

Splenic Masses

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Introduction

In veterinary medicine, the word “mass” is commonly used as a general description for an abnormal growth of tissue in an abnormal location within or on the body. These abnormal growths can be caused by a variety of different physiologic process which cannot be differentiated by the naked eye. These processes can be neoplastic, hyperplastic, immune mediated, cystic, hemorrhagic, or infectious (abscesses and granulomas). While often appearing very similar, neoplastic masses (tumors) are classified into two groups: benign or malignant. Benign masses generally pose no life threatening consequences and very rarely spread to other parts of the body.¹ Malignant masses can have severe impacts on the health of the patient by metastasizing to other parts the body.¹ Masses can be found in a variety of sizes, shapes, and locations depending on the physiologic process behind its origin.

One region of the body in which masses are commonly seen in veterinary medicine is within the abdomen. Abdominal masses can arise from a number of different tissues of origin such as the stomach, liver, spleen, pancreas, or the intestines. These types of masses can be hard to differentiate without the use of advanced diagnostic procedures to help in the identification. It is important to gather as much information as possible in order to correctly diagnose the type of mass. Imaging techniques such as radiographs, ultrasound, and computed tomography are available to help identify the origins of the mass; however, these types of imaging cannot diagnose the specific type of tumor. Fine needle aspirates and surgical biopsies (or removal) are methods of sampling tissues for microscopic evaluation, including cytology and histopathology. Abdominal masses cannot be diagnosed based on imaging alone and should always have histopathology performed due to the similarity in appearance that many of them may share.

History and Presentation

The case discussed is a ten-year-old spayed female beagle mix who had been diagnosed with a splenic mass two years previously by the referring veterinarian. The rDVM discovered the mass while performing an abdominal ultrasound and informed the owners that the patient had a very grave prognosis because this mass was likely an aggressive form of cancer. Although that was a possibility, no further diagnostics were pursued in order to reach a definite diagnosis. With very little hope, the owners took their pet home to make her as comfortable and as happy as possible for the little time they had left with her. After two years, the owners had many questions about the original diagnosis of their rDVM and wanted some answers. On April 8, 2015 the patient was brought to MSU-CVM for further diagnostics.

On initial observation, the patient presented with a body condition score of 1/9 and was reported to have a decreased appetite. She was bright, alert, and responsive. Her temperature, pulse, and respiration rates were all within normal limits. She had a severely distended abdomen which was very firm upon palpation. The owners reported that the patient was still eating and drinking and that she was urinating and defecating normally. Overall, she appeared to feel good. The only abnormalities on her blood work were the presence of a mild anemia and thrombocytopenia. In order to get more answers, further diagnostics were pursued.

Pathophysiology

Splenic masses comprise a large number of cases of abdominal masses seen in practices. These masses can either be hematopoietic or non-hematopoietic.² Hematopoietic tumors are malignant tumors which arise from cells found in the blood stream can include mast cell tumors, plasma cell tumors, malignant histiocytosis, myeloproliferative disorders, or lymphoproliferative disorders such as malignant lymphoma, marginal zone lymphoma, or leukemia.² Non-hematopoietic tumors arise from soft tissue found in the spleen and can be classified as either

benign or malignant.² Benign tumors can be classified as either hemangioma, leiomyoma, fibroma, or lipoma.² Malignant tumors can be classified as either hemangiosarcoma or non-angiomatous such as leiomyosarcoma, fibrosarcoma, liposarcoma, osteosarcoma, chondrosarcoma, myxosarcoma, rhabdomyosarcoma, mesenchyoma, or metastatic carcinoma.²

About 66% of the recorded instances of splenic masses have been reported to be malignant and of those 70% were reported to be hemangiosarcoma.³ Hemangiosarcoma is an aggressive tumor that is highly malignant and that carries a grave prognosis for the patient. In addition, the most common type of benign mass associated with the spleen is a hemangioma, or splenic hematoma. The major health risk associated with hemangiomas is the possibility of rupture-causing death by hemorrhage.²

Hemangiosarcomas are extremely malignant tumors which are often multiple in number. These tumors arise from the endothelium of blood capillaries and are most commonly seen in dogs between 8-10 years of age.⁴ There has been no sex predilection noted at this time. The most common breed affected by this type of tumor is German Shepherds. They can be found in a wide variety of tissues such as spleen, liver, heart, lungs, kidney, skin, oral cavity, muscle, bone, and peritoneum.⁵ The most common areas of metastasis for a splenic hemangiosarcoma are the liver and lungs; however, kidneys, muscle, peritoneum, omentum, lymph nodes, mesentery, adrenal glands, and diaphragm are all possible locations for metastasis.⁵ Prognosis is poor if the mass has already metastasized. If caught early, the spleen can be removed and chemotherapy can be performed. With aggressive therapy, patients still only have reported post-operative survival times of 96-273 days.²

Hemangiomas are benign masses which can be formed by the occurrence of a traumatic injury to the spleen, poor blood flow, or bleeding due to ruptured or weak splenic blood vessels.⁶

These tumors generally pose no life threatening consequences unless they rupture. If this happens, emergency surgery must be performed to stop the hemorrhage before the animal dies. Removal of the mass is curative and has a good prognosis.⁶

Diagnostic Approach/ Considerations

Upon presentation to MSU-CVM, a variety of imaging procedures were performed to confirm the tissue of origin of the previously diagnosed splenic mass and to determine whether or not it was surgically resectable. First, thoracic and abdominal radiographs were performed. The thoracic radiographs revealed no evidence of metastatic disease. The cardiac silhouette and pulmonary parenchyma were normal in appearance. There was evidence of a decreased size of the lung field due to the cranial displacement of the diaphragm by the abdominal mass. On abdominal radiographs, there was a large sharply marginated soft tissue opaque mass seen which was cranially displacing the stomach and dorsally displacing the intestines. It was difficult to determine the origin of the mass due to the lack of serosal detail on the radiographs, so an abdominal ultrasound was recommended.

