Proceedings of the 34th World Small Animal Veterinary Congress
WSAVA 2009

São Paulo, Brazil - 2009

Next WSAVA Congress:

Reprinted in IVIS with the permission of the Congress Organizers
SPLENIC NEOPLASIA

The spleen is composed of a variety of tissues, and splenic neoplasia may arise from blood vessels, lymphoid tissues, smooth muscle, or the connective tissue that makes up the fibrous stroma. The most common tumor in dogs is HSA. Other malignant and benign neoplasms may also occur. The most frequently recognized nonneoplastic lesions of the spleen are nodular hyperplasia, hemangioma, and hematoma.

Canine splenic HSA is more common than all other types of malignant splenic tumors; it accounts for approximately half of all splenic malignancies identified. Because HSA arise from blood vessels, they may form in several different sites in the body (e.g., spleen, right atrium, subcutaneous tissues, and liver). As many as 25% of dogs with splenic HSA may have concurrent right atrial HSA. Splenic HSAs are aggressive tumors that frequently metastasize to the liver, omentum, mesentery, and brain. A majority of dogs with HSA have gross evidence of metastatic disease on initial presentation.

Splenic hematomas vary in size and are encapsulated, blood- and fibrin-filled masses that often are grossly indistinguishable from HSA. Histologically, the cavities are surrounded by congestion, fibrosis, and areas of necrosis. They may result from trauma, may occur spontaneously, or may develop secondary to other diseases (e.g., nodular hyperplasia). Hemangiomas and HSA may be difficult to distinguish histologically, but because the prognosis for these lesions is very different (see below), it is important that they be accurately differentiated. Splenic masses with evidence of malignant neoplastic endothelial cell proliferation can be easily identified as HSA. However, multiple sections of a malignant mass may be studied without obvious malignancy being seen. More important, proliferation of plump endothelial cells that resemble neoplastic endothelium but do not have evidence of mitotic activity may be misdiagnosed as HSA. Splenic hematoma and hemangioma account for 20% to 34% of splenic masses, whereas HSA accounts for 10% to 20% of all splenic samples submitted to veterinary pathology laboratories. However, this 10 to 20% underestimates the true incidence of HSA in dogs with large splenic masses because many such masses are not submitted for pathologic examination, especially if apparent metastasis is seen at surgery. Hyperplastic nodules are an even more common finding at necropsy than HSA.

Diagnosis

Clinical Presentation

Signalment. Splenic tumors (including hematomas) usually occur in medium-to-large sized dogs. German shepherd dogs are at increased risk for hemangiosarcoma and hemangioma. Some authors have reported that spayed female dogs have increased risk, although others have reported this tumor to occur more commonly in male dogs. No obvious breed or sex predilection has been observed in dogs with nonangiogenic and nonlymphomatous splenic sarcomas.

History. Dogs with hemangiosarcoma may present for abdominal enlargement, anorexia, lethargy, depression, and/or vomiting or may have acute signs of weakness, depression, anorexia, and hypovolemic shock caused by splenic rupture and hemorrhage. Clinical signs with splenic hematoma are similar, except that rupture leading to collapse and anorexia are less common because large masses frequently become apparent before rupture occurs. The most common clinical signs of disease with other types of sarcomas are decreased appetite, abdominal distention (as a result of peritoneal effusion and/or tumor mass), polydipsia, vomiting, and/or lethargy. In contrast to dogs with hemangiosarcoma, splenic rupture and hemorrhage are uncommon in dogs with nonangiogenic and nonlymphomatous splenic tumors.

