CONTINUING EDUCATION

Chronic Vomiting in Cats: When to Recommend Endoscopy

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Chronic vomiting is a common presenting sign for cats, and evaluation can be frustrating for both owners and veterinarians because of the long differential list. Chronic vomiting has previously been defined as vomiting 3 or more times per month for at least 3 months.[1] Vomiting of trichobezoars (hairballs) should not be dismissed, particularly in cats without long hair, because their development could reflect altered gastrointestinal (GI) motility due to underlying disease.[2]

Endoscopy can be a valuable tool in achieving a final diagnosis, but it is not inexpensive or completely without risk. Additionally, premature performance of endoscopy can result in misdiagnosis because histologic findings do not differentiate among types of chronic enteropathy, such as food responsive disease (FRD) and inflammatory bowel disease (IBD).[3,4] Thus, when evaluating a cat for chronic vomiting, clinicians must follow a systematic approach.

Vomiting should first be differentiated from regurgitation. Vomiting is an active process with retching or heaving, and it is often preceded by nausea or hypersalivation. Vomitus may contain partially digested food and be discolored because of the presence of bile. In contrast, regurgitation is a passive process; regurgitated food is typically undigested, might have a mucus coating, and lacks bile.

After confirmation of chronic vomiting, the next step is crafting an appropriate differential list based on the patient's signalment, environment and husbandry, history, and physical examination findings because this can drastically alter the diagnostic approach. For example, although metabolic evaluation is generally warranted in older cats before abdominal imaging, immediate performance of abdominal radiography might be more appropriate in a young cat because of increased risk for linear foreign body ingestion.[5]

PET PEEVES
Chronic vomiting in cats is a frustrating condition, and accurate diagnosis hinges on use of a systematic approach. Endoscopy is warranted after systemic diseases have been ruled out, particularly in cases without solitary jejunal disease.

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Tables 1 and 2 present the systemic and GI diseases most commonly associated with chronic vomiting in cats. An exhaustive review of causes of vomiting in cats, along with a ranking of the level of evidence supporting each association, has been published by Batchelor et al.[8]

SIGNALMENT AND CLINICAL HISTORY

Retrospective analysis suggests that the prevalence of urinary, neoplastic, cardiovascular, and GI diseases increases with age, whereas the prevalence

TABLE 1 Extragastrointestinal or Systemic Diseases Associated With Chronic Vomiting in Cats

CAUSE	SIGNALMENT AND CLINICAL SIGNS	PHYSICAL EXAMINATION FINDINGS	POSSIBLE RELEVANT DIAGNOSTIC TEST RESULTS
INFECTIOUS			
Parasitic (eg, heartworm, hepatic and pancreatic flukes, *Toxoplasma*)	Young cat that hunts Outdoor exposure Exposure to raw meat	Potbelly Underweight	↓ Albumin ↑ Globulins ↑ Liver enzymes + Heartworm test, echocardiogram
Viral (FeLV, FIV, FIP)	Young to adult, geriatric Outdoor exposure Multicat environment History of cat fights	Anterior uveitis or chorioretinitis Fever Peritoneal effusion Thickened intestines Underweight	↓ Hct ↓ WBC ↑ Globulins without ↓ albumin ↑ Liver enzymes and bilirubin Positive viral test results
METABOLIC			
Chronic kidney disease	PUPD Hyporexia/food aversion Weight loss	Hypothermia (without shock) Hypertension, retinal hemorrhages Poor hair coat Irregular, small kidneys	↓ Hct ↑ BUN, creatinine ↑ tCa, PO_4, ↑/↓ K+ Isosthenuria/minimally concentrated urine ↑ UPC
Diabetes mellitus	Burmese Polyphagia PUPD	Ill-kempt coat Obese Plantigrade stance	↑ Glucose, fructosamine Glucosuria
Hepatobiliary disease (eg, lymphocytic cholangitis, suppurative cholangitis)	Middle-aged Weight loss (lymphocytic)	Dehydration and fever (suppurative) Jaundice Peritoneal effusion Underweight (lymphocytic)	↓ Hct (lymphocytic) ↓ Albumin ↑ Globulins ↑ Liver enzymes, bilirubin
Hyperthyroidism	Behavioral changes Polyphagia PUPD Weight loss	Heart murmur Hypertension Palpable goiter Thickened intestines[6]	n/↑ Hct ↑ Liver enzymes n/↑ BUN, creatinine Isosthenuria/minimally concentrated urine ↑ UPC[7] ↑ T4/fT4 GI thickening
Pancreatitis	Middle-aged Hyporexia/food aversion Weight loss	Ill-kempt coat Cranial abdominal pain Peritoneal effusion Thickened intestines	↑ Liver enzymes ↑ fPL/DGGR lipase Widened gastroduodenal angle, loss of serosal detail Hypoechoic or heterogenous pancreas, hyperechoic mesentery, duodenal corrugation
NEOPLASTIC			
Hepatic and pancreatic	Adult Hyporexia/food aversion Weight loss	Cranial abdominal organomegaly Underweight	↓ Hct ↑ Liver enzymes Organomegaly on radiography Mass on ultrasonography
Round cell tumors (lymphoma, mast cell tumor)	Any age Hyporexia Weight loss	Cranial abdominal organomegaly (uncommon)	Variable Gastric ulceration (mast cell)

