

Chronic Vomiting in Dogs and Cats: The Roles of Ultrasonography in Diagnosis and *Helicobacter* in Treatment

Michael Leib, DVM, MS, DACVIM

**Virginia-Maryland Regional College of Veterinary Medicine
Blacksburg, VA**

Chronic vomiting (intermittently or continuously for at least 7 days) in dogs and cats is a common and frustrating problem for clients and veterinarians. Because many diseases cause chronic vomiting, a thorough evaluation must be performed to arrive at an accurate diagnosis. Definitive diagnosis of many diseases requires mucosal biopsy. In the past, exploratory celiotomy was necessary to obtain biopsy specimens. However, the increased availability of flexible fiberoptic endoscopy in veterinary medicine has allowed less invasive tissue biopsy.

The first step in the approach to the chronically vomiting patient is to determine that vomiting and not regurgitation is present. Vomiting is associated with signs of nausea (depression, salivation, frequent swallowing, and vocalization in some cats) that is followed by abdominal contractions prior to the expulsion of material. Regurgitation is associated with esophageal disorders and occurs passively, usually associated with increased intrathoracic pressure that may be caused by excitement, activity, or changes in body position.

Once you have determined vomiting is present the history and physical examination can contain many clues to the etiology. A thorough dietary history should be obtained. In some cases, correcting dietary indiscretion or instituting a highly digestible diet for 3-4 weeks will resolve the vomiting. Dietary indiscretion can be due to a recent diet change, feeding of table scraps, free-roaming behavior allowing ingestion of garbage, ingestion of foreign objects, exposure to toxins (including house plants), excessive ingestion of hair, or feeding a low quality poorly digestible diet. The history may identify the use of drugs, such as NSAIDs, that can cause vomiting due to gastritis or ulceration. The presence of diarrhea or signs of systemic disease may help to rank the rule-out list.

Physical examination may be normal or only demonstrate signs of weight loss. An abdominal mass or dilated loop of small bowel may be identified as a cause of high partial small bowel obstruction. If vomiting has recently become more frequent, signs of dehydration may be present (delayed capillary refill time, enophthalmos, decreased skin turgor, tachycardia, pale mucous membranes, and cold extremities). Signs suggesting systemic disease include: polyuria / polydipsia, polyphagia, hepatomegaly, cataract formation, icterus, encephalopathy, ascites, pyrexia, bradycardia, tachycardia, small irregular kidneys, oral ulceration, pale mucous membranes, splenomegaly, or an abdominal mass.

Table 1 lists some causes of chronic vomiting in dogs and cats. Systemic diseases can usually be ruled out by a thorough history, careful physical examination and routine laboratory tests (complete blood count, biochemical profile, urinalysis, amylase, lipase, and cPLI, heartworm antibody test, and T4). Correction of dietary indiscretion or a 3-4 week trial with a highly digestible diet should be performed before more invasive testing. Gastrointestinal causes of chronic vomiting may involve either the stomach or oral small intestine. An efficient plan to evaluate gastrointestinal causes includes fecal examination for parasites, survey abdominal radiography, and endoscopic examination with mucosal biopsy. If endoscopy is not available, a barium contrast upper GI series and exploratory laparotomy can be used (Table 2). Although helpful in some cases, the diagnostic utility of abdominal ultrasound has not yet been fully determined. Abnormalities that can be detected include thickened stomach or small bowel, gastric, small bowel or pancreatic mass, enlarged regional lymph nodes, enlarged hypoechoic pancreas, dilated small bowel, abnormal gastric or small bowel motility, or evidence of an intraluminal foreign body.

Survey abdominal radiographs rarely establish a cause for chronic vomiting (unless a radiodense foreign body is seen) and a barium upper GI series is usually indicated. Advantages of contrast radiography versus endoscopy and laparotomy include the following: 1) available in all practices, 2) noninvasive, 3) does not require general anesthesia, 4) always visualizes the duodenum, 5) evaluates gastric size and position, 6) provides a qualitative description of gastric motility and emptying of liquids, and 7) detects extraluminal and submucosal / muscular masses. A barium series is time consuming to perform, costly to the client, and is a source of radiation exposure to the hospital staff. If lesions are identified, tissue biopsy is needed to confirm a diagnosis. If a foreign body is detected, it must be removed via endoscopy or exploratory laparotomy. The upper GI series is insensitive for mucosal lesions.

