

## Interventional Radiological (IR) Surgery

– Assistant Professor Chick Weisse, VMD, faculty at the University of Pennsylvania's Ryan Veterinary Hospital, is pioneering an experimental, minimally-invasive, interventional radiological (IR) surgery to correct intrahepatic shunts. Peri-operative mortality rates for this surgery are below 12%. Recovery time is minimal because there is no abdominal incision. The surgical technique involves threading a catheter through the jugular vein and placing a mesh sleeve (stent) inside the vena cava where the shunt enters, having bypassed the liver. The surgeon then places several embolization coils on the shunt side of the mesh stent. The coils are coated with a thrombogenic material so that clots develop around the coils, gradually closing off the abnormal blood flow through the shunt. There is still the risk of portal hypertension. As such, IR surgeons err on the side of placing too few coils rather than too many. For that reason, a second surgery may be needed to add more coils if clinical signs are still present.

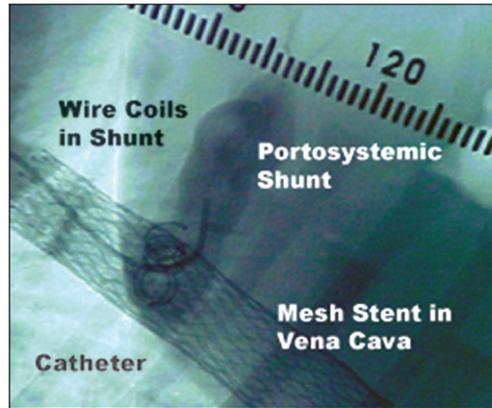
The radiological image (page 6) shows the stent as it is placed in Sophie Tucker's vena cava and the two embolization coils placed in her intrahepatic shunt.

Sophie's IR surgery took 70 minutes. Moments after she awoke, she was playing with staff. No additional surgery was required. Currently, Sophie is off all medications, behaves normally, and weighs 65 lbs (29.55 kgs).

Although this pamphlet emphasizes IR surgery's application to IHPSS, it is also used for blocking blood flow to malignant inoperable tumors and repairing collapsed tracheas (see [www.sevs.org](http://www.sevs.org)). In both cases, recovery time is minimal.

## How Can We Prevent IHPSS?

Currently, the best way to treat liver shunts is to avoid breeding dogs that could pass on the



disease trait. Affected individuals and their offspring should not be used for breeding. Siblings should only be used after careful screening. If any affected offspring are born, breeding of the parents should be discontinued.

In the meantime, breeders can screen their litters with a relatively inexpensive blood ammonia test a few weeks after birth to ascertain the possibility of a shunt.

Dr. Jan Rothuizen at Utrecht University in the Netherlands is attempting to find a genetic marker for the gene that causes IHPSS in BMDs so that a genetic test can be developed to determine if breeding dogs carry this defective gene. If you are interested in this research, please contact Dr. Rothuizen at [j.rothuizen@vet.uu.nl](mailto:j.rothuizen@vet.uu.nl) or Berner-Garde trustee, Mary Maliarik, Ph.D., at [mmaliarik.aol.com](mailto:mmaliarik.aol.com).

*This pamphlet is written to inform, not to diagnose. Your veterinarian is your best source of advice regarding your pet.*

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## INTRAHEPATIC PORTOSYSTEMIC SHUNTS (IHPSS) in BERNESE MOUNTAIN DOGS



*"Sophie Tucker," an Ohio puppy-mill, dog auction rescue, was born with an intrahepatic portosystemic (liver) shunt (IHPSS), a congenital defect suspected of being genetic. Close to death, Sophie, who weighed only 12 lbs. at 12 weeks, could not find a willing foster home, was not adoptable, and without a miracle, she would be dead in weeks.*

## What is IHPSS?

All puppy fetuses have a large shunt (ductus venosus) that carries blood rapidly through the fetal liver to the heart. While in the womb, the mother's liver does the work of filtering out toxins, storing sugar and producing protein for the unborn puppy. The puppy's liver does not function, yet. Within a week after birth, the shunt normally closes and the puppy's own liver begins to take over the tasks previously handled by the mother's liver. In Sophie Tucker's case, her shunt did not close (patent ductus venosus), resulting in an intrahepatic (inside the liver) portosystemic shunt. As such, her blood bypasses her liver and is recycled, never filtered of toxins.

