FELINE SHUNTS, DO THEY DIFFER?
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Key Points
- There is a limited evidence base from which to choose one surgical technique over another for cats undergoing portosystemic shunt attenuation.
- Cats are more likely to suffer post-operative neurological complications compared to dogs, irrespective of the type of shunt surgery performed.
- The concept of pre-treating all cats undergoing shunt surgery with anti-seizure medication is not supported by the current literature.
- Despite the potential for serious postoperative neurological complications, longterm outcomes for cats following shunt surgery are good and comparable to those reported for dogs.

In cats the most common congenital portosystemic shunt (CPSS) is an extrahepatic vessel connecting the left gastric vein to the caudal vena cava. Intrahepatic shunts are relatively rare in cats and the majority are left divisional, usually a patent ductus venosus (PDV). Unlike the breed predispositions seen in dogs with CPSS, the majority of cats are domestic shorthair, although pedigree breeds include the Persian, Himalayan and Siamese. Clinical presentation of cats with CPSS is similar to dogs except that ptyalism and copper irises are often present, neither of which are reported in dogs. Polyuria/dypsia, gastrointestinal and urinary tract signs are seen much less frequently than in dogs with CPSS. Results of diagnostic investigations for cats with CPSS are similar to dogs although the hypoalbuminaemia, hypoproteinaemia, hypoglycaemia and anaemia typically seen in dogs with CPSS are uncommon in cats. Clotting abnormalities have described in dogs with CPSS but there have not been any studies examining this in the cat.

Many cats with a CPSS show relatively severe clinical signs at the time of diagnosis and it is important to stabilise their condition with medical management prior to definitive treatment. In one study where 25 cats were managed medically prior to surgery there was no response to medical treatment in 12%, a partial response in 56% and 32% of cats had complete resolution of their clinical signs. Whilst it is clear that medical management may be effective in stabilising the clinical signs associated with HE in the short term, and a study in dogs concluded that surgical treatment was preferable to medical treatment of CPSS in terms of longterm survival, there is very little information regarding sole use of medical treatment for CPSS long term in the cat.

Surgery is the recommended treatment for most cats with CPSS and a number of different surgical procedures have been described, including i) suture attenuation (with a second surgery if necessary to achieve final complete shunt attenuation), ii) ameroid constrictor (AC) and iii) cellophane band (CB).

There are no studies directly comparing one surgical technique to another and there is a relative lack of longterm (years) follow-up for cats undergoing CPSS, which is particularly important given that many of these animals are presented and undergo surgery at a very young age. When considering key questions regarding the choice of surgical method for cats with CPSS, the current literature provides the following information:

What degree of shunt attenuation is achieved?
Similar to dogs, complete suture attenuation is possible in 29-43% of cats at initial surgery. A second surgery performed two to three months later allows a further attempt at complete suture attenuation. During this time the hepatic vasculature will have developed, allowing full shunt attenuation in the majority (95%) of cats. If available, assessment of hepatic portal
vasculature by intraoperative mesenteric portovenography may be useful as a prognostic indicator.

Long term residual shunting is common with both AC and CB techniques and the exact rate of attenuation is unknown. In one study 57% of cats with an AC had persistent shunting at 8-10 weeks. Although some surgeons place a CB around a CPSS without any initial shunt attenuation, others recommend performing temporary complete CPSS occlusion intraoperatively in all cats in order to determine the degree of acute CB shunt attenuation that is possible. The latter approach allows any cat that can tolerate a complete acute CPSS attenuation to benefit from this and the remainder of cats to have their shunt maximally acutely partially attenuated at the initial surgery, with the expectation of further attenuation with the cellophane band.

In a study of cats with intrahepatic shunts it was possible to perform suture attenuation of the vessel but only one of six cats tolerated complete shunt attenuation at the first surgery. Another study reported no difference in ability to achieve partial versus complete suture attenuation in intra versus extrahepatic cat shunts, whereas in larger dog CPSS studies it has been documented that a higher rate of initial complete shunt attenuation is possible for extrahepatic as compared to intrahepatic shunts. It is generally much more difficult to apply either an AC or CB to an intrahepatic shunt due to lack of space around the shunt in these locations. Intravascular coil embolization of an intrahepatic shunt has been reported in one cat.