Abdominal ultrasonography has recently been added to the diagnostic plan for many dogs and cats with chronic vomiting or chronic diarrhea. Ultrasound has been shown to be very helpful in animals with a mass lesion, especially neoplasia. An ultrasound guided fine needle aspirate or tru-cut biopsy can be performed. Ultrasound has also been shown to be helpful in cases with chronic pancreatitis. Other advantages of ultrasound include: being noninvasive, imaging of the liver and biliary system, imaging of the small and large bowel and mesenteric lymph nodes, and assessment of the layers of the GI tract and its motility. Disadvantages include the need for expensive equipment and specialized training, interference by gas within the GI tract, and difficulty in imaging the pancreas.

A recent study has been performed in which the diagnostic utility of abdominal ultrasound in dogs with chronic vomiting has been evaluated. A single radiologist performed each abdominal ultrasound. Two internists, who did not directly participate in case management, reviewed each medical record. In each case, the contribution the ultrasound made towards the final diagnosis was assessed and scored from 1-5, based on the following scale:

1. Diagnosis was obtained via ultrasonography (including ultrasound-guided aspirate or biopsy). Additional biopsy via endoscopy or exploratory celiotomy was not necessary.
2. Ultrasonography provided data that suggested endoscopy was not indicated and exploratory celiotomy should be performed to obtain a diagnosis. Ultrasonography suggested how to obtain a tissue biopsy, making it very important for diagnosis.
3. Ultrasonography provided important diagnostic information that helped assess other data, including endoscopic findings. Ultrasonography was important in arriving at a diagnosis.
4. Ultrasonography provided descriptive information that did not affect assessment of other data obtained via endoscopy or exploratory celiotomy. The same diagnosis would have been reached without performing ultrasonography.
5. Ultrasonography provided conflicting information that did not support, or may have hindered obtaining the final diagnosis.

In the group of dogs with chronic vomiting, the following factors were associated with a higher diagnostic utility of abdominal ultrasound: presence of weight loss, higher percentage of body weight lost, increasing age, increasing duration of vomiting, an increased frequency of vomiting/week, and a final diagnosis of GI lymphoma or gastric adenocarcinoma. Based on diagnostic utility scores, abdominal ultrasonography was vital or beneficial to obtaining a diagnosis in 22.5% of cases, not helpful in 68.5%, and of marginal value in 9%. Considering all contributions to case management (including factors unrelated to the vomiting problem), abdominal ultrasound was considered helpful in 27% of dogs with chronic vomiting.

Exploratory celiotomy can be performed in veterinary hospitals and allows visual inspection of serosal surfaces, palpation of the stomach and small intestine, and limited mucosal visualization. It also allows for exploration and biopsy of the pancreas, mesenteric lymph nodes, and the entire small and large intestines. Directed large full-thickness biopsies can be obtained from the stomach and small intestine. Definitive treatment for some conditions (foreign bodies and tumors) can be accomplished. A duodenal aspirate for *Giardia* can be collected. Disadvantages include the need for general anesthesia, the surgical risk to the patient, post-operative morbidity and the risk for complications, and expense to the client.

Endoscopic examination lacks some of the disadvantages of the upper GI series and exploratory laparotomy. Advantages include the following: 1) visual mucosal inspection of the entire stomach and some of the duodenum, 2) directed tissue biopsy, 3) few false-negative procedures (related to the endoscopist's skill), 4) less invasive than laparotomy, 5) quick to perform, 6) the ability to remove foreign bodies, 7) assessment of the feasibility of surgical resection of tumors, and 8) ability to obtain a duodenal aspiration sample for *Giardia*. Disadvantages include the cost of equipment, the clinical skills necessary to perform endoscopy, the small size of biopsy samples, biopsy of mucosa only, the inability to resect masses, failure to enter the duodenum, evaluation of the oral small bowel only, and the necessity of general anesthesia. Because of the usefulness of endoscopy in cases with chronic vomiting, the author routinely performs endoscopy (and reaches a diagnosis) instead of performing a barium upper GI series or exploratory laparotomy.