BUN, blood urea nitrogen; DGGR, 1,2-o-dilauryl-rac-glycero glutaric acid-(6'-methylresorufin) ester; fPL, feline pancreas-specific lipase; fT4, free thyroxine; GI, gastrointestinal; Hct, hematocrit; n, normal; PUPD, polyuria and polydipsia; T4, thyroxine; tCa, total calcium; UPC, urine protein-to-creatinine ratio; WBC, white blood cell.

TABLE 2 Gastrointestinal Diseases Associated With Chronic Vomiting in Cats

DISEASE	SIGNALMENT AND CLINICAL SIGNS	PHYSICAL EXAMINATION FINDINGS	POSSIBLE RELEVANT DIAGNOSTIC TEST RESULTS
ANATOMIC			
Obstruction (gastric or linear foreign body, trichobezoars, neoplasia)	History of foreign-body ingestion Long-hair coat Vomiting associated with food ingestion	Mass effect Intestinal plication String under tongue	Mass effect Intestinal plication
Pseudoobstruction (hypomotility)			Large, fluid-filled stomach on imaging
INFECTIOUS			
Bacterial (spiral bacteria)	Hyporexia, food aversion	Generally normal	Demonstration of organisms on biopsy (with lack of gross or histologic abnormalities in the small intestine)
Fungal (*Histoplasma* species)	Geographic location Outdoor/bird exposure Lameness Respiratory signs Weight loss	Anterior uveitis or chorioretinitis Bone pain Fever, jaundice Abnormal lung sounds Thickened intestines Splenomegaly	↓ Hct/WBC/platelets ↑ Globulins, ↓ albumin ↑ Liver enzymes Pulmonary infiltrates Thickened intestines, lymphadenomegaly FeLV positivity
Parasitic (*Physaloptera, Ollulanus, Ancylostoma, Toxocara, Toxascaris*, and *Dipylidium* species)	Hunter Outdoor exposure New cat or dog introduced into home Cattery History of fleas	Generally normal Thickened intestines	↑ Eosinophils Positive fecal test result Microscopic visualization in vomitus or gastric lavage samples Direct visualization
Viral (dry form FIP)	Outdoor exposure Multicat environment	Anterior uveitis or chorioretinitis Fever Thickened intestines Underweight	↓ Hct ↑ Liver enzymes and bilirubin ↑ Globulins without ↓ albumin Positive viral test results GI thickening, scant perinephric effusion
INFLAMMATORY/IMMUNE			
FRD	Behavioral changes Diarrhea Hyporexia, food aversion Polyphagia Weight loss	Dermatologic abnormalities Ill-kempt coat Thickened intestines Underweight	↑ BUN with normal creatinine ↓ Albumin ↑ Eosinophils GI thickening, muscularis thickening Response to diet trial
IBD (including ESF)	Behavioral changes Diarrhea Hyporexia, food aversion Polyphagia Weight loss	Ill-kempt coat Thickened intestines Underweight	↑ Eosinophils GI thickening ± muscularis thickening (primarily duodenal), loss of wall layering Mass effect (ESF)
NEOPLASTIC			
Carcinoma	Older animals Hyporexia, food aversion Polyphagia Weight loss	Mass effect Thickened intestines	Focal mass effect Gastric ulceration GI thickening/mass effect ± loss of wall layering
Lymphoma	FeLV positivity Diarrhea Hyporexia, food aversion Polyphagia Weight loss	Abdominal pain Nausea Mesenteric lymphadenomegaly Thickened intestines	Gastric ulceration GI thickening ± muscularis thickening (primarily jejunal), loss of wall layering, mass effect, mesenteric lymphadenomegaly

