Splenectomy cases in dogs and cats

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The reasons for carrying out a splenectomy include splenic neoplasia, splenic torsion, infiltrative disease and infarction, traumatic injury, non-neoplastic masses, and immuno-mediated processes.

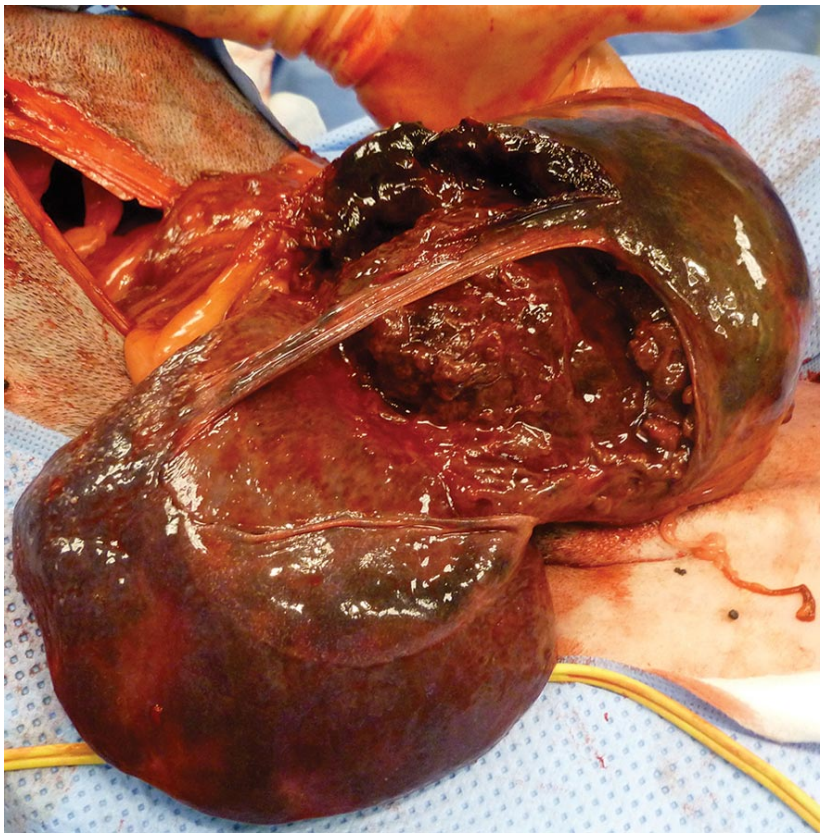

Figure 1. Ruptured splenic haematoma (click to zoom).

Between 48 to 59% of splenic masses in dogs are malignant, and 51 to 73% of these are haemangiosarcomas (HSA).

Other differentials for splenic masses include non-neoplastic lesions, such as nodular hyperplasia and haematomas (**Figure 1**), or less common splenic malignancies, such as histiocytic sarcoma (**Figure 2**), leiomyosarcoma and fibrosarcoma (Wendelburg et al, 2014).

Mast cell tumours are the most common reason for splenectomy in cats, followed by HSA and lymphoma (Gordon et al 2010).

Splenic HSA is highly metastatic and often ruptures, resulting in acute haemoabdomen, and many dogs have macroscopic metastatic disease in the liver and other sites upon initial evaluation.

Staging of the patient with splenic HSA includes three stages:

- **Stage I**: HSA confined to the spleen
- **Stage II**: ruptured splenic HSA, or HSA with nodal metastases
- **Stage III**: splenic HSA with distant metastases

Tumours are graded low, intermediate and high on the basis of a cumulative score determined through the assessment of overall differentiation, nuclear pleomorphism, percentage of necrosis and mitotic index (Wendelburg et al, 2015).

Metastases are considered to be present if they are detected in the lungs by thoracic radiographs, in the right atrium by echocardiography or in other organs evaluated histologically after sampling of evident lesions (**Figure 3**).

Staging for dogs with splenic mass should, therefore, always include three-view thoracic radiographs and abdominal ultrasonography/ echocardiography. In fact, 9% of dogs with signs of a splenic HSA have concurrent right atrial HSA (Wendelburg et al, 2015).

Because cardiac tamponade and haemopericardium secondary to haemorrhage can develop at any time, echocardiography should be recommended to all owners contemplating surgery for their dog with splenic mass.

Half of dogs with splenic HSA and macroscopic hepatic abnormalities have HSA metastases. Dogs with splenic HSA and grossly normal liver usually do not present metastases detected on liver histopathology; however, the presence of multiple dark-coloured and active bleeding hepatic nodules is highly associated with malignancy (Clendaniel et al, 2014).