Thorough endoscopic examination of the stomach and duodenum of the dog and cat can be performed with a flexible fiberoptic gastroscope with an outside tip diameter of <10 mm or less. Four-way control of the tip of the endoscope is necessary. Biopsy channels of 2.8 mm in diameter or greater will provide adequate biopsy samples for histologic evaluation and accept a wide range of foreign body forceps.

The endoscopic examination is performed after an overnight fast with the animal under general anesthesia and placed in left lateral recumbency. The endoscope should only be advanced if the gastrointestinal lumen is clearly visible, reducing the possibility of tissue perforation. The endoscope is passed through the lower esophageal sphincter into the cardiac region of the stomach. Initial assessment of the rugal folds should be made before insufflation and gastric distention. Gastric mucosa appears pinker than esophageal mucosa. It is smooth, glistening, and tough. The endoscope is advanced along the greater curvature until the angularis incisura is located. Deflection of the endoscope tip towards the antrum (control knob down) will allow visualization of the antral and pyloric region. Movement of the tip towards the cardia (control knob up) will provide a retroflexed view of the gastric body, fundus and cardia. To enter the duodenum, the scope should be advanced towards the pylorus and gently pushed through. If difficulty is encountered, rolling the animal into dorsal recumbency may allow successful passage. The duodenal mucosa has a more granular appearance than the stomach and is slightly paler. A duodenal aspirate for *Giardia* should be performed.

If abnormalities are found, multiple biopsies of lesions should be taken. If gross abnormalities are not present, biopsies of standard regions should be obtained (cardia, greater curvature, angularis incisura, antrum, pylorus, and duodenum). A biopsy sample should be placed in a rapid urease test to detect the presence of *Helicobacter spp.* Multiple samples can be placed into the test media, although the author routinely places a single biopsy from the angularis into a CLO test (Tri-Med Specialties Inc. 9531 Arden, Lenexa, KS 66215, 800 874 6331). Foreign bodies can be removed with grasping forceps. In addition, brush cytology of lesions may allow rapid diagnosis.

By following the diagnostic plan outlined above, most cases with chronic vomiting can be efficiently diagnosed, allowing for development of an appropriate therapeutic plan. Systemic diseases should be thoroughly evaluated before more invasive and expensive tests are performed. Correction of dietary indiscretion or institution of a highly digestible diet may eliminate clinical signs. The use of endoscopy allows a less invasive, more efficient and accurate diagnosis of gastrointestinal causes of chronic vomiting to be reached. Serious complications such as perforation of the stomach are very uncommon and can be avoided with careful endoscopic technique.

Helicobacter gastritis in dogs

Helicobacter pylori infection is the most common cause of chronic gastritis and peptic ulceration in humans. It is also associated with an increased risk of gastric lymphoma and adenocarcinoma. Spiral bacteria were described in 1896 in humans and several animal species. They were “rediscovered” in 1983 when they were reported to cause of peptic ulceration in humans. *Helicobacter pylori* is a microaerophilic curved spiral gram negative organism with 4 flagella. The bacterium lives in gastric mucus, can attach to epithelial cells, and may penetrate intercellular junctions. High bacterial urease concentration cleaves urea to produce ammonia, which helps to neutralize the acid environment surrounding the bacterium. The immune system does not result in removal of the organisms; without treatment infection is life-long. Some studies have shown as many as 90% of people are infected with *H. pylori*. Luckily, most infections are not associated with clinical signs. Diagnosis can be made with serology, cytology of gastric mucus, culture of biopsies, histopathology of biopsies with H&E or silver stains, C-13 or C-14 labeled urea breath tests, or rapid urease tests. Many treatments have been studied, but the gold standard to which they are all compared to is omeprazole, ampicillin or tetracycline, metronidazole, and bismuth for 2 weeks.

