

Alimentary Neoplasia in Geriatric Dogs and Cats

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KEYWORDS

- Lymphoma
- Carcinoma
- Adenocarcinoma
- Leiomyoma
- Stromal tumor
- Mastocytoma

KEY POINTS

- There are 2 main types of alimentary lymphoma in cats: large cell lymphoblastic and small cell lymphocytic. The former has a poor prognosis, while the latter has a relatively good prognosis.
- It is important to biopsy more than just the duodenum, even when doing biopsies endoscopically. More cases of lymphoma are diagnosed in ileal biopsies than in duodenal biopsies.
- Many tumors previously diagnosed as being leiomyomas and leiomyosarcomas are being reclassified as gastrointestinal stromal tumors based upon immunohistochemical staining.
- Chow chows appear to be predisposed to gastric carcinomas.

Alimentary neoplasia is a common and important problem in geriatric dogs and cats. While there are numerous possible cell types, locations, and associated clinical signs, there are some that are particularly common that should be high on the clinician's "radar screen" when dealing with older pets. This article will focus on the more common neoplastic problems of the esophagus and gastrointestinal tract (GIT) of geriatric dogs and cats.

LYMPHOMA

Lymphoma is the most common neoplasm of the feline GIT and is either the most common or second most common in the canine GIT. Up to 70% of cats with lymphoma have GIT involvement.¹⁻³ Alimentary lymphoma in cats can be B cell (more commonly but not exclusively in lymphoblastic lymphoma [LBL]) or T cell (more commonly but not exclusively in small cell, lymphocytic lymphoma [SCL]).⁴ Different studies have found different preponderances of T- versus B-cell intestinal lymphoma

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in the cat.^{2,4-9} Most canine alimentary tract lymphomas are T cell in origin.^{10,11} Feline leukemia virus infection and feline immunodeficiency virus infection are important risk factors for feline lymphoma, but most cats with alimentary lymphoma have neither as diagnosed by commonly used assays. However, polymerase chain reaction (PCR) analysis has suggested that feline leukemia virus might be involved in at least some animals that are negative by routine enzyme-linked immunosorbent assay.¹ Cigarette smoke¹² and *Helicobacter* spp infection¹³ are also hypothesized to be risk factors for lymphoma in cats. Risk factors in dogs are not clearly identified.

Intestinal Lymphomas

Lymphoma can affect the entire GIT, but it can also be relatively localized to 1 segment. In cats, the small intestine is the most commonly affected site.¹⁴ Small intestinal involvement primarily causes weight loss, often but not invariably associated with diarrhea. Weight loss may precede diarrhea by weeks or months. Hyporexia and/or vomiting may also be seen, especially if there is thickening of the intestinal wall causing obstruction. Large intestinal involvement more reliably causes diarrhea because there is no segment of bowel after it that can mask its involvement. But, severe large bowel involvement can also cause weight loss. If the disease involves extra-GIT sites, clinical signs may vary depending on which other organ or organs are affected. Icterus from hepatic involvement and abdominal enlargement from splenomegaly are especially common. If paraneoplastic hypercalcemia of malignancy is present (primarily in dogs), polyuria-polydipsia may occur.

Cats can have LBL, SCL, epitheliotropic lymphoma (a subset of SCL), and large granular lymphoma of the GIT. Large granular lymphoma is very aggressive.^{15,16} Fortunately, it is rare and will not be discussed further. Dogs primarily have LBL of the GIT. Lymphoblastic lymphoma of the GIT in cats is similar enough to the canine form that they will be discussed together. In both species, LBL tends to be aggressive, growing quickly and producing severe, progressive clinical signs. Alimentary LBL often affects organs outside the GIT; therefore, organomegaly (especially spleen, liver, mesenteric lymph nodes) is common and can sometimes be detected at physical examination.