## What are the Symptoms of IHPSS?

Symptoms are often seen at a young age (under 1 year). They include intermittent anorexia, small stature, poor muscle development, neurologic dysfunction (e.g., circling, disorientation, unresponsiveness, staring, head pressing), unusual vocalization, seizures, and lethargy. Less frequent symptoms include excessive water consumption and frequent urination, urinary stones, diarrhea, vomiting, pica, or apparent blindness. Sophie exhibited all these symptoms a few weeks after birth with the exception of seizure, head pressing and blindness.

Some dogs are diagnosed after they take a long time to recover from anesthesia or sedatives. Prior to her spay surgery, Sophie became very sedated after a light dose of pre-operative sedative. After surgery, she regained consciousness quickly, but remained lethargic for a prolonged period. It is also possible that an IHPSS-affected dog will show no symptoms until the dog is older.

## How is IHPSS Diagnosed?

Typically, diagnosis is done in three stages. First, your veterinarian will do a complete blood count and serum chemistry profile. Dogs with IHPSS typically have low blood urea nitrogen (BUN) and albumin concentrations. They may also be anemic or suffer from microcytosis (the dog's red blood cells are smaller than normal). Liver enzymes (AST and ALT) may be high. If a urinalysis is done, findings may include low specific gravity (dilute urine), ammonium biurate crystals, and abnormal PH.

After reviewing these findings, if your veterinarian suspects IHPSS, she will likely suggest running a fasting (pre-prandial) and a post-feeding (post-prandial) bile acid test. Your dog will be required to fast for 12 hours before the pre-prandial blood sample is drawn. He will then eat a meal and in 2 hours the

post-prandial blood sample will be drawn. Dogs with IHPSS typically have elevated bile acid concentrations. Sophie's blood results were consistent with these observations.

Unfortunately, IHPSS cannot be diagnosed definitively by blood work. A liver shunt can only be found using techniques such as ultrasound, scintigraphy, portography, CT, MRI or exploratory surgery. Each technique has advantages and disadvantages. In Sophie's case, she was diagnosed using a Doppler ultrasound. The film shows Sophie's shunt.



## What are IHPSS Treatment Options?

There are two basic treatment alternatives – medical management or surgery.

**Medical Management** – The least invasive alternative to stabilize the IHPSS-affected dog is to manage him medically. Typically this involves administering medications, such as lactulose, several times a day to reduce the amount of toxins produced and absorbed in the large intestine. In addition, the dog is usually put on a prescription low-protein/low-fat diet. If clinical signs are still not managed, then antibiotics (e.g., metronidazole) are given to reduce the number of toxin-producing bacteria in the intestine. Other medications may be required to

control seizures, blood sugar or to remove intestinal toxins. Most dogs see clinical improvement with medical management, but unfortunately over 50% of these dogs are euthanized within 10 months of their diagnosis because of uncontrolled seizures.

**Traditional Surgery** – According to most veterinarians, surgery provides the best chance for a healthy life. In cases in which the shunt is outside the liver (i.e., congenital extrahepatic shunts), the surgeon makes an abdominal incision, finds the abnormal blood vessel and closes it off to redirect the blood flow back through the liver. To close the abnormal vessel off too suddenly risks the development of fatal portal hypertension because the vessels inside the liver may not be developed enough to handle the increased flow. For that reason, surgeons closing extrahepatic shunts may use an ameroid constrictor ring which gradually closes the shunt over a 1-2 week period as the inner ring absorbs fluid and swells to gradually close the shunt. Sutures and cellophane bands can also be used in shunt surgeries.

Unfortunately, most large-breed dogs do not have shunts located on the outside of the liver. Instead, they are affected by congenital intrahepatic (i.e., inside the liver) shunts which are much more difficult to find and correct using traditional surgeries. Locating the abnormal vessel using traditional surgery requires that the surgeon cut into the abdomen and the liver, increasing recovery time, the probability that the dog will bleed to death or that he will suffer serious damage to the liver. Mortality rates for correcting intrahepatic shunts with traditional surgery can be as high as 66%. Because Sophie's shunt was large and inside the liver, we felt that the risks were too high to subject her to the traditional surgery.