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Case Report Rapport de cas

Gastric malpositioning and chronic, intermittent vomiting following prophylactic gastropexy in a 20-month-old great Dane dog

Jessie S. Sutton, Michele A. Steffey, Cecily M. Bonadio, Stanley L. Marks

Abstract — A 20-month-old castrated male great Dane dog was presented for evaluation of chronic intermittent vomiting of 2 months' duration. A prophylactic incisional gastropexy performed at 6 mo of age resulted in gastric malpositioning and subsequent partial gastric outflow tract obstruction.

Résumé — Malposition gastrique et vomissements intermittents chroniques après une gastropexie prophylactique chez un chien Grand danois âgé de 20 mois. Un chien Grand danois mâle castré âgé de 20 mois a été présenté pour une évaluation de vomissements chroniques durant depuis 2 mois. Une gastropexie incisionnelle prophylactique réalisée à l'âge de 6 mois a produit une malposition gastrique et une obstruction partielle de l'échappement du tractus gastrique.

(Traduit par Isabelle Vallières)

Can Vet J 2015;56:1053–1056

Gastric dilation and volvulus (GDV) is a life-threatening condition that most commonly affects large and giant breed dogs (1). Despite aggressive surgical intervention, mortality rates for patients which experience GDV approach 10% to 25% (2,3). For this reason, prophylactic gastropexy is frequently recommended and performed in juvenile dogs with a known breed predisposition to GDV (4). Breeds over-represented for the development of GDV include the great Dane, Irish setter, standard poodle, Weimaraner, and rottweiler, with the great Dane having a reported lifetime risk as high as 36.7% (5,6).

Prophylactic gastropexy is commonly performed at the time of elective sterilization (7,8). Multiple surgical gastropexy techniques have been described, including those performed through a traditional open celiotomy (incisional, belt-loop, circumcostal) and newer less invasive laparoscopic and laparoscopic-assisted approaches (4,7–12). Prophylactic gastropexy has been historically well-documented to significantly decrease the risk of development of GDV, with rates of occurrence following gastropexy ranging from 0% to 4.3%, regardless of surgical method employed (4,13,14). Few complications have been documented following these prophylactic procedures.

This report describes a dog which experienced chronic, intermittent vomiting following prophylactic gastropexy and whose clinical signs resolved following surgical revision of a malpositioned gastropexy site.

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Case description

A 20-month-old castrated male great Dane dog was referred to the Veterinary Medical Teaching Hospital (VMTH) at the University of California-Davis for evaluation of chronic, intermittent vomiting of 2 months' duration. Vomiting was confirmed by the visualization of active abdominal contractions by the owner, and no episodes of passive regurgitation were ever witnessed. The vomiting episodes were not associated with any time of the day or night, but were consistently associated with the feeding of $>$ 1 cup of dry kibble at any given time. The vomiting episodes ranged in frequency from 1 to 4 episodes per day, depending on the amount of food the dog had ingested. The vomitus was characterized primarily as undigested food. The owner had fed the dog multiple canned and dry commercial diets in an effort to resolve the dog's vomiting and had also attempted to feed the dog multiple smaller meals per day. The dog was being fed a limited-ingredient kangaroo-based veterinary prescription diet (Iams® Veterinary Formula™ Skin & Coat Plus Response™ KO; Procter & Gamble, Cincinnati, Ohio, USA) for treatment of suspected allergic dermatitis at the time of evaluation at the UC–Davis VMTH. The dog's stools were well formed and the dog had an excellent appetite and energy level. Previous medical history included a routine castration with prophylactic incisional gastropexy performed via celiotomy at 6 mo of age. The dog weighed 32 kg at the time of the gastropexy.

On physical examination the dog was bright and alert with normal temperature (39°C), heart rate (126 beats/min), and respiratory rate (24 breaths/min). He was in lean body condition (body condition score: 3/9, weight: 56.0 kg), but the remainder of his physical examination was unremarkable.