Most clinical pathology findings tend to be mild or nonspecific (ie, mild anemia, mild neutrophilia, increased hepatic enzymes). However, clinical pathology sometimes helps make a diagnosis. Rarely, circulating lymphoblasts (ie, leukemia) will be found in patients with alimentary lymphoma. Lymphoma is an important cause of protein-losing enteropathy in both the dog and cat; severe hypoalbuminemia (ie, <2.0 g/dL) with or without hypoglobulinemia that is not due to renal losses or hepatic insufficiency mandates consideration of lymphoma.¹⁷ However, lymphoma is not the most common cause of protein-losing enteropathy in dogs (although it might be in cats). Hypercalcemia is uncommon in alimentary lymphoma but is seen more commonly in dogs than cats. Finding hypercalcemia in a patient with GIT signs as mentioned earlier necessitates a careful hunt for neoplasia, especially lymphoma. The ileum is often (not invariably) affected in patients with alimentary lymphoma, and finding hypocobalaminemia may help localize disease to the ileum. However, such ileal disease may be neoplastic or non-neoplastic, and finding a normal serum cobalamin is meaningless when considering whether intestinal disease is present or absent.

Abdominal radiographs can be helpful, but ultrasound is particularly useful in finding changes indicative of infiltrative disease. The majority of cats (~90%) with alimentary lymphoma have been reported to have ultrasonographic changes.^{18,19} However, one should never eliminate lymphoma because changes suggestive of infiltrative disease were not found sonographically. While ultrasound is relatively

specific for infiltrative diseases, it is potentially insensitive, especially for the less aggressive SCL. Thickened intestinal mucosa in which the normal distinction between different layers is lost is particularly suggestive of lymphoma but is primarily found in the more aggressive LBL. Recently, it has been found that muscular layer thickening in feline intestines is particularly suggestive of lymphoma.²⁰ The significance of mesenteric lymphadenomegaly depends on the severity of the enlargement. While major enlargement is suggestive of lymphoma, mild to moderate enlargement can be due to any number of inflammatory abdominal diseases, including inflammatory bowel disease (IBD).²⁰

If organomegaly (especially hepatic or splenic) is noted at physical examination or infiltrative disease is suggested by ultrasound, then fine needle aspirate cytology of that organ can sometimes be diagnostic (especially with LBL). Cytologic diagnosis of LBL is easier than cytologic diagnosis of SCL because LBL typically displays obvious signs of malignancy; therefore, it is usually relatively easy to determine that a round cell malignancy is present depending on the adequacy of the sample. Like ultrasonography, fine needle aspiration cytology is very specific with a high positive predictive value but is not always sensitive. You cannot eliminate lymphoma because you did not find it on a fine needle aspirate cytology. Neoplastic lymphoblasts can be very fragile; they can readily rupture during aspiration or preparation of the cytology slide. Only a few cells are necessary to make a diagnosis, but they must be intact. Aspirate cytology of mesenteric lymph nodes poses special difficulties because these lymph nodes are typically reactive since they drain the intestines. Such inflammation may make it difficult to obtain sufficient neoplastic cells to make a diagnosis.

A common source of confusion stems from performing cytology (or histopathology) on a patient that has been receiving corticosteroid therapy for presumptive IBD. If the steroids cause even a partial remission, it can be much harder to make a diagnosis of lymphoma. However, if the steroid therapy has had no beneficial effect or if an initial beneficial effect has been replaced with severe symptomatology, then cytology is more likely to be helpful.