Diagnostic Imaging
Abdominal masses usually are detected radiographically in dogs with HSA and nonangiogenic and nonlymphomatous sarcomas; however, peritoneal fluid may make locating the lesion in the spleen difficult. Masses involving the tail of the spleen are typically identified in the cranial ventral abdomen on the lateral radiographic projection. Thoracic radiographs should be taken in animals with splenic masses to detect pulmonary or thoracic neoplasia. Ultrasonography is more definitive in locating lesions in the spleen and detecting abdominal metastases than radiography; however, differentiation of hematomas from neoplastic lesions is unreliable. Finding internal septation and encapsulation or apparent metastasis may help differentiate hematomas from HSA. Magnetic resonance imaging may be a useful tool for differentiating benign and malignant splenic lesions in dogs.

**Laboratory Findings**

Neutrophilic leukocytosis may be present in some dogs. Mild or moderate anemia associated with chronic disease or hemoperitoneum also is common. Other hematologic abnormalities caused by HSA may include numerous nucleated red blood cells (inappropriate numbers for the degree of anemia), Howell-Jolly bodies, poikilocytosis, acanthocytosis, schistocytosis, and/or thrombocytopenia. Hemostatic disorders, particularly thrombocytopenia caused by DIC, are common in dogs with splenic tumors. Abdominal effusion generally is serosanguineous or hemorrhagic. Cytologic analysis of abdominal fluid rarely reveals tumor cells.

**Surgical treatment**

Splenectomy is the treatment of choice for animals with splenic hematoma and hemangioma. It is also the treatment of choice for animals with hemangiosarcoma, in whom evidence of extensive metastasis or other organ failure does not preclude the short-term benefits of removing the enlarged and/or ruptured spleen. The median survival time of dogs with splenic hemangiosarcoma is between 10 and 23 weeks after splenectomy, depending on the stage of the disease. With nonangiogenic and nonlymphomatous sarcomas, the median survival times after splenectomy were 2.5 months for all dogs that survived the early postoperative period, and 9 months for the subset of dogs that did not have evidence of metastasis at surgery. Splenectomy may not be warranted in dogs with concurrent right atrial tumors. Thus careful preoperative examination of patients is warranted. Dogs with splenic lymphoma and clinical signs associated with massive splenomegaly, splenic rupture, and hemoperitoneum may also benefit from splenectomy.

**Total splenectomy** is most commonly performed in animals with splenic neoplasia, torsion (stomach or spleen), or severe trauma. Splenectomy has previously been advocated for immune-mediated hematologic disorders refractory to medical therapy (e.g., thrombocytopenia or hemolytic anemia); however, proper use of immunosuppressive drugs and corticosteroids has decreased the need for splenectomy. However, splenectomy may be used if drug therapy is unsuccessful or unacceptable. Although life-threatening sepsis has been associated with total splenectomy in humans, this has not been recognized in dogs.
Animals with pancreatic inflammation often present with vomiting and may also have weight loss and debilitation; however, cats with pancreatitis do not show vomiting as reliably as do dogs. Vomiting animals require fluid therapy and correction of electrolyte and acid-base abnormalities before surgery. Diabetic animals (which may be prone to pancreatitis) are often anesthetized for elective and nonelective procedures. These animals should be carefully evaluated for overall metabolic status before surgery. Preoperative laboratory analysis includes CBC, serum biochemical panel (including fasting blood glucose, BUN, and creatinine), and urinalysis. Severe hyperglycemia (greater than 300 mg/dl) or ketoacidosis should be corrected before surgery with insulin administration, intravenous fluids, and electrolytes. Animals with pancreatic tumors may present with a wide variety of metabolic disorders.

SURGICAL TECHNIQUES

After performing a ventral midline abdominal incision that extends from the xiphoid cartilage to caudal to the umbilicus, examine the pancreas using a combination of gentle palpation and visual examination. It must be handled gently to avoid causing pancreatitis. The free portion of the greater omentum is retracted cranially and covered with moist sponges. The omental leaf overlying the pancreas can be bluntly separated to allow direct visualization of the left pancreas. When neoplasia is suspected, lymph nodes that lie along the splenic vessels and portal vein and those at the hilus of the liver and head of the pancreas should be examined for evidence of metastasis.