BUN, blood urea nitrogen; ESF, eosinophilic sclerosing fibroplasia; FeLV, feline leukemia virus; FIP, feline infectious peritonitis; FIV, feline immunodeficiency virus; FRD, food responsive disease; GI, gastrointestinal; Hct, hematocrit; IBD, inflammatory bowel disease; WBC, white blood cell.

of infectious and traumatic diseases decreases.[9] Cats with outdoor access often have greater exposure to parasites and retroviruses, although all cats should be considered at risk. Although these trends can help guide the formation of an appropriate initial diagnostic plan, atypical presentation is possible.

Cats with chronic vomiting should be assessed for the changes listed in **Box 1**. Polydipsia with polyuria should be differentiated from polydipsia in the absence of polyuria. The latter can result from increased GI water loss, which is not always accompanied by diarrhea. Fecal scoring charts should be reviewed with clients to determine fecal consistency. If present, diarrhea should be categorized (small, large, or mixed bowel) and the presence of blood determined. Weight loss should be subdivided into changes to fat stores, muscle mass, or both.

If GI disease is diagnosed, the feline chronic enteropathy activity index should be calculated to quantitate the severity of disease,[10] thereby facilitating more accurate evaluation of the patient's response to therapy.

PHYSICAL EXAMINATION

Although physical examination is often unremarkable in cats with chronic vomiting, abnormalities can aid in winnowing the differential list.

Cats with chronic GI disease are typically euvolemic but can have decreased **skin turgor** due to dermal aging changes or depletion of fat stores. Conversely, **oral mucous membranes** can be moist in dehydrated cats because of ptyalism. The **nictitans, sclera, and mucous** membranes should be carefully assessed for jaundice. The **base of the tongue** should be elevated to check for linear foreign bodies, particularly in younger cats and cats with a history of pica. The **breath** should be checked for uremic halitosis and the **mouth** surveyed for periodontal disease, calculus, ulcers, and masses. Complete **ophthalmic evaluation** might reveal anterior uveitis, chorioretinitis, vascular tortuosity, or retinal hemorrhage. The **ventral neck** should be carefully palpated for thyroid nodules.

Abnormalities on **thoracic auscultation or abdominal palpation** might alter initial testing. The thorax should be auscultated for cardiac murmurs, rhythm disturbances, and abnormal bronchovesicular sounds. Gentle but thorough abdominal palpation might reveal nausea (licking of lips, excessive swallowing, resistance to palpation), hepatomegaly, cranial abdominal pain, irregularity or asymmetry of the kidneys, an enlarged urinary bladder, or peritoneal effusion, increasing prioritization of abdominal imaging. Careful attention should be paid to GI abnormalities, such as diffuse thickening or mass effects.

Rectal temperature should be determined regardless of patient temperament; alterations such as hypothermia and fever generally suggest systemic disease. Hematochezia or melena might be identified on inspection of the thermometer or sedated rectal examination.

INITIAL DIAGNOSTIC TESTS

As noted above, the diagnostic approach for each case should be customized after assessment of the patient's history, physical examination findings (including metabolic stability), and differential diagnosis. The typical baseline diagnostics are discussed below. Although a second-tier test for most cases of chronic vomiting, abdominal radiography might be the initial diagnostic test performed when obstruction or an abdominal mass effect is suspected.