Histopathology (ie, from intestinal biopsy) will be required if a diagnosis cannot be obtained cytologically. Tissue samples may be obtained endoscopically or surgically. There is ongoing controversy as to whether endoscopy or surgery is the preferred technique for intestinal biopsy, the arguments revolving around the quality of tissue samples obtained and access to the different parts of the GIT. While the quality of the tissue sample is probably a major issue when trying to diagnose SCL of cats (see later), it is probably not as major an issue with LBL. Marginal tissue samples often allow histologic diagnosis because the infiltrate is usually extensive in the affected areas and cellular characteristics of malignancy are often obvious. What is important with any intestinal disease (not just lymphoma) is to recognize that the affected portion of the intestine must be biopsied. Some patients with severe infiltrative intestinal disease have no localizing changes on ultrasound or physical examination. If imaging does not localize the lesion, then it behooves the clinician who chooses endoscopic biopsy to access as much of the GIT as possible. Lymphoma may affect all of the GIT or only 1 section (eg, ileum or jejunum) or it may "skip" sections. Furthermore, even when a particular section of the intestines (eg, duodenum) is affected, that does not mean that all the biopsy samples from that portion of the intestine will have the lesion. One can take 6 or 8 duodenal tissue samples endoscopically and only find lymphoma in a subset of the samples, even if all the samples are of adequate quality. How often this occurs is unknown, but the author has seen occasional cases in which this occurred.

Many patients with small intestinal disease undergoing endoscopy only receive gastroduodenoscopy. Ileal biopsy may be particularly important for a variety of intestinal diseases; lymphoma has been diagnosed in the ileum many times when there was no evidence of neoplasia in the duodenum.^{21,22} A competent endoscopist should be able to biopsy the ileum in almost all patients. Therefore, endoscopic biopsy of the ileum should be routinely performed unless there is good reason to believe that the duodenum is affected with the same disease process. The gross endoscopic appearance of intestinal mucosal lymphoma varies⁹; therefore, one should biopsy all segments of the bowel, regardless of their appearance.

If laparotomy is performed instead of flexible endoscopy, one should generally biopsy the duodenum, jejunum, ileum, mesenteric lymph node, and liver (plus any other organ or structure that appears abnormal). If the patient is severely hypoalbuminemic, special consideration should be given to preventing suture line dehiscence. If obstruction occurs because of lymphomatous infiltrates, it must be removed if the patient is going to be treated although surgery will not be curative. Furthermore, it is possible that there will be neoplastic infiltration at the suture line (even when it appears normal), making dehiscence an important risk when performing full-thickness biopsy samples.

The prognosis for patients with alimentary LBL is poor. A combination of cyclophosphamide, doxorubicin, vincristine, and prednisolone (CHOP) is a well-accepted protocol for affected cats. Approximately 70% of cats with LBL respond to this chemotherapy with less than 50% achieving complete remission. In cats, the median survival time is 4 to 6 months with chemotherapy. Abdominal radiation has been used with some success as a rescue therapy in affected cats.²³ Dogs treated with combination chemotherapy (ie, cyclophosphamide, doxorubicin, vincristine, L-asparaginase, prednisolone, lomustine, procarbazine, mustargen) have approximately a 50% response rate, and responders have a median survival time of approximately 110 days.¹¹ Diarrhea is a negative prognostic factor for dogs with alimentary lymphoma. Colorectal lymphoma may have a somewhat better prognosis.¹⁰

Patients with substantial, transmural neoplastic infiltration seem to have more complications from chemotherapy (ie, vomiting, diarrhea, perforation with subsequent peritonitis) than patients being treated for multicentric lymphoma. Hypocobalaminemic cats may benefit substantially from cobalamin injections as supportive therapy.

SCL of Cats

SCL of the GIT is relatively unique to the cat, and the following discussion will be for the cat only. This form of lymphoma is generally T-cell. In some studies, it was the most common form of feline intestinal lymphoma,^{17,24} while in other studies it was less common than LBL.^{4,25} This difference in incidence of SCL versus LBL may represent different epidemiologic factors predisposing cats to lymphoma in different geographic areas. Epitheliotropic intestinal lymphoma tends to be a subset of SCL, although some patients have intermediate-sized lymphocytes.⁸ It is unknown if this subset responds differently than the nonepitheliotropic form of SCL.

SCL tends to have a much less aggressive course than patients with LBL. SCL patients are often characterized by chronic weight loss and diarrhea. Organomegaly is rare, and diagnosis is more difficult than with LBL. Major diseases to differentiate from SCL are IBD and hyperthyroidism.