On abdominal ultrasound, there was a small amount of normal spleen seen just adjacent to the left kidney, however, it was very small and hard to find. There was a large hyperechoic area seen in the abdomen adjacent to the spleen which was believed to be the mass. It contained multiple thin-walled cavitations seen throughout. An ultrasound-guided fine-needle aspirate was then performed on the mass which revealed a substance with low cellularity and a large amount of blood. Since the mass was so large, it was still difficult to determine the tissue of origin so computed tomography (CT) was recommended.

A CT scan was performed to help determine the involvement of the mass to know whether surgical removal was a viable option. On CT, the origin of the mass was determined to be coming from the spleen. On the coronal view, it the close relationship that the mass had with the liver was noted; however, when viewed with contrast it was evident that the mass did not attach itself to the liver. Likewise, when viewing the coronal view with contrast, it was noted that the spleen fed directly into the mass. By using contrast, the blood vessels are enhanced to the point where a better diagnosis can be made as to the tissue of origin.⁹ There was evidence of the mass cranially displacing the stomach and liver, along with dorsally displacing the intestines and kidneys. Now knowing that the mass was indeed originating from the spleen, a splenectomy was recommended in order to completely remove the mass.

With the lack of metastasis seen on imaging, and the two year duration of the mass, malignant tumors were ruled out as a differential. Likewise, with the presence of cavitations within the mass, solid tumors were also ruled out. Having ruled out malignant tumors, our top differentials for benign splenic masses were hemangioma, leiomyoma, fibroma, and lipoma. Although the last three are all solid tumors, such a large tumor can lead to necrosis of its interior from lack of blood supply, giving it a cavitory appearance.

Treatment and Management

Based on the findings from the imaging procedures performed, it was determined that the abdominal mass was only involving the spleen. The recommended treatment for splenic masses is the complete surgical removal of the spleen.⁵ Without removal of the spleen, the prognosis of the patient is very poor and the likelihood of the mass causing more complications increases. Untreated splenic masses can eventually lead to complete disruption of the gastrointestinal system, decreases blood flow, or even hemorrhage.⁶

With the findings in this case it was determined that surgical removal of the spleen via a splenectomy was a viable option for treatment. Splenectomy can carry risks for both perioperative and postoperative complications. Perioperative complications can include life threatening arrhythmias and hemorrhage. The patient must be continuously monitored on an electrocardiogram during surgery to identify any life threatening arrhythmias which may occur so appropriate measures can be taken to correct them. Also, the spleen is a highly vascularized organ, and must be carefully monitored for hemorrhage during surgery. Splenic masses can have extremely large blood vessels supplying blood from the spleen. These vessels can be prone to tearing or difficult to ligate so it is important to be cautious when handling and make sure proper ligation techniques are used. Postoperative complications can include a phenomenon known as reperfusion injury, hemorrhage, DIC, abscessation, traumatic pancreatitis, and gastric fistulation.⁷ Reperfusion injury occurs when blood flow suddenly returns to tissues which have previously been deprived of their appropriate blood supply. The sudden return of blood flow to the previously ischemic tissues causes oxidative damage and triggers an inflammatory response.⁷ Internal hemorrhage is also an important postoperative complication for a splenectomy. Unlike hemorrhage as a perioperative complication, postoperative hemorrhage cannot be seen. The patient must be continually monitored for signs of internal bleeding such as disseminated intravascular coagulation (DIC) so immediate actions can be taken to correct the issue.⁶

After all the options had been weighed, the patient was then taken to surgery and a splenectomy was performed. A ventral midline celiotomy was performed extending from the patient's xyphoid to pubis. A highly vascularized splenic mass was visualized which was severely displacing all other organs in the abdomen. There were multiple omental adhesions to the spleen which were transected and removed with the mass. The mass was gradually elevated

out of the body cavity while simultaneous ligation of the numerous blood vessels was performed. After ligation of all attaching blood vessels, the remaining connective tissue was cut and the mass was removed.

After removal, the spleen and mass together weighed approximately 15 pounds and measured 14.7 cm x 22.3 cm x 28.8 cm. The abdomen was thoroughly flushed with warm saline and closed in a routine manner. There were no complications during surgery and the patient had an uneventful recovery in ICU. She remained in ICU and was placed on 0.2 mg/kg Methadone IV q6h for pain management and LRS at 35 ml/hr IV to help maintain her fluid volume. While in ICU she was monitored for reperfusion injury and internal hemorrhage. After two days of being in ICU, she had no complications, was switched to oral Tramadol for pain, and was sent home to continue her recovery.

Case Outcome

Upon the arrival of histopathology results, it was determined that the splenic mass in this case was a splenic hematoma with extramedullary hematopoiesis. There was also evidence of previous nodular hyperplasia found which had been destroyed by necrosis (a finding commonly seen with splenic hematomas).⁸ With these findings it was ruled that this mass was completely benign and that recurrence was highly unlikely after removal. The owners were very happy with this news, and on the follow up phone call to check on her, the owners stated that the patient was continuing to heal and was acting like a puppy again. They reported that, after her incision had healed completely, she was running around playing again like she had not done in years.

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