Pancreatic biopsy and partial pancreatectomy are more frequently performed in dogs than in cats. However, because of the difficulty in diagnosing feline pancreatitis, biopsy may be more commonly indicated than presently used. Laparoscopic biopsy is possible in cats and seems to be well tolerated in this species. Pancreatic biopsy is occasionally performed in dogs to differentiate benign pancreatic conditions (e.g., pancreatitis, pancreatic fibrosis) from neoplastic disease. Although ultrasound-guided biopsies of large pancreatic lesions may be possible, exploratory laparotomy and direct visualization of pancreatic tissue are usually indicated. Partial pancreatectomy is indicated in animals with insulin-secreting or gastrin-
secreting tumors or for pancreatic adenocarcinoma. Total pancreatectomy is infrequently performed in veterinary patients. Removal of the pancreas without duodenectomy requires that pancreatic tissue be bluntly dissected from the pancreaticoduodenal vessels without damaging branches supplying the duodenum. In animals with pancreatic disease this is difficult because of adhesions, fibrosis, and edema. Therefore total pancreatectomy is usually performed in conjunction with resection and anastomosis of the proximal duodenum, common bile duct ligation, and cholecystojejunostomy. These procedures are associated with high morbidity and mortality. Pancreatic drainage is indicated in some conditions (e.g., large abscesses or cysts) in which pancreatectomy is not feasible. A Penrose drain or double-lumen sump drain is sutured to the surrounding tissues with chromic gut suture and exteriorized lateral to the abdominal incision tissue. Use care to avoid damaging adjacent blood vessels or pancreatic ducts.

Partial Pancreatectomy
Focal lesions near the extremity of the pancreas can be removed by the suture fracture technique. Incise the mesoduodenum or omentum on each side of the pancreas to be removed. Pass nonabsorbable suture material from one side of the pancreas to the other, through the incisions, so that the suture is just proximal to the lesion being excised. Tighten the suture and allow it to crush through the parenchyma, which ligates vessels and ducts. Excise the specimen, distal to the ligature. Close any holes in the mesoduodenum with absorbable suture material.

Blunt separation of pancreatic lobules and ligation of ducts can be performed for lesions anywhere within the pancreas. With small lesions it may be possible to identify and preserve the pancreatic ducts. Identify the lesion to be removed, and gently incise the mesoduodenum or omentum overlying it. For lesions involving the pancreatic body or proximal aspect of the right lobe, bluntly dissect pancreatic tissue from the pancreaticoduodenal vessels, using gauze sponges. Ligate or cauterize small pancreatic vessels, but avoid damaging the pancreaticoduodenal vessels. Separate the affected lobules from adjoining tissue by blunt dissection, using sterile Q-tips or Halsted mosquito. (Fig. 4) Identify blood vessels and ducts supplying the portion of pancreas to be removed and ligate them. Excise the affected pancreatic tissue, and close any holes in the mesoduodenum.

Pancreatic Abscesses
Perform a midline abdominal laparotomy that extends from the xiphoid cartilage caudally to distal to the umbilicus. Gently explore the abdomen. Locate the pancreatic mass and obtain cultures of infected tissues. Gently break down adhesions to the intestine and omentum. Try to preserve the pancreatic ducts, common bile ducts, and adjacent vascular structures during dissection. Debride necrotic or purulent areas of the pancreas using a combination of sharp and blunt dissection. Resect as much of the infected and necrotic pancreas as possible. If the mass is not resectable, debride it and place a Penrose drain(s) into the mass, and exteriorize it lateral to the abdominal incision. Determine common bile duct patency by gently expressing the gallbladder. If the common bile duct is not patent, catheterize the duct and try to obtain flow, or perform a cholecystoenterostomy. Make sure you do not ligate the common bile duct. If generalized peritonitis is present, lavage the abdomen thoroughly with warmed, sterile saline or lactated Ringer’s solution. The abdomen may be closed or left open for drainage.