) outside the liver or Intrahepatic (IHPPS) inside the liver. Acquired shunts are usually multiple and are secondary to an underlying hepatic disease process and the development of portal hypertension.

Extrahepatic shunts (EHPPS) are commonly found in small breeds of dogs. They are considered a developmental anomaly. Intrahepatic shunts (IHPPS) are often found in large breeds of dogs. Intrahepatic shunts are caused by a failure of the vessel that regulates blood flow from the placenta to vital organs like lungs & heart during fetal development to close. This would usually close within a few days of birth. <sup>(1)</sup>

### Signs & Symptoms

Dogs with Congenital Shunts tend to present at a young age though asymptomatic dogs as old as 13 have been seen <sup>(2)</sup>. There is no gender predisposition. Clinical signs may increase after eating.

Signs of Hepatic Encephalopathy (HE) – Ataxia, behavioural changes, aggression, pacing, circling, head pressing, blindness, seizures, coma. Failure to thrive or gain weight. Often small in stature - runt of litter. Polyuria, polydipsia, weight loss, vomiting, intermittent anorexia, diarrhoea, pica. Often have poor anesthesia tolerance. Ammonium biurate crystals or Stones.

It is thought that this is a semi lethal gene and likely causes fetal death so not all affected puppies are even seen. <sup>(2)</sup>

### Diagnostic Tests

Complete Blood Count (CBC) and Bile Acid Test. Common advanced imaging diagnostic tests includes Abdominal Ultrasound, Nuclear Scintigraphy, MRI, Computed tomography (CT) are also used.

### Causes

Congenital portosystemic shunts have been reported in 110 of 201 (55%) breeds of dogs. It is more common in purebred dogs than cross bred dogs <sup>(3)(4)</sup> and has been demonstrated to be genetic in many different breeds of dogs <sup>(3)(4)(5)(6)</sup> though predisposed breeds can vary from country to country <sup>(5)</sup>.

### Treatment

#### Medical management

Medical management is used for dogs that cannot have surgery or when surgery is declined and also to stabilize dogs prior to surgery. Medical management is titrated for each individual depending on severity of symptoms therefore it is best to work with a veterinary specialist. Medical management can control the signs of HE but will not treat the underlying hepatic atrophy. For dogs with intrahepatic shunts GI protectants are recommended for life usually Omeprazole. <sup>(7)</sup>

## Surgical management

Considered the best long term solution for shunts, it redirects the shunting blood to the liver reversing hepatic atrophy and may resolve clinical signs.

Extrahepatic shunts - suture ligation, cellophane banding or ameroid constriction.

Intrahepatic shunts have been considered more challenging to fix overall often with high mortality using the above surgical methods. There is now a minimally invasive method – Percutaneous Transjugular Coil Embolization. The mortality rate with this procedure is less than 5% <sup>(7)</sup>.

Medical vs. Surgical management is a complex subject there have been very few studies published. <sup>(8)</sup>

<sup>(9)</sup> one other study has been presented in abstract form at the ACVIM Forum in 2012 by Cornell University this involves the largest number of dogs so far but it is yet to be published. <sup>(10)</sup>

## Links to further information & research

There are many papers on liver shunts PubMed has in excess of 700. There are also various support groups on facebook the information given in these groups range from excellent to dangerous. Find a good internal medicine specialist to assist you in managing your dog.

- Genome-wide based model predicting recovery from portosystemic shunting after liver shunt attenuation in dogs - <https://onlinelibrary.wiley.com/doi/full/10.1111/jvim.15140>
- Canine congenital portosystemic shunts: Disconnections dissected L.Van den Bossche F.G.van Steenbeek  
<https://www.sciencedirect.com/science/article/pii/S1090023315003950>
- <http://vetnetinfo.com/tudasbasis/files/2016/02/Portosystemic-Shunts-and-Portal-Venous-Hypoplasia-2007.pdf>
- Aberrant Gene Expression in Dogs with Portosystemic Shunts <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3581512/>
- Portosystemic Vascular Anomalies Allyson C. Berent, DVMa,\*, Karen M. Tobias, DVM, MSb

## References

<sup>(1)</sup> Doppler ultrasonographic assessment of closure of the ductus venosus in neonatal Irish wolfhounds. Lamb CR, Burton CA Vet Rec. 2004 Nov 27; 155(22):699-701.

<sup>(2)</sup> Portosystemic Vascular Anomalies (PSVA) & Microvascular Dysplasia (MVD) S A Center, DVM, Dipl ACVIM Professor of Internal Medicine, Cornell University, Ithaca, NY

<sup>(3)</sup> Association of breed with diagnosis of congenital portosystemic shunts in dogs: 2400 cases (1980-2002) Karen M Tobias, DVM, MS DACVS, & Barton W Rohrbach, VMD, MPH, DACVPM – JAVMA , Vol 223, No 11 December 1, 2003.

<sup>(4)</sup> Prevalence of inherited disorders among mixed-breed and purebred dogs: 27,254 cases (1995-2010) Thomas P Bellumori, MS; Thomas R Famula PhD; Danika L Bannasch, PhD, DVM; Janelle M bellanger, MS; Anita M Oberbauer PhD. JAVMA, Vol 242 No 11 June 1 2013.

<sup>(5)</sup> Effect of breed on anatomy of porto-systemic shunts resulting from congenital disease in dogs and cats: a review of 242 cases. GB Hunt Veterinary Cardiovascular Unit, University Veterinary Centre, Faculty of Veterinary Science, University of Sydney, New South Wales 2006. Australian Veterinary Journal Volume 82, No 12, December 2004.

<sup>(6)</sup> Inherited liver shunts in dogs elucidate pathways regulating embryonic development and clinical disorders of the portal vein. Frank G. van Steenbeek, Lindsay van den Bossche, Peter A. J. Leegwater, and Jan Rothuizen. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275728/>

<sup>(7)</sup> Endovascular evaluation and treatment of intrahepatic portosystemic shunts in dogs: 100 cases (2001–2011) - Chick Weisse, VMD; Allyson C. Berent, DVM; Kimberly Todd; Jeffrey A. Solomon, MD; Constantin Cope, MD JAVMA January 1, 2014, Vol. 244, No. 1, Pages 78-94

<sup>(8)</sup> Comparison of survival after surgical or medical treatment in dogs with a congenital portosystemic shunt. Stephen N Greenhalgh et al. JAVMA Vol 236, No 11 June 1 2010.

<sup>(9)</sup> Medical Management of congenital portosystemic shunts in 27 dogs: A retrospective study. J Small anim Pract 39:62-68 1998

<sup>(10)</sup> Long-term survival of dogs (n=597) with congenital or acquired portosystemic shunting: 1980-2010. Center SA, Randolph J, Warner K, et al. J Vet Intern Med 2012;26:781A ACVIM Forum 2012, New Orleans, LA (abstract)