While obtaining biopsies of macroscopically normal livers during surgery for splenic HSA is unnecessary, sampling of evident hepatic lesions, and possibly of the regional lymph nodes for a correct staging of the patient, is recommended.

Abdominal ultrasonography can also help detect hepatic lesions deep in the parenchyma in the pre-operatory phase.

Dogs with splenic mass

Decision-making for a dog with a splenic mass can be difficult for owners because the long-term prognosis varies with the histopathological diagnosis. Surgery and aftercare can also be very expensive.

Dogs with ruptured splenic HSA and haemoabdomen develop sudden clinical signs without warning, so owners have to decide quickly whether to elect for surgery. Good communication skills and knowledge of the biological behaviour of this kind of splenic tumour is very important for assisting the owner in the decision-making process.

The median survival time (MST) for dogs with splenic HSA treated with splenectomy only is 1.6 months. The clinical stage of the tumour is strongly associated with survival time, with the shortest among dogs with stage III disease. These dogs are typically euthanised soon after splenectomy because of haemorrhage from progressive metastatic disease.

Dogs with stage I disease have longer survival times than dogs with stage II disease, and dogs with stage I or stage II disease have longer survival times than dogs with stage III disease.

MST of dogs with stage I disease undergoing splenectomy only is 5.5 months, against 0.9 months for dogs with stage III disease. Dogs with a solitary splenic HSA survive longer than dogs with multiple masses (Wendelburg et al, 2015).

Dogs that receive doxorubicin-based chemotherapy appear to survive longer than patients treated with surgery alone. Epirubicin, developed to reduce cardiotoxicity, also appears to prolong survival time (Kim et al, 2007).

A study of 208 dogs with splenic HSA showed conventional chemotherapy protocols containing doxorubicin, combined with metronomic protocols containing cyclophosphamide, are likely to be more efficacious in treating splenic HSA than either type of chemotherapy alone.

The combined approach slows cancer progression through impairment of angiogenesis (metronomic chemotherapy) and direct cytotoxicity (conventional chemotherapy).

The most important side effect of simultaneous administration is higher risk of gastrointestinal and haematological toxicoses (Wendelburg et al, 2015).

Survival time of cats after splenectomy

Several papers have examined prognostic indicators for survival time in dogs following splenectomy, but very few studies have looked at survival of cats after splenectomy.

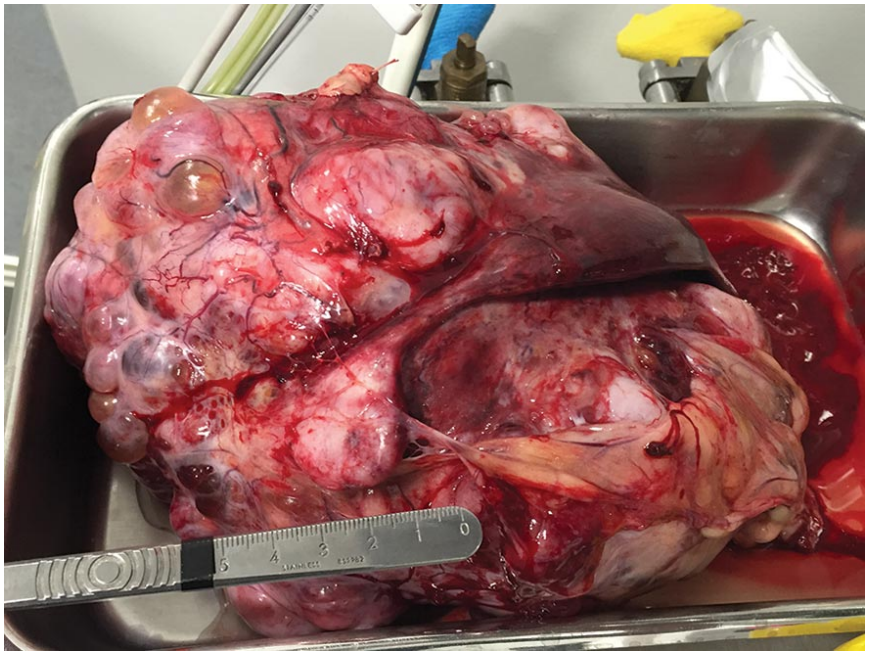

Figure 2. Splenic histiocytic sarcoma (click to zoom).