Fecal Flotation/Empirical Deworming

Fecal flotation and empirical deworming should be performed in all cases, regardless of outdoor exposure. A minimum of 2 g of feces, a solution with a specific gravity greater than 1.240, and centrifugation should be used for fecal flotation to decrease the likelihood of false-negative results (by up to 10-fold for some parasites).[11]

BOX 1. Pertinent Historical Changes in Cats With Chronic Vomiting

- Activity level and appetite
- Water intake
- Urine output
- Fecal consistency
- Weight
- Body and muscle condition score (eg, client reports that the cat is "hollow in the belly" or "skinny")
- Demeanor and activity, (eg, hyperactivity, irritability, pruritus, excessive vocalization)

A broad-spectrum parasiticide, such as fenbendazole (generally given for 3 days, repeated at 3 weeks and 3 months), should be administered in cases with negative fecal flotation results because of the poor sensitivity of this test.[12] In cases with direct or indirect flea exposure, treatment for *Dipylidium* species should also be administered. When *Physaloptera* species are suspected, multiple pyrantel treatments are recommended.[13]

Diet Trial

Half of cats in a study of chronic enteropathy experienced clinical cure after diet change, with almost immediate cessation of vomiting.[3] Other GI signs, if present, resolved in most cats within 3 days. Because serial diet trials often do not need to exceed 7 to 14 days each, it is reasonable to perform them before pursuing the remaining first-tier diagnostic tests in cats without evidence of systemic disease.

Although the phrase "diet trial" is often used interchangeably with the term "novel protein trial"—suggesting that FRD is uniformly triggered by protein sources—grains, feed additives, and nonspecified changes associated with commercial processing can trigger clinical signs in some cats.[3] Thus, over-the-counter and highly digestible diets can be used in addition to novel or hydrolyzed protein diets.

During each dietary trial, cats should not receive treats, human food, flavored medications, or vitamins or feast on prey. If clinical cure is noted, rechallenge with the cat's initial diet is important to determine whether long-term dietary modification is necessary to prevent recrudescence. In 1 trial, 40% of cats with FRD remained in clinical remission in the face of rechallenge with their initial diet, while the rest experienced recurrence of signs within 3 to 4 days.[3]

Noninvasive Blood Pressure Measurement

Hypertension may indicate the presence of systemic disease, such as chronic kidney disease or hyperthyroidism. To avoid misdiagnosis, blood pressure should be measured in a relaxed environment after a 10-minute acclimation period to the environment and personnel. Use of Doppler method is recommended because it has better accuracy and precision in awake cats compared with oscillometry.[14] Additionally, the coccygeal artery should be used in cats with low muscle condition scores because of a confounding influence of sarcopenia on radial artery measurements.[15]

Complete Blood Count

Normocytic, normochromic, nonregenerative anemia is a nonspecific finding. In contrast, regenerative anemia and microcytic, hypochromic anemia occur secondary to chronic GI bleeding, often without hematochezia or melena. Erythrocytosis in apparently euvolemic patients can result from hyperthyroidism,[16] although subclinical dehydration should be considered. Eosinophilia and basophilia are common in cats with GI disease and/or parasitism, but they are nonspecific findings.

Serum or Plasma Biochemical Profile

Abnormalities should be considered in light of magnitude, proportionality of change, and physical examination findings. For example, discordant increases in blood urea nitrogen and creatinine generally suggest GI bleeding but can also occur in cats with cachexia due to chronic kidney disease.

Discordant elevation of globulin over albumin might indicate systemic disease, while proportional elevation is more consistent with total body water losses and dehydration. Hypochloremia, hyponatremia, hypokalemia, and hypophosphatemia might occur as sequelae of vomiting, while hypercalcemia and hyperphosphatemia generally reflect underlying systemic disease. Ionized calcium measurement is occasionally necessary to differentiate between hemoconcentration-associated increases in total calcium and true hypercalcemia.

Liver enzyme activity increases are more significant in cats than in dogs because of shorter enzyme half-lives and the lack of a glucocorticoid-induced alkaline phosphatase isoform in this species. Discrimination between hepatocellular and cholestatic liver enzyme patterns is a crucial step to guide clinical reasoning. Additional information regarding liver enzyme assessment can be found in McAtee and Lidbury.[17]

Urinalysis

Urine concentration should be interpreted in light of the water content of the patient's diet, as well as the patient's hydration status. Minimally concentrated urine in a cat eating a dry commercial diet suggests extragastrointestinal disease. Proteinuria should be quantified by urine protein:creatinine ratio in patients with negative urine sediment and culture results, with values 0.2 to 0.4 considered borderline proteinuria and >0.4 considered

significant proteinuria. If proteinuria is present, thorough evaluation for systemic disease is generally warranted before pursuing primary GI disease.