Many species of spiral bacteria have been identified in dogs and cats: *H. felis*, *H. pylori*, and *H. Heilmannii* (formerly called *Gastrospirillum hominis*), *H. Salomonis*, and *H. bizzozeronii* are the most common. Experimentally, infection has been established in both dogs and cats and lymphoid follicular gastritis developed. However, in these experimental studies, clinical signs were absent or very mild. Several surveys of laboratory, shelter, and pet populations (with and without GI signs) have shown a very high prevalence rate in dogs and cats, nearing 100% in some studies. Peptic ulceration is very rare in dogs and cats, demonstrating the pathophysiologic difference between *H. pylori* and the spiral bacteria commonly found in dogs and cats. Little is known about the effects of treatment of dogs and cats with chronic vomiting and *Helicobacter spp.* infection. At the present time there are many unanswered questions regarding *Helicobacter* in dogs and cats. Some questions include: 1) What is the relationship between *Helicobacter* and dogs and cats with chronic gastritis and vomiting? 2) What is the optimal treatment to eradicate the organism? 3) After treatment, is reinfection or recrudescence a common occurrence in dogs and cats? 4) What factors can help predict if a dog or cat with chronic gastritis and *Helicobacter* would benefit from treatment for *Helicobacter*? 5) Does *Helicobacter* have a role in other diseases such as gastric cancer and inflammatory bowel disease?

Because of the potential pathophysiologic relationship between *Helicobacter spp.* in dogs and cats and chronic gastritis and vomiting, the author has treated clinical cases for *Helicobacter*. In some cases, treatment has resulted in resolution or improvement in clinical signs. Until additional studies about *Helicobacter* in dogs and cats are available, it seems prudent to at least determine if spiral bacteria are present in dogs and cats with chronic vomiting, during gastroscopic examination or exploratory celiotomy. Spiral bacteria can be identified in gastric biopsy or brush cytology specimens, or indirectly identified by rapid urease testing of gastric mucosal samples. Obtaining results from histologic evaluation of biopsy samples requires 24-72 hours. Results of rapid urease tests and gastric brush cytology are available much sooner.

I have completed a clinical study comparing 2 treatments for *Helicobacter* in dogs. Dogs with chronic vomiting for at least 2 weeks, with *Helicobacter spp.* identified in gastric biopsy samples and gastritis, with or without inflammatory bowel disease, were entered into the study. The diagnostic workup included a CBC, biochemical profile, UA, fecal examination, abdominal ultrasonography, gastroduodenoscopy with mucosal biopsy, gastric cytology, and CLO test. Dogs with systemic diseases, gastric foreign bodies, gastric / duodenal neoplasia, pyloric hypertrophy, or *Physaloptera* infection were not eligible for the study. Dogs were randomly assigned to receive either triple therapy (amoxicillin 15 mg/kg, metronidazole 10 mg/kg, and Pepto Bismol tablets [(<5 kg; 0.25 tablet, 5-9.9 kg; 0.5 tablet, 10-24.9 kg; 1.0 tablet, and >25 kg; 2.0 tablets]) or quadruple therapy (triple therapy plus famotidine 0.5 mg/kg). All drugs were given BID for 2 weeks. Owners kept a daily diary of clinical signs and endoscopy was repeated 4 weeks and 6 months after treatment was completed. Results of the study have not yet been published but have been reported in abstract form. Six months after completing either therapy, approximately 40% of dogs had gastric biopsy specimens that were negative for *Helicobacter*. There was no difference between the 2 treatments in the percentage of dogs that remained negative. Both treatments reduced the frequency of vomiting by approximately 85%. Dogs that were negative for *Helicobacter* had a greater reduction in vomiting frequency that those that were positive and almost 80% of this group had at least a 90% reduction in vomiting frequency.

Because of the high rate of treatment failure in this study after 6 months, I have been investigating the use of clarithromycin based protocols; clarithromycin (7.5 mg/kg BID), in combination with amoxicillin (15 mg/kg BID) or omeprazole (0.7mg/kg SID).