Histopathology of good samples of intestinal tissue (ie, full thickness of mucosa and oriented so that one can see from the tips of the villi to the base of the crypts) is critical because it is impossible to diagnose SCL on cytologic criteria (ie, the small

lymphocytes have no malignant characteristics). It has been suggested that endoscopy is sufficient to make a diagnosis of SCL in approximately 70% of the cases,¹ but there are no critical studies that document this statement or that meaningfully compare diagnosis of endoscopic biopsies versus surgical biopsies. The controversy between endoscopic biopsies and surgical biopsies centers around the ability to endoscopically obtain tissue samples with minimal stress (especially in ill, debilitated patients) versus the common problem of obtaining tissue samples that are superficial and do not allow evaluation of the entire thickness of the mucosa, much less the muscularis mucosa. Unfortunately, poor tissue samples are commonly obtained by endoscopists, especially novices or individuals who have not been trained in taking good tissue samples.

It is also clear that lymphoma may only affect 1 section of the intestines. Ileal biopsies seem particularly important in the diagnosis of feline SCL, but it is not clear that ileal biopsies will guarantee diagnosis. One study stated that full-thickness samples were superior to endoscopic samples.²¹ However, careful reading of the report reveals that in each case in which a full-thickness, laparoscopic sample provided a diagnosis that was missed by an endoscopic sample, the endoscopic sample was from the duodenum while the full-thickness sample was from the ileum. While ileal biopsies are clearly useful for diagnosing lymphoma, the importance or lack thereof of biopsying the jejunum when looking for SCL is an issue that has not been critically addressed. Jejunal samples may be found to be as or even more important than ileal samples. There is a report of 17 cats with SCL in which jejunum samples were diagnostic in 15 of 15 cats while ileal samples were diagnostic in 13 of 14 cases²⁶; however, this is a relatively small study. While the proximal jejunum can be accessed endoscopically in some cats, there are many patients in which endoscopy cannot reach the jejunum.

Laparotomy not only allows jejunal biopsy but also allows biopsy of liver, mesenteric lymph nodes, and other organs (eg, spleen) that might contain neoplastic infiltrates. At this time, there is some thought that laparoscopic biopsy of the intestines may be an advantageous compromise (ie, full-thickness samples of the different sections of intestine but less stress in debilitated patients). While laparoscopy allows full-thickness biopsy of jejunum and ileum as well as liver, it can be very hard to biopsy mesenteric lymph nodes using this technique.

In distinction to LBL (which is generally easy to diagnose), SCL can be a difficult diagnosis even with an excellent tissue sample. Finding infiltrates in the submucosa and muscularis has been suggested to be an important indicator of SCL, but some patients with IBD will have lymphocytic infiltrates in the same places, albeit less marked. Immunohistochemical staining and PCR analysis may be needed. In particular, enteric-associated T-cell infiltration may be especially difficult to distinguish from lymphocytic lymphoma since all the cells will be of the same phenotype.²⁷ In addition, some SCL have mixed populations of B-cells and T-cells. Therefore, simply obtaining full-thickness samples of intestine does not reliably allow one to distinguish IBD from neoplasia.

Adding to the confusion is the fact that alimentary lymphoma and alimentary inflammation often coexist in the same patient.^{26,28} Immunohistochemical staining (eg, immunophenotyping by staining for CD3 and CD79a) will result in diagnosing some patients that initially appeared to have IBD as in fact having lymphoma (primarily SCL) and vice versus.⁶ However, immunohistochemical staining is not always sufficient for clear-cut differentiation.²⁸ PCR testing for gene rearrangement (ie, clonality) is also available and appears to be necessary for definitive diagnosis in some patients.⁵ Each assay has advantage and disadvantages. While the sensitivity

of these assays is reported for other forms of lymphoma, we do not know what it is for alimentary lymphoma, especially with endoscopic biopsies. The subject is complex and beyond what we will approach here. Suffice it that these resources should be considered whenever the patient or the patient's response to therapy does not clearly fit in the histopathologic diagnosis. The reader is referred to other publications for a discussion on advantages and pitfalls of these techniques.²⁹⁻³³

There is ongoing debate about whether IBD can be a risk factor for cats developing SCL. As of this writing, it is not clear whether IBD can transform into SCL. However, it is interesting that distinguishing SCL from IBD is a focal point of the controversy about the best way to biopsy feline intestines. Adding to the confusion is the fact that cats may have SCL in one section of the bowel but IBD in another section.