Heartworm and Retroviral Testing

Geographic location dictates prioritization of heartworm testing, although it should be considered a first-tier test in areas where heartworms are endemic. Serum antigen testing is generally considered more specific but less sensitive than antibody testing[18] because it assesses the presence of worm antigen versus historical exposure. However, a recent study found serum antigen testing to be more sensitive and specific than serum antibody testing.[19] Combination testing has the highest sensitivity, although false-negative results still occur.[20]

Retroviral status should be confirmed as part of initial diagnostic screening, even for indoor-only cats.[21] Confirmatory testing is recommended for cats that are positive on initial screening. Care should be taken to ascertain FIV vaccination status because not all point-of-care antibody tests can accurately differentiate between prior vaccination and infection.[22] A positive FIV result from an antibody test with unknown differentiation ability should be confirmed via Western blot or polymerase chain reaction (PCR).

Thyroid Hormone Quantitation

Screening for hyperthyroidism is warranted regardless of age, given reports of clinical hyperthyroidism in cats as young as 8 months.[23] Measurement of total thyroxine (T4) concentration is diagnostic for hyperthyroidism in approximately 95% of cases. Free T4 concentration determination is recommended for cats suspected of hyperthyroidism that have total T4 concentrations in the upper half of the reference range. Elevated free T4 in the presence of total T4 measurements in the upper half of the reference range suggests hyperthyroidism.[24]

SECOND-TIER DIAGNOSTIC TESTS

If the cause of vomiting remains unknown after completion of the preceding tests, second-tier diagnostics are warranted.

Abdominal Imaging

To optimize diagnostic accuracy, abdominal radiography and ultrasonography should be performed after a routine fast. Inadequate fasting particularly complicates assessment for motility disorders.

Radiographs are evaluated for alterations in organ size, the presence of mass effects and foreign bodies, GI abnormalities suggestive of obstruction or motility disorders, and peritoneal effusion. Such findings are generally specific, although their absence does not rule out significant disease.

Advantages of **ultrasonography** in evaluation of patients with GI signs include the ability to detect homogenous and heterogenous changes to the parenchyma of various viscera; visualize the biliary tree and its path through the pancreas; differentiate between the GI lumen and various layers of the wall, as well as localize and quantitate any thickening present; assess intestinal motility, corrugation, and plication; identify mesenteric lymphadenomegaly, foreign bodies, and masses; and guide noninvasive tissue and fluid sampling. Care should be taken in differentiating between dilatation and simple dilation of the common bile duct (an aging-related change in cats).

Assuming hyperthyroidism has been ruled out, **changes in GI wall layering or thickness suggest primary GI disease** (eg, FRD, IBD, neoplasia, histoplasmosis). It is generally accepted that small intestinal wall thickening of 0.28 cm or greater is clinically significant; such thickening has been associated with both lymphoma and IBD.[1,2,25,26] Wall thickening can be focal, diffuse, or segmental. Although focal thickening can suggest neoplasia, ulceration and IBD also can be associated with focal defects and warrant consideration. Segmental thickening has been found with multiple abnormalities, such as concurrent IBD and lymphoma.[26] Thickening can affect all wall layers or specific layers (**Figure 1**). Thickening of the muscularis propria (greater than half the thickness of the submucosa) is more likely in cats with lymphocytic lymphoma, although it

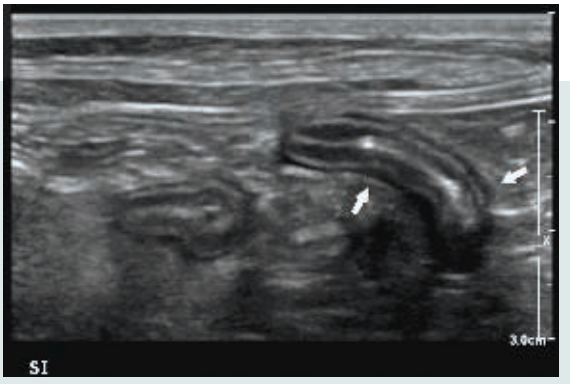

FIGURE 1. Diffuse muscularis thickening (**arrows**) in a cat with chronic vomiting diagnosed with hyperthyroidism.