Unfortunately, preliminary data 4 weeks and 6 months after completion of therapy appears to be similar to triple or quadruple therapy. Overall reduction in vomiting was about 80%, but only about 40% of dogs negative for *Helicobacter* had at least a 90% reduction in vomiting frequency. Additionally a recent study treated a small number of dogs and cats for 3 weeks using triple therapy. Eradication results were encouraging.

It will take many controlled clinical studies before we can understand the potential role of *Helicobacter* in dogs and cats with chronic gastritis, and can answer many of the questions I have proposed. Although treatment of *Helicobacter* offers another, and very different, therapeutic route for animals with chronic gastritis, we must remember that a direct cause and effect relationship between *Helicobacter* and chronic gastritis has not yet been established in dogs or cats. Failure of a patient to rapidly respond to antimicrobial treatment suggests that something besides *Helicobacter* is causing the chronic gastritis and vomiting. Presently, based on current evidence, I recommend 3 weeks of therapy with clarithromycin, amoxicillin, and omeprazole.

Table 1 - Some causes of chronic vomiting

Systemic

- Diabetes mellitus
- Chronic renal failure
- Hepatobiliary diseases
- Chronic pancreatitis
- Feline hyperthyroidism
- Hypoadrenocorticism
- Lead poisoning
- Feline heartworm disease
- Systemic mastocytosis
- Drug therapy: NSAID

Gastrointestinal - stomach

- Chronic gastritis
 - Dietary indiscretion
 - Hair-induced
 - Plasmacytic lymphocytic
 - Eosinophilic
 - *Helicobacter*
- Foreign body
- Ulcer
- Neoplasia
- Pyloric hypertrophy
- *Physaloptera*
- Gastric motility disorder

Gastrointestinal - small intestine

- Inflammatory bowel disease
 - Plasmacytic-lymphocytic
 - Eosinophilic
- Partial obstruction-stagnant loop syndrome
 - Neoplasia
 - Foreign body
 - Intussusception
 - Extra-luminal obstruction
- Diffuse mucosal lymphosarcoma
- Histoplasmosis
- Ulcer

Table 2: Comparison of diagnostic modalities

Diagnosis	Survey Rad	Barium UGI	Ultrasound	Endoscopy	Exp Surgery
Dietary indiscretion intolerance	-	-	-	-	-
Gastritis	-	-	-	++++	++++
IBD	-	-	-	++++	++++
Foreign body	++	++++	+/++	++++	++++
Neoplasia diffuse	-	++	+/++++	++++	++++
Neoplasia nodular	-	++	+/++++	++++	++++
Pyloric hypertrophy	-	++	+/++	++++	++++
Motility disorder	-	+++	+/+++	++	++

Chronic vomiting case 1

Signalment

Himalayan, 3.5 years, NM

History

- Chronic intermittent vomiting for 1 year
- Food followed by mucus
- Several hours after eating
- Frequency: 2 x / week, progressed to once every day
- Vomiting associated with abdominal contractions and retching
- No weight loss, good appetite, no diarrhea
- Diet: c/d and table scraps

Physical examination

Normal

Regurgitation or vomiting (circle one)

Differential diagnosis

- Systemic Heartworm disease
- Liver diseases
- Hyperthyroidism
- GI Dietary indiscretion
- Hair-induced gastritis / duodenitis
- Chronic gastritis
- IBD
- Gastric foreign body

Diagnostic plan

- CBC, biochemical profile, UA, heartworm antibody, T4, fecal
- +/- abdominal radiograph
- +/- abdominal ultrasound
- Endoscopy
- Upper GI barium series
- Exploratory laparotomy

Diagnostic results/diagnosis

- MDB - normal
- HW antibody - neg
- T4 - 2.4 (1-2.5)
- Fecal - neg x2, large amount of hair
- Endoscopy - granular / friable duodenum, duodenal aspirate neg for *Giardia*, CLO – neg
- Histopathology - normal stomach, mild IBD in SI

Diagnosis

- Dietary indiscretion?
- Hair-induced gastritis / duodenitis?
- IBD?