The prognosis for intestinal SCL is much better than that for LBL, and the drugs used to treat it tend to have fewer side effects than the combination chemotherapy mentioned earlier for LBL. Chlorambucil and prednisolone form the mainstay of treatment and may be administered in various ways. Median survival time of patients that respond to prednisolone plus chlorambucil ranges from 1.5 to 2 years with an excellent quality of life.^{26,34,35} Interestingly, this is the same treatment used for severe lymphocytic IBD, and anecdotally the outcome is about the same.

Gastric Lymphoma

The stomach may be infiltrated with lymphoma in association with intestinal lesions, or it may be the only site in the GIT that is affected. The primary clinical sign of gastric lymphoma is typically hyporexia. Vomiting typically comes later, only in the more advanced stages, unless the tumor involves the pylorus and causes vomiting early due to obstruction. Solitary gastric lymphomas are almost always B-cell in origin.²⁵ *Helicobacter pylori* infection in people is documented to cause low-grade mucosal lymphoma. The question is whether the species of *Helicobacter* found in the feline stomach (eg, *H felis*, *H helmanii*, etc) can cause gastric lymphoma.¹³ Anecdotally, some cats with solitary gastric lymphoma have been cured with surgery; this might represent lymphoma caused by *Helicobacter* spp.

CARCINOMA/ADENOCARCINOMA

Carcinomas, including adenocarcinomas, are the most common tumor of the canine stomach and the second most common intestinal tumor in the cat. They occur about as frequently as lymphomas in the canine small intestinal tract but are the most common large intestinal malignancy in the dog. German shepherds and Siamese cats appear predisposed to intestinal carcinomas; Chow-chow dogs appear predisposed to gastric carcinomas.³⁶

Esophageal Carcinomas

Esophageal carcinomas are relatively uncommon in dogs and cats, but carcinomas are the most common primary esophageal tumor of cats.³⁷ There are no recognized predisposing causes. Clinical signs (ie, regurgitation, anorexia, halitosis) are usually absent until the tumor is relatively large or has caused obstruction. Some animals with carcinomas at the lower esophageal sphincter seem to have a more generalized esophageal dysfunction, but this is anecdotal. Plain radiographs may be helpful in diagnosing esophageal carcinomas, but barium contrast esophagrams will usually reliably demonstrate the lesion. Esophagoscopy is definitive because it can locate the lesion and obtain diagnostic tissue samples. The prognosis is very poor. These cancers are usually not diagnosed until they are advanced, at which time they are

typically difficult to impossible to resect. They metastasize early. Photodynamic therapy has been tried, but with modest results.³⁸

Gastric Carcinomas

Gastric tumors in dogs are usually adenocarcinomas which are often scirrhous in nature. Any part of the stomach may be affected, but the incisura angularis and antrum/pylorus are frequently affected sites. Breeds at increased risk include the Chow-chow,³⁶ rough collies, Staffordshire bull terriers,³⁹ and Belgium shepherds.⁴⁰ These tumors are locally invasive plus they metastasize to regional lymph nodes early.