also can be seen in normal cats or those with IBD.[27] Additionally, loss of intestinal wall layering, mass-like lesions, and/or reduced wall echogenicity have been associated with lymphoblastic lymphoma.[27]

Markers of Dysbiosis, Vitamin Deficiency, and Pancreatic Inflammation

Hypocobalaminemia is present in 61% of cats with primary GI disease,[28] and vomiting has been reported as the only clinical sign in some cats with hypocobalaminemia.[29] Hypocobalaminemia also has been reported in cats with extragastrointestinal disease, such as hepatitis and hyperthyroidism.[27,30,31] It is important that cobalamin deficiency be detected and addressed because failure to do so can result in persistence of clinical signs despite treatment of the primary disease.[27] Some cats have been diagnosed with clinical cobalamin deficiency based on the presence of increased methylmalonic acid concentrations without hypocobalaminemia.[28] Consequently, supplementation should be considered for cats with values in the low end of the reference range.

Folate is absorbed in the proximal small intestine only. Elevated serum folate concentrations can be secondary to small intestinal bacterial overgrowth (resulting from GI disease or dysbiosis) or coprophagia (feces have high folate concentrations).[32] Decreased serum folate concentrations can be secondary to focal proximal or diffuse small intestinal disease, but they also have been noted in cases of pancreatitis or cholangiohepatitis.[27] Low serum folate concentrations also can be seen in clinically healthy cats.[27]

Concurrent low cobalamin and folate concentrations have been associated with severe diffuse GI disease.[33] Some patients with high serum folate and low cobalamin concentrations experience normalization of folate concentrations after cobalamin supplementation.[29] Reevaluation of folate concentration after correction of hypocobalaminemia might, therefore, be prudent in some cases.

Exocrine pancreatic disease can be divided into exocrine pancreatic insufficiency (EPI) and pancreatitis. EPI is diagnosed based on decreased serum **trypsin-like immunoreactivity concentration**. Although feline EPI historically has been considered rare, the apparently low prevalence could reflect inadequate surveillance for the disease, according to a recent report.[34] Clinical signs in cats with EPI in that report included poor body condition, weight loss, loose stools or diarrhea, and polyphagia, but also lethargy, anorexia, and vomiting. The study found a high frequency of low cobalamin and high folate concentrations.

Elevated trypsin-like immunoreactivity also can be seen in cats with small intestinal disease, pancreatitis, and kidney failure. Sensitivities (42% to 80%) and specificities (63% to 100%) of the validated lipase assays for pancreatitis vary dramatically, depending on the criteria for diagnosis (histologic inflammation, clinical signs and ultrasonographic changes, or some combination thereof).[35–38] A semiquantitative point-of-care feline pancreatic-specific lipase test is available, but its sensitivity, specificity, and accuracy have not been independently validated. None of the biomarkers for pancreatic inflammation are a substitute for clinical judgment, and clinical signs and other diagnostic test results should be integrated into the diagnosis of feline pancreatitis.

Urine *Histoplasma* Antigen

Histoplasma urine antigen concentration (**miravistalabs.com**) should be quantitated in cases with appropriate clinical history and exposure, laboratory findings, and abdominal imaging changes. *Histoplasma* infections primarily occur in the Ohio River Valley and southeastern United States. The assay has good sensitivity (94.4%), although negative test results do not rule out infection.[39] Cross-reactivity with other systemic infectious agents is possible.[39]

Helicobacter Species Testing

Helicobacter species have been identified in biopsy specimens from both clinically ill and healthy cats.[40–44] Prevalence increases with age,[43] although the organisms have been noted in animals as young as 6 weeks.[45] Because of the high prevalence of *Helicobacter* species within healthy populations, treatment is generally withheld unless concurrent histopathologic abnormalities have been identified and other causes of gastritis have been ruled out.[45] Treatment consists of multimodal antibiotics with or without gastric acid suppression.[45–47]

WHEN TO RECOMMEND ENDOSCOPY

Direct evaluation of the GI tract should be considered when the preceding testing does not reveal a systemic cause for vomiting and diet trials have failed or the cat has evidence of focal disease that warrants focused

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investigation. This can be accomplished via endoscopy, laparoscopy, or laparotomy. The decision to perform endoscopy over laparotomy is multifactorial, and advantages of each approach are listed in **Box 2**.