A complete blood (cell) count (CBC), biochemistry panel and adrenocorticotropic hormone (ACTH) stimulation test to help

rule out Addison's disease were performed. A mild eosinophilia [1719/μL; reference range (RR): 0 to 1500/μL] was noted on the CBC and was suspected to be associated with the dog's allergic dermatitis. A mild hypercalcemia (2.85 mmol/L; RR: 2.40 to 2.80 mmol/L) and mildly elevated alkaline phosphatase (192 IU/L; RR: 14 to 91 IU/L) were noted on the serum biochemistry panel, and were attributed to the dog's juvenile age. Pre-ACTH and post-ACTH administration cortisol levels were within reference range (pre: 33.1 nmol/L; RR: 0 to 165.5 nmol/L; post: 245.5 nmol/L; RR: 165.5 to 413.9 nmol/L). Thoracic radiographs were unremarkable.

A standard two-view abdominal radiographic study, including ventrodorsal and right lateral view, and an abdominal ultrasound were then performed. On survey lateral radiographic projections of the abdomen the gastric axis appeared caudally rotated. No foreign material or evidence of gastrointestinal obstruction was visible within the gastric lumen, pylorus, or small intestinal loops on any projection. On abdominal ultrasound the spleen was identified in an abnormal position, residing cranial to the stomach. The architecture of the small intestinal wall appeared within normal limits. No additional abnormalities were noted in the remainder of the abdominal organs.

A videofluoroscopic barium swallow study and upper gastrointestinal series were then performed. For the swallow study 5- to 10-mL boluses of barium were administered repeatedly and swallowing was observed. Normal esophageal motility was identified with minimal gastroesophageal reflux. For the upper gastrointestinal series a total volume of 7 mL of barium per kg body weight (BW) was administered orally. Persistent gastric malpositioning was noted, as previously described in the radiographic projections obtained. The pyloric sphincter subjectively did not open sufficiently during the duration of the fluoroscopic study with only a thin column of liquid barium exiting during pyloroantral contractions. These findings were suggestive of restrictive pyloric disease. In the subsequent radiographic projections obtained during the upper gastrointestinal series, continued gastric malpositioning with the pylorus residing on midline on the ventrodorsal projection was noted (Figure 1). The completed study demonstrated normal passage of barium from the stomach through the small intestines and into the colon with no evidence of small intestinal obstruction over a 24-hour period.

Surgical exploration of the abnormally positioned stomach and abnormal pyloric outflow tract was recommended, and an exploratory celiotomy was performed. The patient was premedicated with hydromorphone (West-Ward Pharmaceuticals, Eatontown, New Jersey, USA), 0.05 mg/kg BW, IV, acepromazine (Vedco, St. Joseph, Missouri, USA), 0.01 mg/kg BW, IV, and atropine (Vedco), 0.02 mg/kg BW, IV. Anesthesia was induced with ketamine (Fort Dodge Animal Health, Fort Dodge, Iowa, USA), 5 mg/kg BW, IV, and diazepam (Hospira, Lake Forest, Illinois, USA), 0.5 mg/kg BW, IV, and maintained with inhaled isoflurane. An approximately 8-cm surgical scar was noted along the cranial one-third of the ventral abdomen on midline, consistent with the patient's previous gastropexy procedure. A standard ventral midline celiotomy was performed, extending from the xiphoid to the prepuce, and was approximately 35 cm in length. At the time of exploratory celiotomy the gastropexy site was inspected. An incisional gastropexy had been performed with a transversely oriented incision in the seromuscular layer of the gastric wall at the level of the pyloric antrum and a longitudinal incision in the right abdominal wall, approximately 2 cm lateral to the linea alba. While the gastric wall incision was appropriately performed within the pyloric antrum, the ventral nature of the gastropexy site and orientation of the body wall incision with respect to the gastric wall incision resulted in rotation and ventral displacement of the gastric outflow tract with folding of the gastric body just orad to the pyloric antrum (Figure 2). Subsequent partial pyloric outflow tract obstruction was suspected. No other gross abnormalities were identified in the remainder of the abdominal organs.