Anorexia (and attendant weight loss) is often the first abnormality noted by the client and can predate vomiting by months unless the lesion is very close to the pylorus (in which case vomiting may occur early due to outflow obstruction). When vomiting occurs, hematemesis may or may not be present.⁴¹ Laboratory changes are usually nonspecific (ie, anemia of chronic disease, increased serum alkaline phosphatase). If alimentary blood loss has been sufficiently chronic and severe, iron-deficiency anemia (microcytic, hypochromic) may occur. However, such an anemia is not especially common, and its absence does not lessen the likelihood of a gastric carcinoma.³⁹

Plain abdominal radiographs rarely reveal a gastric mass. Barium contrast gastrograms can often document infiltrative disease of the gastric wall, but these contrast studies are cumbersome and take relatively long to perform (especially when a double contrast study is requested). Furthermore, it can take over 24 hours for the barium to leave the stomach sufficiently to allow meaningful gastroscopy. Abdominal ultrasound may reveal an infiltrative lesion in the gastric wall.^{42,43} However, it can be hard to adequately examine the entire gastric wall because of luminal contents (especially gas) and gastric motility. Therefore, ultrasound is specific for infiltrative gastric wall lesions but insensitive. Sometimes, it is easier to find gastric lymphadenomegaly secondary to metastasis than the primary gastric lesion. Percutaneous fine needle aspiration of enlarged lymph nodes or thickened gastric wall often allows diagnosis (especially when malignant epithelial cells are found in lymph node). Endoscopic ultrasound allows more reliable evaluation of gastric tumors,⁴⁴ but the technique is not widely available.

Endoscopy is typically the most sensitive and specific way to diagnose gastric carcinomas short of exploratory surgery.⁴⁵ A careful, methodical examination of the gastric mucosa typically reveals an area that is irregular and eroded or ulcerated, usually on the lesser curvature or near the pylorus.^{41,46} More advanced cases of scirrhous carcinomas will typically have a large ulcer with a black center. It can be hard to make a definitive diagnosis endoscopically because the scirrhous nature of many tumors makes it difficult to obtain adequate tissue samples with flexible endoscopic forceps. Although much has been made of the idea that biopsying the margin of the ulcer typically allows diagnosis, that has not been the experience of the author. However, the characteristic appearance of scirrhous gastric adenocarcinomas allows the endoscopist to make a presumptive diagnosis when the tumor is advanced. It is also important to recognize that if the lesion is not ulcerated, it is easy for endoscopic forceps to just obtain normal gastric mucosa that is overlying the neoplasia. Cytologic and histologic diagnoses are typically relatively easy. Recently, galectin-3 has been found in canine gastric carcinomas.⁴⁷ It may have a pathologic role in tumorigenesis.

Gastric carcinomas have a terrible prognosis. Surgery is the only potentially curative therapy, but it is rare that all the local disease can be surgically resected.⁴¹ A gastric wall resection that does eliminate all local disease typically results in such

a small gastric lumen that the patient cannot function. Furthermore, gastric carcinomas have typically metastasized before they have been diagnosed.⁴⁸

Intestinal Carcinomas

Carcinomas may occur anywhere in the canine or feline intestine. Small intestinal carcinomas typically develop as solitary intestinal masses with a propensity to quickly metastasize to regional lymph nodes. Large intestinal carcinomas and adenocarcinomas in dogs are primarily found in the rectum, while large intestinal carcinomas in cats are more commonly found elsewhere in the colon.⁴⁹ Benign colonic polyps in dogs (these are rare in cats) are also primarily found in the rectal area. Malignant transformation of benign rectal polyps into carcinomas is reported but rare in dogs (as opposed to people, where it is a common problem).⁵⁰ However, it is critical to accurately distinguish the two.