Investigating Imaging Findings

No Abnormalities

Endoscopy is generally preferable as an initial sampling technique for patients without abnormalities on imaging because it is less invasive and might reveal focal mucosal lesions that would be missed by laparotomy.

Diffuse Changes

Endoscopy should be considered for cases with diffuse or accessible focal GI changes, whereas laparotomy is prioritized for patients with ultrasonographic abnormalities limited to the jejunum. Although the muscularis is inaccessible endoscopically, **thickening on ultrasonography does not necessarily dictate use of more invasive sampling techniques,** such as laparotomy. Diffuse ultrasonographic thickening is often associated with IBD and lymphoma (**Figure 2**),[49,50] which are regularly diagnosed via endoscopic biopsy.

Focal Thickening

Focal thickening of the muscularis propria has been associated with mast cell tumor,[51] which might be amenable to endoscopic sampling depending on location. Because muscularis thickening can occur in cats without GI disease, sampling is not warranted in the absence of clinical signs.[52] Similarly, although focal mass effects on examination or diagnostic imaging are most suggestive of neoplasia, disorders such as GI eosinophilic sclerosing fibroplasia and (rarely) fungal infection should not be overlooked. Because the location of lesions can substantially complicate surgical removal and positive, long-term responses can be achieved by using a combination of diet and medical therapies,[53] it is reasonable to rule out GI eosinophilic sclerosing fibroplasia via endoscopy before proceeding to laparotomy.

Identifying Lesions for Surgery

Endoscopy can be useful for localizing and targeting mucosal lesions for surgical intervention, although it is very reasonable to proceed directly to laparotomy in cases with concurrent abnormalities in the liver, pancreas, or other organs. If financial limitations are present,

BOX 2. Advantages of Endoscopy versus Laparoscopy or Laparotomy[48]

Advantages of endoscopy

- Allows direct, continuous visualization of the gastrointestinal tract (**Figure A**) without disruption of normal anatomy, thereby enhancing detection of:
  - Primary and secondary esophageal diseases (eg, esophagitis)
  - Gastroduodenal reflux
  - Erosions and ulcerations
  - Multifocal and highly localized lesions
  - Alterations in gastrointestinal motility
- Uses natural orifices for access, allowing more rapid recovery and avoiding risk of dehiscence

Advantages of laparoscopy or laparotomy

- Ability to obtain full-thickness samples
- Ability to sample neighboring structures (eg, liver, pancreas, regional lymph nodes)
- Ability to access lesions aborad to approximately 50% of the duodenum or orad to the ileum
- Ability to achieve cure through surgical resection of focal neoplasms or other masses

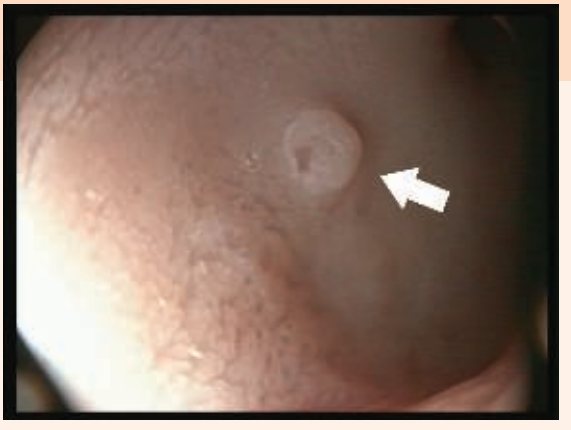

FIGURE A. Endoscopic image of a prominent duodenal papilla (**arrow**) and generalized mild duodenal edema in a cat with chronic hyporexia and vomiting due to lymphocytic IBD.

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laparotomy with biopsies of all possibly affected organs is generally recommended to avoid missing the primary disease process or a chance to achieve surgical cure.