Reported MST of cats that underwent splenectomy for a mast cell tumour is 360 to 570 days, with a range of 60 to 1,140 days. Death is usually due to euthanasia after clinical signs return (Gordon et al, 2010).

Splenectomy is also the primary method of treatment of splenic HSA in cats. The MST of cats undergoing splenectomy for HSA has been reported to be 140 days, ranging from 42 to 245 days.

The only factor identified as a significant prognostic indicator for survival after splenectomy in cats is whether the cats are noted to have preoperative weight loss or not.

MST in cats with weight loss is three days, while for cats with no weight loss noted the MST is 293 days (Gordon et al, 2010).

Perioperative care

The systemic effects of general anaesthesia, age, general health, changes in blood pressure, tissue perfusion, oxygen carrying capacity and coagulation influence perioperative death in dogs undergoing splenectomy for splenic masses.

It is also important to consider mortality rate in light of the resources for perioperative support and expertise available in primary care practices and teaching hospitals. In these, perioperative mortality is understandably expected to be lower than in first opinion practices (Wendelburg et al, 2015).

Marked preoperative thrombocytopenia and anaemia, and development of intraoperative ventricular arrhythmias, are identified as main risk factors for perioperative death in dogs with splenic masses.

Preventing thrombotic (portal system thrombosis; PST, pulmonary thromboembolism; PTE) and coagulopathic (disseminated intravascular coagulation, DIC) syndromes, and controlling all sources of intra-abdominal haemorrhage, may limit the risk of death (Wendelburg et al, 2014).

Haemorrhagic and thrombotic events can occur independently or can be simultaneous. Severe intra-abdominal haemorrhage from ruptured splenic masses or metastatic lesions may consume platelets and coagulation factors. Fluids administered to restore intravascular volume can also dilute these.

The presence of a large splenic mass can lead to stasis of the intra-abdominal blood flow promoting thromboembolism of large veins, such as portal and pulmonary veins, and may predispose the patient to DIC (Ponziani et al, 2010).

Dogs with PST may develop signs of hypovolaemic shock, acute abdomen, ascites and abdominal distension, vomiting and melena. Portal system thrombosis in dogs is associated with thrombocytopenia, high hepatic enzymes and hypoalbuminaemia (Respess et al, 2012).

Dogs with PTE develop acute, severe, unexplained respiratory distress without previous respiratory signs. Most of these patients have unremarkable thoracic radiographs and evidence of hypoxaemia on blood gas analysis (LaRue et al, 1990).

Uncontrolled haemorrhage from intra-abdominal metastases is a common cause of death in dogs with splenic masses. The most common sites for intra-abdominal metastases of splenic HSA are the liver, omentum and mesentery. Sites of intra-abdominal haemorrhage may be masked by anaesthesia-related hypotension and bleeding may develop during recovery.

Low platelet count and PCV greater than 30% have been found to be most closely associated with perioperative death. In addition, development of intra-operative ventricular arrhythmias is considered a negative prognostic indicator (Wendelburg et al, 2014).

The association of severe anaemia and perioperative death reflects the tendency of poor oxygen delivery in these patients. Anaemia, hypocoagulability and evidence of shock should be the triggers for the decision to perform blood transfusion in dogs undergoing splenectomy for splenic masses.

However, dogs undergoing blood transfusion have greater odds of poor long-term outcome compared to dogs that do not undergo transfusion (Lynch et al, 2015).

Gastric dilatation-volvulus

In the past it has been hypothesised dogs with a history of previous splenectomy may have an increased odds of gastric dilatation-volvulus (GDV). A possible association may also exist between GDV and previous splenectomy.