Intestinal carcinomas can cause anorexia, vomiting, obstruction, diarrhea, weight loss, bleeding, and/or intussusception. Rectal adenocarcinomas tend to have different signs. Classically found in older German shepherd dogs, the major clinical signs of rectal adenocarcinoma are tenesmus, dyschezia, hematochezia, and finally constipation.⁵¹ Stools can become "ribbon-like" as the rectal lesion progressively constricts the lumen. Digital rectal examination is the most sensitive test to find rectal lesions; it is more sensitive than proctoscopy or ultrasonography for early lesions. Digital examination is so important that chemical restraint is indicated if the patient strenuously objects to the examination. If a mass lesion or a deep infiltrative lesion is noted during digital examination, then proctoscopy and biopsy are indicated. For rectal lesions, rigid proctoscopy is often superior to flexible endoscopy. Rigid proctoscopy typically provides better visualization of rectal lesions, but more importantly it allows use of rigid biopsy forceps. Proper use of these forceps routinely allows one to obtain excellent tissue samples containing generous amounts of submucosa, which is where malignant cells are most reliably found. Such deep biopsies are especially critical for distinguishing benign polyps from adenocarcinomas.

Carcinomas in the ascending or descending colon are more difficult to diagnose than are rectal neoplasms. Ultrasonography can often find such colonic carcinomas. Colonoscopy tends to be more sensitive than ultrasound for finding colonic tumors and will allow definitive diagnosis (which ultrasound will not). If the lesion is in the descending colon, rigid colonoscopy is typically superior to flexible endoscopy for the same reasons as mentioned earlier for rectal lesions. However, rigid endoscopy will not allow examination of the transverse or ascending colon, nor will it allow examination of the entire descending colon in larger dogs. Abdominal ultrasound is almost always indicated before colonoscopy because finding lymphadenomegaly with metastatic carcinoma cells may obviate the need for colonoscopy and the attendant colonic cleaning and anesthesia.

Treatment of small intestinal carcinomas preferentially consists of surgical resection. Resection is possible for large intestinal carcinomas, but the colon is more prone to dehiscence than the small intestine. Pubic and/or ischial osteotomy is possible for malignant lesions in the caudal colon,⁵² and polyps as well as malignant lesions can be surgically resected or removed endoscopically with polypectomy.^{53,54} Rectal lesions are easier to expose and resect.^{55,56} Surgical cure of malignant lesions is possible, but regional metastasis is common. Adjunctive chemotherapy is reasonable but palliative. Treatment of rectal adenocarcinoma is particularly difficult because surgical resection (ie, rectal pull through) is often associated with fecal incontinence. If the patient does not experience complications, tumor resection may palliate the

patient for months. Resection with concurrent colostomy is possible, but requires a dedicated owner because subsequent patient management can require substantial effort. Radiation therapy has been reported but is not commonly performed.⁵⁷ Placement of a stent to alleviate rectal obstruction may be tried, but is a palliative maneuver that has only been attempted a few times.⁵⁸ Anecdotally, administration of nonsteroidal anti-inflammatory drugs may help palliate some rectal carcinomas.

MESENCHYMAL TUMORS

Leiomyomas and leiomyosarcomas have classically been the connective tissue tumor diagnosed in the canine GIT. Recently, immunohistochemistry has allowed pathologists to distinguish stromal tumors (ie, those that originate from the interstitial cells of Cajal) (GIST) from leiomyomas (ie, those that originate from smooth muscle).⁵⁹ GIST are positive for CD117 and CD34, while leiomyomas and leiomyosarcomas are negative for these antigens but positive for smooth muscle actin and/or desmin.^{60–62} The clinical importance of this reclassification is uncertain at this time.

Esophageal Tumors

Leiomyomas and leiomyosarcomas seem to have a predisposition for the canine lower esophageal sphincter (LES),⁶³ also called the lower esophageal high pressure zone. They are reported in older beagles⁶⁴ but may be found in any breed. These neoplasms may be on the gastric side or the esophageal side of the LES. Signs (eg, regurgitation) are usually absent until the tumor is relatively large and causing obstruction. Ultrasound, especially through an abdominal window, may often reveal submucosal infiltration at the LES. Endoscopy is typically the most sensitive technique for finding a mass in this location. However, it is hard to impossible to obtain diagnostic tissue samples with a flexible endoscope because this tumor is typically completely submucosa and covered with normal mucosa. The endoscopist must usually presume the diagnosis based upon the endoscopic appearance and location; definitive diagnosis typically requires surgery. However, it is important to have an experienced surgeon for tumors near the LES. This region is very unforgiving of any technical errors during surgery. Obstruction from cicatrix formation and gastroesophageal reflux from LES dysfunction are 2 potentially devastating postoperative complications. Successful surgery is typically curative.^{63,65}