What is the rate of occurrence of multiple acquired shunts?

Development of multiple acquired shunts (MAS) following CPSS surgery represents a failure of the hepatic portal vasculature to accommodate the attempted re-direction of blood flow from the shunt vessel to the portal vein. In cats undergoing a second surgery and mesenteric portovenography following initial partial suture attenuation the rate of MAS is low, <5%.

The rate of MAS following AC or CB is difficult to establish and there is very little data available for the cat. If a cat is clinically well attempts are not usually made to establish the presence of MAS. If a cat suffers continued or recurrent clinical signs following CB or AC, further imaging is required to determine if these are due to persistent blood flow through the original shunt or development of MAS. Both of these factors are likely to lead to under reporting of MAS and any associated longterm clinical sequelae.

It has been suggested that cats with a very high initial portal pressure (e.g. >25 mmHg) following temporary CPSS occlusion may not be good candidates for an AC due to the risk of development of multiple acquired shunts if the rate of shunt attenuation exceeds the capacity of the intrahepatic portal vasculature to accommodate the acute increase in blood flow.

What is the rate and severity of postoperative neurological complications?

Neurological signs such as severe depression, disorientation, tremors, ataxia, headpressing and central blindness are the most common serious postoperative problem in cats and are reported in 13-37% compared to 0-21% in dogs. In contrast to cats, dogs have not been reported to suffer central blindness. It is not known why cats appear so sensitive to development of this complication compared to dogs. Seizures are a particularly severe complication, reported in 6.5-22% of cats treated with suture attenuation. Interestingly, neurological complications, including seizures, occur as frequently following treatment with gradual occlusion devices, both AC and CB, compared to suture attenuation.

A proportion of cats that develop neurological signs (4-13%) die or are euthanased due to their neurological complications, whilst other cats may never fully recover or require long term anti-seizure medication (22%). Although postoperative neurological complications are the major cause of mortality for cats undergoing CPSS attenuation by any method the mortality rates are still low, 0-4.5% for large series of cats undergoing suture or AC attenuation. Cats with poor development of their intrahepatic vasculature on intra-operative
portovenography had an increased risk of developing postoperative neurological complications. However, no other risk factors have been identified and there does not seem to be a difference between intrahepatic and extrahepatic CPSS, full or partial ligation, the age of the cat or the presence of seizures pre-operatively.

Prophylactic treatment of cats with phenobarbitone has been suggested to reduce the risk of postoperative seizures. Little information is available to support this concept in the cat as neurological complications still occurred despite 83% and 100% of cats receiving preoperative anti-seizure medication in two studies. Levetiracetam is a relatively new antiseizure medication that has been used in cats although there are no published reports of its use in cats with hepatic encephalopathy or postoperative neurological complications. Close monitoring of cats for neurological signs in the postoperative period is recommended, with anti-seizure medication being given promptly if any neurological signs are detected, even if relatively mild.

**What is the perioperative mortality rate?**

With improvements in anaesthesia, critical care and surgical experience, the occurrence of serious postoperative portal hypertension has become very rare in both cats and dogs by any surgical method. Mortality rates for large series of cats undergoing suture ligation or ameroid shunt attenuation are low (0-4.5%) and usually due to neurological complications with no cats in these studies dying as a result of portal hypertension.

**What is the longterm outcome?**

The majority of cats treated by a variety of surgical methods have a good outcome following surgery which is comparable to outcomes reported for dogs.

In a study of cats receiving suture attenuation for their CPSS, 83% of the 36 cats available for longterm follow-up (median 47 months) were alive, with good to excellent outcome in 75% of the cats.

In one study using AC, longterm outcome (3-51 months) was excellent in 75% of cats, despite a high rate of postoperative neurological complications and a high rate of residual persistent shunting. In another study using AC only three of nine cats had a good to excellent longterm outcome 10-60 months after surgery.

There is limited information on CB outcome in cats. In one study of five cats, three were doing well up to 3 months after surgery. In another study of nine cats, the three year survival rate was 66%.


Lipscomb VJ, Jones HJ, Brockman DJ: Complications and long-term outcomes of the ligation of congenital portosystemic shunts in 49 cats. *Vet Record* 2007;160:465-70