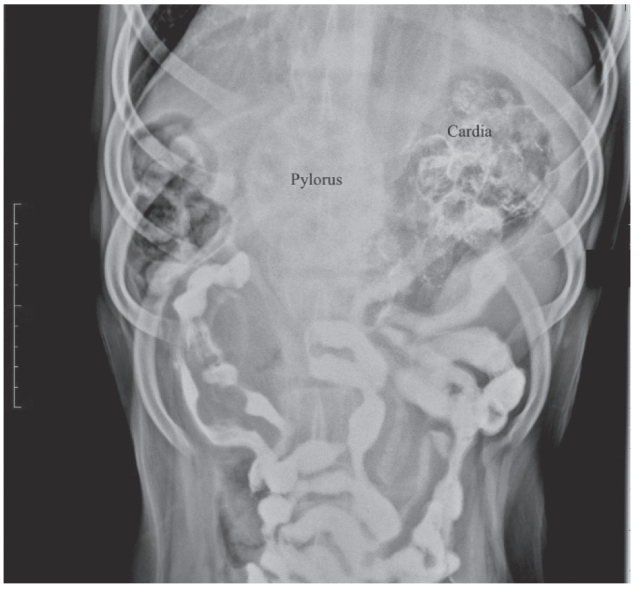

Figure 1. Standard ventrodorsal image obtained during the pre-operative upper gastrointestinal series. The gastric axis is clearly identified due to the presence of positive contrast material (barium). Note the unusual location of the pylorus on midline.

A gastropexy revision was performed in which the previous gastropexy site was disrupted with blunt dissection using right angle forceps. A new incisional gastropexy was performed with the stomach in an appropriate anatomic position. A 3-cm incision was created through the seromuscular layer of the gastric wall in a transverse fashion, adjacent to the previous gastropexy site in the pyloric antrum. The edges of the seromuscular incision were sutured to the edges of a defect of similar size created in the right lateral abdominal wall using 0 PDS (Ethicon, Bridgewater, New Jersey, USA) in 2 lines of simple continuous sutures. A 2 × 0.5 cm biopsy sample was obtained from the gastric wall at the level of the fundus and the defect was apposed in a 2-layer, inverting pattern using 3-0 PDS (Ethicon). Full thickness biopsies were also obtained from the duodenum (n = 2), jejunum (n = 2) and ileum (n = 1) using a 6-mm punch biopsy instrument. The intestinal biopsy sites were closed in a single layer using 3-0 PDS (Ethicon) in a simple interrupted pattern. Histopathologic evaluation of these samples was unremarkable. The dog experienced 1 episode of regurgitation under anesthesia but recovered uneventfully. He was hospitalized 1 night