Therapy

- Hypoallergenic diet - d/d, frequent grooming, no table scraps
- FU 4 weeks - rare vomiting, challenge with c/d - no vomiting

- FU 1.5 yrs - vomiting associated with table scraps

Chronic vomiting case 2

Signalment

6 year old, MN, Shetland sheepdog

History

- Vomiting 1x / q48H for 2 years
- Yellow foam, twigs
- Vomiting associated with abdominal contractions
- Normal appetite, no diarrhea
- Present diet: Purina EN, fruits and vegetables
- HW: Filarabits plus

Physical examination

Normal

Regurgitation or vomiting (circle one)

Differential diagnosis

- Systemic No likely rule outs
- GI Dietary indiscretion
- Chronic gastritis
- Inflammatory bowel disease
- *Physaloptera*
- Gastric foreign body

Diagnostic plan

- CBC, biochemical profile, UA (anesthesia workup)
- Fecal
- +/- abdominal ultrasound
- +/- abdominal radiograph
- Endoscopy
- +/- upper GI barium series
- exploratory laparotomy

Diagnostic results/diagnosis

- CBC, biochemical profile, UA - normal
- Endoscopy - mucosal follicles, superficial erosions, granular duodenum, CLO pos
- Histopathology - gastritis, IBD, spiral bacteria

Therapy

- Triple therapy- amoxicillin, metronidazole, Pepto Bismol BID x 14 days
- Continue EN, avoid table food
- FU 6 weeks - vomited 3x, normal endoscopy, normal histopathology, CLO neg, silver stain neg
- FU 6 months - Vomited 4 times, added fruits, cheese, dog treats, and hot dog!
- Endoscopy - stomach contained grass and bird seed, CLO neg, histopathology normal

References

- Leib MS, Larson MM, Panciera DL, et al. Diagnostic utility of abdominal ultrasonography in dogs with chronic vomiting. *J Vet Int Med* 2010; 24: 803-808.
- Leib M. Diseases of the stomach. In: Leib MS, Monroe WE (ed.). *Practical Small Animal Internal Medicine*. Philadelphia, W B Saunders, 1997; 654-679.
- Leib MS. Gastrointestinal Endoscopy. In: August JR (ed.). *Consultations in Feline Internal Medicine*. Philadelphia, W B Saunders, 1994; 119-126.
- Tams TR. A diagnostic approach to vomiting in dogs and cats. *Vet Med* 1992; 87: 785-793.
- Kantrowitz B, Biller D. Using radiography to evaluate vomiting in dogs and cats. *Vet Med* 1992; 87: 806-813.
- Guilford WG. Upper gastrointestinal endoscopy. *Vet Clin North Am: Sm Anim Pract* 1990; 20: 1209-1227.
- Tams TR. Gastrosocopy. In: Tams TR (ed.). *Small Animal Endoscopy*. St. Louis, C V Mosby, 1990; 89-166.
- Penninck D, Nyland T, LY K, et al. Ultrasonographic evaluation of gastrointestinal diseases in small animals. *Vet Radiol* 1990; 31: 134-141.
- Leib MS. Chronic vomiting: a diagnostic approach. In: August JR (ed.). *Consultations in Feline Internal Medicine*. Philadelphia, W. B. Saunders Company, 1991; 403-407.
- Moon M, Myer W. Gastrointestinal contrast radiology in small animals. *Sem Vet Med Surg* 1986; 1: 121-143.
- Kleine LJ. Interpreting radiographic signs of abdominal disease in dogs and cats - 3. *Vet Med* 80:73-85, 1985.

Sullivan M, Miller A: Endoscopy (fiberoptic) of the oesophagus and stomach in the dog with persistent regurgitation or vomiting. *J Small Anim Pract* 26:369-379, 1985.

Happe RP, van der Gaag I: Endoscopic examination of the esophagus, stomach and duodenum in the dog. *J Am Anim Hosp Assoc* 19:197-206, 1983

Thayer GW: Vomiting: A Clinical Approach. *Comp Cont Educ Prac Vet* 3:49-52, 1981.