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Minimally Invasive Surgery (Percutaneous Transvenous Coil Embolisation) for Single Congenital Intrahepatic Shunts

Congenital portosystemic shunts have been reported to occur in 0.18% of all dogs, and most are single vessels connecting the portal circulation and the systemic venous circulations, typically to either the caudal vena cava or the azygous vein. About 70-75% of single congenital portosystemic shunts are extrahepatic and are typically seen in small Terrier and brachycephalic breeds. Most intrahepatic shunts are seen in large dogs but they are also occasionally seen in cats. Intrahepatic shunts are of larger diameter than extrahepatic shunts, so there is more shunting of blood and more severe clinical signs at a younger age.

Treatment of shunts by surgery or coil embolisation is recommended over medical management, as it is associated with a longer survival time. Most extrahepatic shunts are readily amenable to either complete surgical ligation, or attenuation with cellophane banding, partial ligation or placement of an ameroid constrictor if complete ligation is not tolerated. Surgical management of intrahepatic shunts is much more challenging, as they may be dilated, thin walled and completely surrounded by liver parenchyma. Very few can be completely ligated at the first attempt and therefore they require gradual attenuation techniques or multiple surgeries. Complication rates as high as 75% are reported with open surgery, with reported perioperative mortality rates ranging up to 28% and overall mortality rates up to 64%. These challenges have driven research into minimally invasive procedures. Innovations in the management of persistent ductus arteriosus (a congenital heart condition) have inspired a similar approach to intrahepatic shunts to avoid the challenges and risks associated with intra hepatic dissection and improve the outcomes and success rates for these patients. Percutaneous transvenous coil embolisation has become a viable alternative to open surgery and this is the technique we use at Anderson Moores.

Diagnosis of intrahepatic shunt is made by ultrasound examination of the abdomen in animals with clinical signs and serum biochemistry changes suggestive of a portosystemic shunt. The shunt is characterised and measured using CT angiography, allowing determination of the diameter and length of the shunting vessel and the adjacent caudal vena cava prior to definitive treatment. The stents and coils are custom ordered for the patient and then placed under fluoroscopic guidance using guide wires inserted through the jugular vein. During the procedure, digital subtraction angiograms demonstrate the shunt and its communication with the vena cava. A stent is passed along guide wires and deployed within the vena cava across the mouth of the shunt – its role is to stop coils subsequently migrating from the shunt into the vena cava. Then a series of coils are passed between the interstices of the stent's wall into the shunt and are deployed in turn whilst simultaneously monitoring pressure within the shunt, to avoid the development of portal hypertension. The coils are thrombogenic and gradual attenuation of the shunt will occur as they occlude the vessel. Post operative recovery should be largely uneventful, although gastrointestinal ulceration is common in dogs with intrahepatic portosystemic shunts, regardless of treatment type, and lifelong antacid therapy is recommended.

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The Granary, Bunstead Barns, Poles Lane,
Hursley, Winchester, Hampshire SO21 2LL

Tel: 01962 767920 Fax: 01962 775909
Email: info@andersonmoores.com
www.andersonmoores.com

Registered in England. Company No. 5576269
VAT Registration No. 881327808

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This technique has been described in a large case series (111 procedures in 95 dogs over a 10-year period) reporting lower morbidity and mortality rates compared to traditional open surgery, but with similar outcomes (Weisse et al). The procedure takes an average of 90 minutes and dogs are usually hospitalised for 2-3 days after the procedure. Major intraoperative complications occurred in less than 3% of dogs in this study. Most complications occurred in the first week post operatively (13%) and included seizures/neurological signs and portal hypertension. In this large study, 4% of dogs died peri operatively, but this is a massive improvement on the mortality rates of open surgery for intrahepatic shunts (from 28-64%). Median follow up time was >2.5 years and of the dogs re-evaluated, 67% were considered clinically normal, whilst the others still showed some degree of neurological disease or seizures. Median survival time was 2204 days (>6 years). Percutaneous transvenous coil embolisation is likely to lead to incomplete shunt attenuation (closure), but studies of open surgery in dogs show incomplete attenuation is acceptable. If full attenuation does not occur, additional coils can be placed by the same technique at a later date, and was needed in about 15% of dogs in the case series above.

The multi-disciplinary environment at Anderson Moores lends itself to the implementation of this procedure for patients with intrahepatic shunts. The surgeons work closely with our radiologists, anaesthetists and cardiologists to successfully place the coils in the shunting vessel. We have a significant case load of patients with portosystemic shunts and our clinicians and nurses are very experienced in the perioperative management considerations of these patients which is an important factor in optimising outcome after this complex procedure. The prognosis associated with percutaneous transvenous coil embolisation for intrahepatic shunt treatment is much improved compared to traditional surgical techniques or long term medical management alone.

For further information please contact Alison Moores (Surgery) or David Walker (Internal Medicine).

Reference:

Weisse C, Berent AC, Todd K, Solomon JA, Cope C. Endovascular evaluation and treatment of intrahepatic portosystemic shunts in dogs: 100 cases (2001-2011). J Am Vet Med Assoc. 2014 Jan 1;244(1):78-94

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