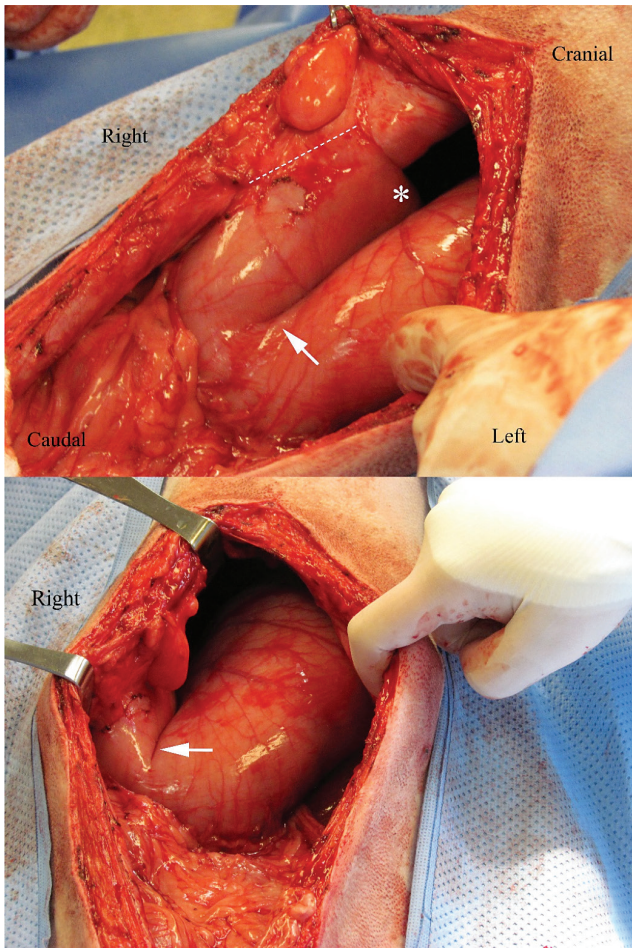

Figure 2. Intra-operative image obtained during exploratory celiotomy. The patient is in dorsal recumbency. The location of the previously performed incisional gastropexy (dotted line) is visible approximately 2 cm lateral to the linea alba. The ventral position of the pyloric antrum resulted in folding of the gastric body just orad to the pyloric antrum (arrow). This positioning led to an acute flexure at the level of the pyloric outflow tract (*), resulting in a suspected partial outflow tract obstruction. These effects were exacerbated when the linea was in a normal anatomic position and not retracted.

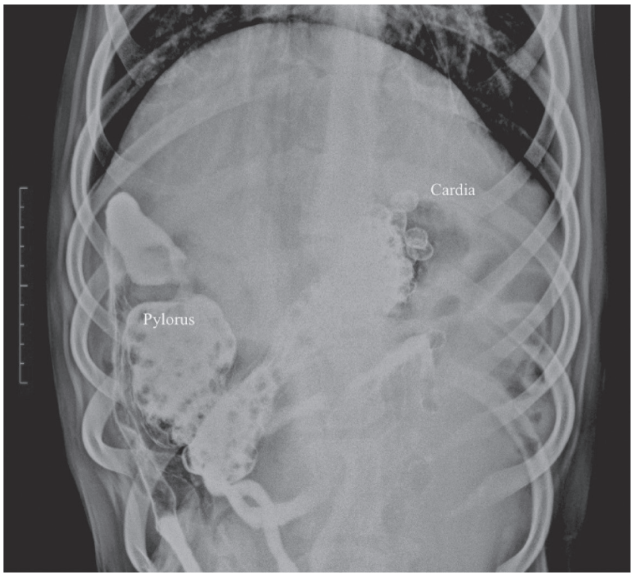

Figure 3. Ventrodorsal image obtained during the re-check upper gastrointestinal series performed 1 y after surgery. The stomach is undergoing a peristaltic contraction. Note the new position of the pylorus in the right, cranial quadrant of the abdominal cavity.

after surgery and administered esomeprazole (AstraZeneca, Wilmington, Delaware, USA), 1.0 mg/kg BW, IV, q24h, famotidine (Merck, Kenilworth, New Jersey, USA), 0.5 mg/kg BW, IV, q12h, and hydromorphone (West-Ward), 0.05 mg/kg BW, IV, q4h. Small, frequent feedings (3/4 cup Iams® Veterinary Formula™ Skin & Coat Plus Response™ KO, Procter & Gamble), q8h, were initiated the following morning. The dog was discharged 2 d after surgery on omeprazole (AstraZeneca), 1.0 mg/kg BW, PO, q24h for 7 d, famotidine (Merck), 0.5 mg/kg BW, PO, q12h for 7 d, and tramadol (Janssen Pharmaceuticals, Titusville, New Jersey, USA), 2 to 3 mg/kg BW, PO, q8 to 12h as needed for pain control. Instructions for strict activity restriction for 10 to 14 d after surgery and small frequent feedings for 3 d with a gradual return to normal feeding schedule after this time period were also discussed with the owner. The dog continued to recover uneventfully and sutures were removed 14 d following the celiotomy. Follow-up telephone conversations with the owner at 1 mo and 3 mo following the celiotomy revealed complete resolution of clinical signs with no further episodes of vomiting.

