LYMPHOMA AND ITS MANY DISGUISES IN CATS

Merrilee Holland, DVM, MS, DACVR

Auburn University College of Veterinary Medicine

1220 Wire Road

Auburn, Alabama 36849-5540

hollame@auburn.edu

Abstract:

Lymphoma is one the most common neoplasia in cats, accounting for up to 30% of all feline malignancies. An overview of imaging findings from the tip of the nose to the tip of the tail will provide a comprehensive pictorial of the common sites and the appearance of lymphoma. In addition, contrasting examples of benign or other malignant processes that can mimic lymphoma will be included in this presentation.

Keywords: lymphoma, pulmonary, gastrointestinal, mediastinal, nasal, renal

Lymphoma (LSA) is one of the most common neoplasia in cats. Viral factors such as feline leukemia virus (FeLV) have a direct role in tumorigenesis. FeLV was more commonly associated with lymphoma cases in the 1960s-1980s. Currently, FeLV plays only a minor role in LSA cases. Feline immunodeficiency virus (FIV) has an indirect role due to the immunocompromise of the cat. The FeLV status plays a role in younger cats (up to 3 years of age) with a higher incidence of mediastinal and spinal forms. In FeLV-negative cats, the onset of lymphoma in older cats is between 7-8 years of age. Dietary modifications in the last 20 years

seem to parallel an increased incidence of intestinal lymphoma, although no direct link has been proven.

The prognosis for lymphoma is related to remission vs. partial remission, stable vs. progressive disease, and FeLV/FIV status. Nasal and small-cell gastrointestinal forms of lymphoma have a better prognosis.

Pulmonary

Pulmonary lymphoma is rare in cats. Variable lung patterns have been found. Some references have described the presence of pulmonary nodules or masses.

Alimentary/gastrointestinal is the most common form seen in older cats. Lymphoma may be confined to the gastrointestinal tract +/- stomach. Alternatively, the intestinal tract, mesenteric lymph nodes, liver, and spleen can be infiltrated. The involvement in the small intestines can be diffuse or solitary.

Gastric neoplasia

Gastric lymphoma is the most common neoplasia, followed by adenocarcinoma or leiomyosarcoma. Large cell lymphoma is the most common type found in the stomach. The median survival time is six months.

Radiographic imaging findings include thickening of the stomach wall with noticeable distortion of the gas bubble. In a few cases, the interface with the gas may outline the soft tissue mass. Mineralization within the gastric infiltrations can occasionally be seen.

On ultrasound, the upper limits of normal gastric wall thickening in cats are 2-4 mm. In cats with gastric lymphoma, there will be focal or diffuse thickening of the gastric wall or altered

echogenicity, most anechoic/hypoechoic, often with destruction of wall layering, and can be associated with gastric ulceration. Regional lymph nodes may also be enlarged, rounded, and anechoic/hypoechoic.

Fine needle aspiration of the gastric wall and regional lymph node(s) is the best way to obtain a cytologic diagnosis.

Small intestinal diffuse

The most common site (50-80%) primarily affects the jejunum and ileum. Odds are greater for LSA if the cat is greater than nine years old with muscularis thickening. Typically, the diagnosis is small cell lymphoma in cats. An intestinal biopsy may be needed when only diffuse intestinal thickening is present. The primary differential diagnosis for lymphoma is inflammatory bowel disease. If the owner can afford treatment and the cat can be handled, this form of lymphoma has a high treatment response rate with a median survival time of 1.5-3.0 years.

Radiographic findings in normal cats: In nonfasted cats without GI disease, greater than 25% of the small bowel can contain gas. In fasted and unsedated cats, gas within the small bowel is rare.

Radiologic rule of thumb: Small intestinal loops should not be greater than 2x the height of central L4 or endplate of L2 on lateral radiographic imaging. The ratio of the small intestine to >2.5 height of L2 was likely obstructed. The small intestines should not be greater than 12.0 mm in diameter.

Radiographic findings on survey images: No abnormalities may be noted on survey radiographs.

Ultrasound: The intestinal thickness is considered normal when <3.0mm (although the ileum may be slightly thicker up to 3.4 cm). On ultrasound, wall thickening with the

muscularis/submucosa, normal to loss of wall layering, reduced wall echogenicity, decreased local motility, regional lymphadenopathy, +/- peritoneal effusion, +/- organomegaly, an increased concern when muscularis layer is equal or greater to the mucosal layer.

Small intestinal Focal/Discrete gastrointestinal mass(es)

The clinical course is aggressive. The median survival time is approximately six months. The diagnosis is more likely to be intermediate to large cell lymphoma. The primary differential diagnosis for a focal intestinal mass is mast cell tumor or adenocarcinoma.

Imaging findings:

Radiographic: Survey abdominal radiographs may appear normal unless the focal mass causes an intestinal obstruction.

Ultrasound: On abdominal ultrasound, transmural wall thickening is present with loss of wall layering +/- lymphadenopathy.

Mediastinal

Mediastinum can be divided into three parts. The cranial mediastinum's most common mass is due to lymphoma, thymoma, ectopic thyroid, or due to benign cysts. Sternal lymphadenopathy is due to an inflammatory or neoplastic process within the abdomen. Cranial mediastinal masses must be differentiated from pulmonary nodules in the same region. The middle mediastinal abnormalities include tracheobronchial lymphadenopathy, as seen with fungal disease or round-cell tumors. The caudal mediastinum occurs near the diaphragm. Hiatal hernia is usually dynamic and observed with a greater frequency on the left lateral projection. Subtly may be seen

on midline on VD/DV view. Other causes of increased soft tissue in the caudal mediastinum are associated with foreign bodies or neoplasia.

