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SPLENIC NEOPLASIA: THE SURGEON'S APPROACH

The spleen is composed of a variety of tissues, and splenic neoplasia may arise from blood vessels, lymphoid tissue, smooth muscle, or the connective tissue that makes up the fibrous stroma. In a recent study of 249 dogs with splenic masses nearly half were found to have non-malignant disease. The most common splenic tumor in dogs is hemangiosarcoma (HAS); this tumor is more commonly diagnosed in large dogs (>27.8 kg) than small dogs. Other malignant tumors of the spleen in dogs include liposarcoma, fibrohistiocytic nodules, lymphoma, blastoma, and adenocarcinoma. Non-malignant masses include nodular hyperplasia, hemangioma, hematoma, and splenitis. Dogs with hemoperitoneum have a higher frequency of splenic neoplasia; similarly cats with hemoperitoneum commonly have abdominal neoplasms and HSA is the most common malignant splenic tumor in cats.

Canine splenic HSA may be seen in more than a third of dogs presenting with acute nontraumatic hemoabdomen. Because HSAs arise from blood vessels, they may form in several different sites in the body (e.g., spleen, right atrium, subcutaneous tissue, liver). The incidence of concurrent splenic and right atrial HSA is unknown, but was recently reported to be as low as 8.7%. Splenic HSAs are aggressive tumors that frequently metastasize to the liver, omentum, mesentery, and brain. Most 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 and ultrasonographically indistinguishable from HSAs. 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 HSAs may be difficult to distinguish histologically, but because the prognosis for these lesions is very different, it is important that they be accurately differentiated. Splenic masses with evidence of malignant neoplastic endothelial cell proliferation can be easily identified as HSAs. However, multiple sections of a malignant mass may be studied without finding malignant cells. More importantly, a proliferation of plump endothelial cells that resemble neoplastic endothelium, but do not have evidence of mitotic activity, may be misdiagnosed as HSA. Hyperplastic nodules are also a common finding at necropsy.

Medical Management

Surgical resection is the mainstay of therapy in dogs with splenic HSA; however, postoperative chemotherapy or immunotherapy may prolong survival. Readers are referred to an oncology text for discussion of protocols and treatment regimens used in dogs with HSA.

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 HSA in which evidence of extensive metastasis or other organ failure does not preclude the short-term benefits of removing the enlarged or ruptured spleen. Laparoscopy is a more sensitive method of detecting visceral HSA metastasis than imaging and can be done before surgery to decide whether surgery is appropriate for a given patient. Splenectomy may not be warranted in dogs with concurrent right atrial tumor; therefore careful preoperative examination (e.g., echocardiogram) of patients is necessary. Dogs with splenic lymphoma and clinical signs associated with massive splenomegaly, splenic rupture, and hemoperitoneum may also benefit from splenectomy. Gastropexy may be performed concurrently (see previous discussion on splenectomy).

Preoperative Management

Anemic animals may require blood transfusions before surgery, and they should be preoxygenated. An electrocardiogram should be performed to determine whether ventricular arrhythmias requiring preoperative or intraoperative therapy are present. Ventricular arrhythmias are present in some dogs with splenic masses, and anemia and hemoabdomen may be strongly associated with arrhythmia development. Hydration, electrolyte, and acid-base abnormalities should be corrected before induction of anesthesia, but it must be remembered that fluid therapy may result in worsening of previously mild anemia; the hematocrit must be re-examined shortly before anesthesia. Perioperative antibiotics (e.g., cefazolin 22 mg/kg IV) may be indicated in some animals undergoing splenectomy.

Surgical Technique
Total splenectomy, rather than partial splenectomy, is warranted in animals with malignant tumors or large benign masses. Laparoscopy has been used to remove splenic HSA; however, only surgeons proficient in interventional lapa¬roscopy should attempt this procedure. A hepatic biopsy (see p. xx) is likely to be of low-yield in a dog with HSA that has a normal appearing liver. In one study, no dogs with grossly normal livers had metastasis detected on liver pathology; however, nodules (be they multiple, dark-colored, and/or actively bleeding) were highly associated with malignancy.

Prognosis
Life expectancy of dogs with splenic masses, as one might expect, is determined largely on whether the mass is benign or malignant. In one study, the median life expectancy of dogs with benign and malignant lesions was 436 and 110 days, respectively. In the aforementioned study, the median life expectancy of dogs with HSA was 132 days; only 7 of these 18 dogs received adjunctive chemotherapy. Vascular tumors of intermediate malignancy, termed *hemangioendotheliomas*, appear to have a better prognosis than HSAs. Because most tumors of the spleen cannot be differentiated on gross inspection alone and survival of dogs with hematomas is much longer than that of dogs with HSA-associated lesions, surgery should not be denied dogs in which a definitive diagnosis of HSA has not been made.

Survival of dogs with HSA may be influenced by clinical stage; dogs with hemoperitoneum at the time of diagnosis may have a shortened survival. Dogs that are anemic or thrombocytopenic at presentation, or that develop ventricular arrhythmias during surgery may have a worse prognosis. Affected dogs typically die from uncontrolled bleeding from metastatic lesions and thrombotic and coagulation disorders. Although the histologic pattern of growth does not appear to affect survival, dogs with cavernous tumors have a shorter survival because of the increased propensity for these tumors to rupture and bleed.

Median survival time of dogs with splenic HSA treated with splenectomy alone was 1.6 months in a recent study. When the entire follow-up period was considered, there was no significant difference in survival time between dogs treated with surgery alone and dogs treated with surgery and chemotherapy. However, during the first 4 months of follow-up, after adjusting for the effects of clinical stage, survival time was significantly prolonged among dogs receiving any type of chemotherapy and among dogs receiving both conventional and metronomic chemotherapy.

Over 50% of dogs with splenic lymphoma treated by splenectomy alone will survive at least one year, and animals surviving to a year are unlikely to die of this disease. Marginal zone lymphoma and mantle cell lymphoma were the most common histologic B cell lymphoma subtypes in one study. Pre- or postoperative adjuvant chemotherapy is unlikely to provide a survival benefit.

Mean survival time (MST) after splenectomy in cats was 197 days, with a range of 2 to 1959 days, in one study. Preoperative weight loss was the only factor that had prognostic significance for survival following splenectomy in the aforementioned study. For cats with weight loss, the MST was 3 days; for those without weight loss, the MST was 293 days.