Fibrosarcomas may occur secondary to *Spirocerca lupi* infections.⁶⁶ Diagnosis is typically delayed because clinical signs like regurgitation do not occur until late in the clinical course. Microcytic anemia occasionally occurs due to chronic bleeding.⁶⁶ Occasionally hypertrophic osteopathy may be the first sign noted. Diagnosis may be made fortuitously when the chest is radiographed for some other reason. Retention of air in the esophagus may be the first abnormality noted on plain radiographs.⁶⁷ Definitive diagnosis requires biopsy, and these tumors are easy to sample with a flexible endoscope. Surgical resection is rarely curative but may be palliative (eg, 2–20 months) as these tend to be slower growing than carcinomas.⁶⁸

Gastric and Intestinal Tumors

Clinical signs due to direct involvement of the GIT include anorexia, vomiting, diarrhea, and/or weight loss. Perforation and subsequent septic peritonitis are reported with these tumors, especially with cecal involvement in the dog.⁶⁰ However, paraneoplastic syndromes are well reported with these tumors. Hypoglycemia is associated with the larger tumors, and polyuria-polydipsia due to nephrogenic diabetes insipidus is recognized to be associated with this tumor.^{69,70} Erythrocytosis

may occur as a paraneoplastic syndrome⁷¹ but, paradoxically, anemia is a particularly important problem associated with these tumors. GIT bleeding due to ulceration of the tumor can be responsible for life-threatening hemorrhagic shock. Gastric tumors in particular are known for bleeding; however, intestinal tumors are also prone to ulceration and hemorrhage. Because these tend to be larger, more bulky tumors, they are usually relatively easy to diagnose. Plain abdominal radiographs may be helpful, but ultrasonographic imaging typically detects them best. Fine needle aspiration cytology is not as helpful for diagnosing these tumors because they exfoliate poorly. Endoscopically, these tumors often appear as hard masses covered with normal mucosa. There may or may not be ulceration. When these tumors are ulcerated, there is usually obvious hemorrhage.

Treatment consists of surgical resection. Assuming no post-operative surgical complications, the prognosis is relatively good with patients often living 2 years or more.⁶⁹ Regional lymph nodes, mesentery and liver are the most common sites for metastasis. The presence of metastasis does not clearly impact prognosis; but hepatic leiomyosarcoma has a poor prognosis.⁷²

FELINE INTESTINAL MAST CELL TUMOR

Mast cell tumor of the GIT is the third most common intestinal tumor of cats.⁷³ It may occur in any section of the small bowel (large bowel involvement is less common) but is usually not associated with cutaneous lesions. Abdominal palpation can often detect a mass lesion. It is a highly malignant tumor with a high rate of metastasis. Clinical pathology findings tend to be nonspecific, but abdominal effusions with mast cells may occur. Mastocytosis is infrequently seen (as opposed to splenic mastocytosis in which mastocytosis is more common). Eosinophilia may be seen in some patients.⁷⁴ Radiographs and ultrasound typically find infiltrative lesions. Cytology or biopsy will allow diagnosis; however, sometimes the histopathology will suggest eosinophilic enteritis.⁷⁵ Treatment consists of surgical resection, but it is invariably palliative for a relatively short time.

SUMMARY

Lymphomas, carcinomas, leiomyomas, and stromal tumors are the most common tumors found in the canine and feline GIT. Endoscopic and surgical biopsies are often the mainstays of diagnosis. SCL of the feline intestines poses a special diagnostic dilemma and may require immunohistochemistry as well as PCR to distinguish it from lymphocytic-plasmacytic enteritis.

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