Lymphoma cases in the mediastinum were more likely to be solid, with equal numbers presenting as hyperechoic or hypoechoic. Differential diagnosis includes thymoma, cystic lesions, ectopic thyroid, and other types of neoplasms. Many thymomas are more cystic than lymphoma. Thymomas have been associated with esophageal dysfunction and acquired myasthenia gravis.

The diagnosis can be made by fluid analysis or aspiration. Intermediate to large cell lymphocytes are typically seen in cases with lymphoma. When a mediastinal mass is found in a young FeLV+ cat, there is a poor prognosis with a median survival time of 2-3 months. In older FeLV-cats, the survival time is similar to other sites.

Imaging findings:

Radiographic: Cranial mediastinal masses are the most common. Dorsal deviation of the tracheal and border effacement with the cardiac silhouette occurs with larger cranial mediastinal masses. The margins of the cardiac silhouette may be difficult to visualize due to the mediastinal mass and concurrent pleural effusion. The location of the carina caudally +/- dorsally will support the presence of a mediastinal mass. Widening of the cranial mediastinum may cause caudal displacement of the cranial lung lobes on the VD/DV view. Concurrent pleural effusion is commonly associated with mediastinal masses and may hinder the identification of the margins of the mediastinal masses.

Ultrasound: The classic appearance is a hypoechoic nodular mass with a well-defined echoic rim. Color Doppler may show variable blood flow to a mediastinal mass. Cytology will be needed for a definitive diagnosis.

Nasal

The presenting sign associated with nasal lymphoma includes nasal discharge, sneezing, stertor, facial deformity, decreased nasal flow, hyporexia, and an increased respiratory effort.

Nasal LSA accounts for 26-49% of nasal malignancies, followed by carcinomas, adenocarcinomas, squamous cell carcinomas, and sarcomas. Most nasal lymphomas are confined to the nasal cavity with only 20% having systemic involvement. Some cats may develop multicentric diseases later. Diagnosis involves staging with computed tomography and nasal biopsy. Nasal lymphoma is usually intermediate to high grade. The median survival time ranges from 1.5 to 3.0 years if both treatments (chemotherapy and radiation therapy) are utilized.

In a recent 2021 paper on nasal masses in cats, the CT findings with lymphoma included a mixed (permeative, expansile, and destructive) and expansile growth pattern (displaced the surrounding bone peripherally) and regional lymphadenopathy. Lymphoma was more likely to occupy the entire nasal cavity than rhinitis. Advanced imaging for staging of 17/35 cats was performed and identified pulmonary nodules (4), intrathoracic lymphadenopathy (2), and pleural effusion (1).

Renal

The incidence of renal lymphoma ranges from 7-30% and can be multicentric or confined to the kidneys.

In the older literature, there was a higher incidence of CNS involvement. The lower incidence of CNS involvement is due to a lower incidence of FeLV in our current feline population.

The renal size on radiographic images in older cats without signs of renal disease is 1.9-2.6 times the length of L2. In most older cats, the renal size is 2.0 times the length of L2.

Radiographic findings: Bilateral renomegaly with irregular margination

Ultrasound finding: Typically enlarged, irregular marginations, with a hypoechoic subcapsular rim. Focal or multifocal nodules or masses have also been reported. The subcapsular region is an accumulation of lymphoma and not fluid.

The differential diagnosis for renal lymphoma includes FIP, transitional cell carcinoma, undifferentiated malignant neoplasia, renal anaplastic carcinoma, or chronic active nephritis.

A fine needle aspiration of the kidney (outer rim) and cytology are needed for diagnosis. Renal lymphoma is usually large cell lymphoma. The prognosis is guarded.

Urinary bladder

Lymphoma affecting the urinary bladder in dogs and cats has been reported rarely. The differential diagnosis for bladder tumors is transitional cell carcinoma, followed by squamous cell carcinoma, adenocarcinoma, and undifferentiated carcinoma.

In this series of 3 dogs and one cat, urinary bladder lymphoma appears on ultrasound as a heterogeneous mural mass with a well-defined luminal–mucosal interface.

Adrenal glands

One case report in a cat found lymphoma in the cat with bilateral adrenal gland enlargement. You may want to consider lymphoma if there is bilateral adrenal enlargement.

References:

Withrow SJ, Vail DM, Page RL. Hematopoietic tumors in *Withrow & MacEwen's Small Animal Clinical Oncology* 5th ed, St. Louis, MO: Elsevier (Saunders) 2013;638-653.

Hudson J. Gastrointestinal disease and urinary disease and hemolymphatic system in *Feline diagnostic imaging*. Hoboken, NJ: Wiley 2020;347-379,455-485, 506-516.

Riedesel EA. Small bowel in *Textbook of Veterinary Diagnostic Radiology*, 7th ed (ed. D.E. Thrall), St. Louis, Mo: Elsevier 2018:926-954.

Larson M. Mediastinal disease in *Feline diagnostic imaging*. Hoboken, NJ: Wiley 2020;293-303.

Bouyssou S, Hammond GJ, Eivers C. Comparison of CT features of 79 cats with intranasal mass lesions. *J Fel Med Surg* 2021;23(10):987-995.

Romine JF, Kozicki AR, Elie MS. Primary adrenal lymphoma causing hypoaldosteronism in a cat. *J Fel Med Surg* 2016;1-6.