Collecting Samples for Biopsy

Endoscopically collected biopsy samples can be both highly sensitive and specific for GI disease, depending on the histologic quality of the samples.[48] To be considered histologically adequate, samples must contain 3 or more villi and lamina propria extending to the mucosa–muscularis mucosa border. A 99% likelihood of detecting cellular infiltrates and villus blunting in the stomach and duodenum can be achieved with as few as 6 adequate samples;[54] if samples are histologically inadequate, 18 to 26 specimens are required for this level of confidence. Histologic quality cannot be determined on the basis of gross appearance; therefore the endoscopist should collect a reasonable number of biopsy samples and follow best practices for sample alignment to avoid overlooking a subtle lesion.[48]

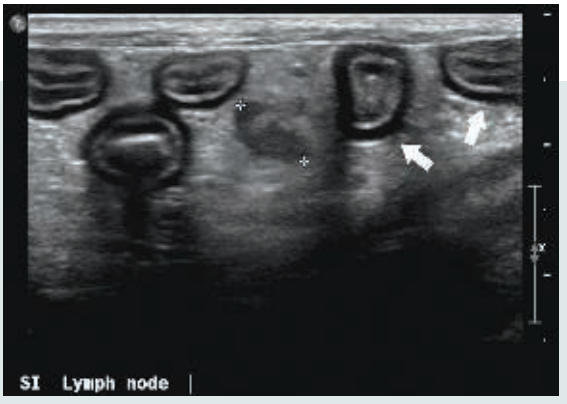

FIGURE 2. Diffuse muscularis thickening (**arrows**) and lymphadenopathy (**caliper markings**) in a cat with chronic vomiting due to lymphoma.

Sensitivity of endoscopic biopsy for detection of lymphoma does not vary according to sample quality,[54] although distinguishing between lymphoma and lymphoplasmacytic enteritis can be difficult regardless of sample quality.[55] The use of immunohistochemistry and PCR for antigen receptor rearrangements can help differentiate between the two differentials.[56–59] Simultaneous collection of ileal biopsy specimens increases the chance of detecting regional disease, particularly with regard to ileal lymphoma.[60] Because this necessitates colonoscopy, clinical judgment should be used in deciding whether the increase in patient preparation, anesthesia time, costs, and potential complications is warranted.

CONCLUSION

Chronic vomiting in cats is a frustrating condition, and accurate diagnosis hinges on use of a systematic approach. Endoscopy is warranted after systemic diseases have been ruled out, particularly in cases without solitary jejunal disease. In the absence of other findings, the presence of muscularis thickening does not indicate a need for laparotomy. As technology advances and endoscopy becomes more sophisticated, it may become more useful or reliable in obtaining samples and performing interventional techniques. TVP

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Chronic Vomiting in Cats: When to Recommend Endoscopy

LEARNING OBJECTIVE

After reading this article, participants will be able to categorize common causes of chronic vomiting in cats, create a systematic diagnostic plan, and distinguish when endoscopy is warranted.

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1. **Vomiting can be distinguished from regurgitation by**
   a. association with eating.
   b. presence of food in vomitus.
   c. frequency of occurrence.
   d. presence of nausea or ptyalism.

2. **_____ testing has the highest sensitivity for detecting heartworm infection in cats.**
   a. Modified Knott
   b. Serum antibody
   c. Serum antigen
   d. Serum antibody with antigen

3. **Thyroid hormone quantitation should be performed in _____ cats with chronic vomiting.**
   a. juvenile
   b. adult
   c. geriatric
   d. all

4. **Diffuse thickening of the muscularis mucosa without concurrent clinical signs of disease necessitates advanced diagnostics such as endoscopy.**
   a. True
   b. False

5. **Ultrasonographic small intestinal thickening of _____ cm is generally considered clinically significant.**
   a. ≥0.08
   b. ≥0.10
   c. ≥0.18
   d. ≥0.28

6. **A duration of _____ is appropriate for a diet trial to rule out food responsive disease in most cats.**
   a. 2 days
   b. 2 weeks
   c. 2 months
   d. 4 months

7. **Approximately what percentage of cats with food responsive disease relapse when rechallenged with their original diet?**
   a. 25%
   b. 50%
   c. 75%
   d. 100%

8. **Tissue in which area of the gastrointestinal tract is inaccessible via endoscopy?**
   a. Stomach
   b. Duodenum
   c. Ileum
   d. Jejunum

9. **Because endoscopy does not allow collection of full-thickness biopsy specimens, it has low diagnostic value for cases with diffuse muscularis propria thickening.**
   a. True
   b. False

10. **Fenbendazole is ineffective for treatment of which of the following parasites?**
    a. *Ancylostoma* species
    b. *Dipylidium* species
    c. *Toxascaris* species
    d. *Trichuris* species

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