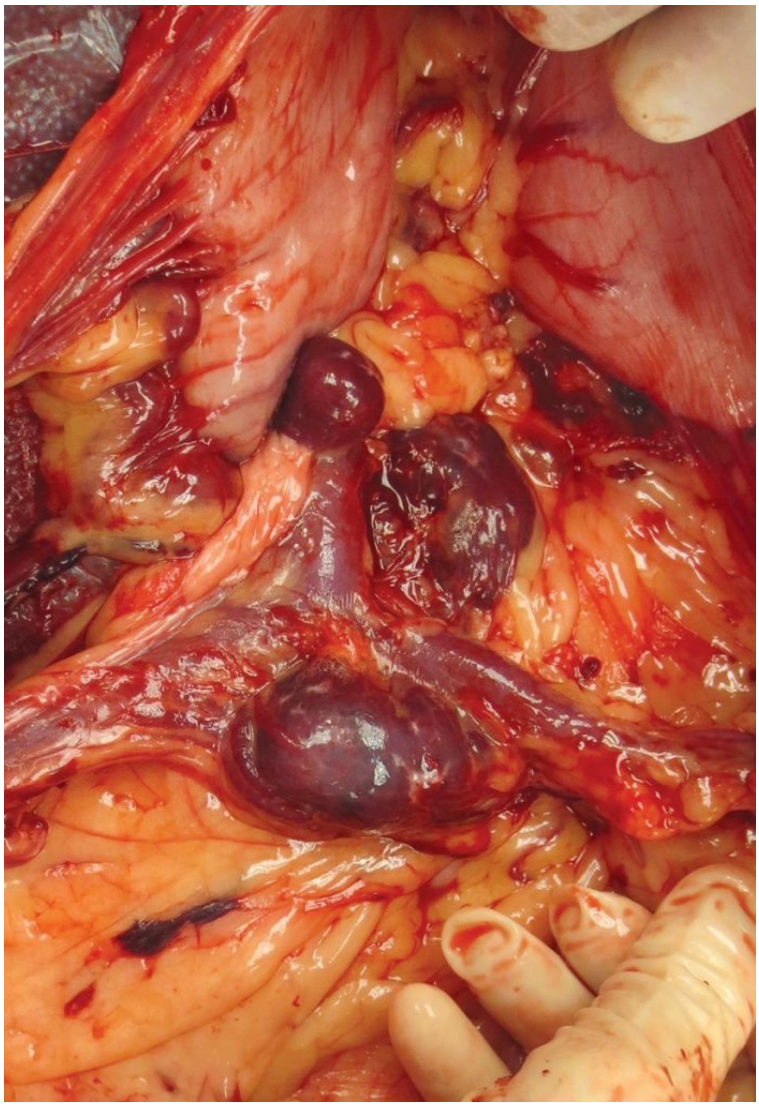

Figure 3. HSA-intra-abdominal lymphnodal metastases (click to zoom).

Several theories have been proposed for why splenectomy may increase the risk for GDV.

First, the anatomic void created after removal of the spleen, particularly if enlarged, may allow increased gastric motility, resulting in GDV.

Second, a splenic mass, or torsion of the spleen, may stretch the gastrosplenic, hepatoduodenal or hepatogastric ligaments, resulting in increased gastric motility (Millis at al, 1995).

In cases of splenic torsion, dogs may initially be predisposed to developing GDV for reasons unrelated to splenic disease and may develop intermittent gastric dilatation without volvulus first, thus stretching the gastrosplenic ligaments or displacing the spleen, ultimately resulting in splenic torsion.

These patients may subsequently develop GDV due to their pre-existing propensity (Millis at al, 1995).

The occurrence of GDV following splenectomy may be coincidental, considering both GDV and conditions necessitating splenectomy, such as HSA and splenic torsion, occur most commonly in large breed dogs (Sartor et al, 2013).

The relationship between splenectomy and GDV has not yet been clearly defined in veterinary patients, but authors of several reports have recommended prophylactic gastropexy following splenectomy in dogs (Grange et al, 2012).

In a recent study, Grange et al (2012) did not find splenectomy to be a risk factor for GDV in 219 dogs that underwent splenectomy for reasons other than splenic torsion (splenic neoplasia, benign masses, trauma, infarction).

In contrast, Sartor et al (2013) found increased odds of GDV in dogs with splenectomy and supported prophylactic gastropexy in particular if other risk factors for GDV were present, such as breed, age and body condition score.

The length of the follow-up period of dogs undergoing splenectomy is particularly relevant. Dogs should be followed-up until death to know the true incidence of GDV after splenectomy.

It is the author’s opinion the nature of the splenic disease necessitating splenectomy may have greater relevance in increasing the risk of GDV than removal itself.

This may be supported by the fact, as splenic HSA is one of the most frequent diseases needing splenectomy, and as the median survival time of these patients is 5.5 months, GDV following splenectomy may not be identified because of the early death of the patients.

In addition, as splenic torsion has a significantly better prognosis than splenic HSA and, therefore, longer life expectations, prophylactic gastropexy may decrease the risk of GDV in this group of patients.

Nevertheless, other factors should always be considered in evaluating the potential role of prophylactic gastropexy at the time of splenectomy. These include the anaesthetic condition of the patient, the breed and the age.

- Some drugs mentioned in this article are used under the cascade.

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