The dog was re-evaluated at the UC–Davis VMTH 12 mo following the gastropexy revision procedure. At the time of this recheck the owner reported complete resolution of clinical signs with no further episodes of vomiting following discharge from the hospital. On physical examination the dog was bright and alert with normal vital parameters. He was in good body condition (body condition score 4/9) and had gained 4.0 kg over the course of the year (weight: 60.0 kg). A videofluoroscopic swallow study and upper gastrointestinal series with liquid barium were repeated. Survey radiographs of the abdomen confirmed appropriate anatomic positioning of the pyloric antrum in the right cranial abdominal quadrant (Figure 3).

Discussion

Post-operative complications associated with elective prophylactic gastropexy have rarely been documented. Episodes of self-limiting gastrointestinal disease characterized by vomiting, diarrhea, regurgitation, and inappetence are the most commonly noted complications (7,11–14). In a single study, post-operative vomiting was documented in 2 of 23 dogs and diarrhea in 4 of 23 dogs that underwent incisional gastropexy, with clinical signs resolving in all dogs without medical intervention within 2 to 4 wk following surgery (14). To the authors' knowledge, only 1 other case report exists documenting long-term gastrointestinal signs following prophylactic gastropexy. In that case, chronic episodes of gastric dilatation occurred following tube gastropexy in a 3-year-old dog (15); however, that dog was also reported to have experienced episodes of gastric dilatation and partial gastric torsion prior to undergoing gastropexy. Clinical signs in the previously reported case also resolved following surgical disruption of excessive adhesion formation and gastropexy revision. Other less frequently documented post-operative

complications following elective gastropexy include suture site reaction or infection, seroma formation, aspiration pneumonia, and ventricular arrhythmias (4,7,12,13).

Limited investigation into the effect of prophylactic gastropexy on gastric motility and gastric emptying time has been performed (10,16,17). Hall et al (17) failed to identify any significant differences in gastric electrical and contractile activities in 13 healthy Labrador retriever and German shepherd dogs, as measured by electrodes implanted in the gastric wall, following prophylactic circumcostal gastropexy. Gastric emptying time, evaluated by observing the movement of solid radiopaque markers out of the gastric lumen, was also unaltered in healthy dogs following gastropexy, but abnormally increased in dogs that had undergone gastropexy as surgical treatment for GDV (16). This discrepancy was suspected to have occurred as a result of the underlying gastroenteropathy that predisposed these individuals to develop GDV, as opposed to the secondary effects of the gastropexy procedure itself. Mathon et al (10) reported that gastric emptying, as assessed through the radiographic measurement of changes in gastric area, decreased mildly following prophylactic gastropexy in healthy beagle dogs. However, this finding was attributed to a more visible gastric outline with the pylorus mildly displaced to the right as opposed to a true change in gastric motility (10).

Given the diagnostic imaging results and intra-operative findings in the present case, malpositioning of the pyloric antrum resulting in partial gastric outflow tract obstruction was suspected. Both the ventral location of the gastropexy site on the body wall and the perpendicular orientation of the body wall incision relative to the seromuscular incision resulted in pronounced malpositioning of the pyloric antrum. The relatively small celiotomy performed during the original surgical procedure, as identified by the surgical scar, likely compromised adequate visualization of gastric anatomic positioning within the abdominal cavity. The follow-up imaging studies obtained 12 mo after gastropexy revision confirmed resolution of the previously described gastric malpositioning and correlated with the dog's resolution of clinical signs.

While it is difficult to explain the onset of clinical signs 14 mo after surgery, it is possible that the dog's dramatic growth during this period (increasing from 32 kg to 56 kg) may have exacerbated the abnormal positioning of the gastric axis. At present, there are no published guidelines outlining the minimum age or size requirements at the time that prophylactic gastropexy is performed. Prophylactic gastropexy is commonly performed in conjunction with routine sterilization to avoid additional anesthetic episodes. Routine sterilization may be performed in dogs as early as 4 to 6 mo of age; however, many of the large and giant breed dogs that are considered at high risk for the development of GDV are far from skeletal maturity at this age.

Other differential diagnoses that were considered for this case of chronic, intermittent vomiting included food intolerance, dietary indiscretion, inflammatory bowel disease, and gastric foreign body. Extra-gastrointestinal causes of vomiting were ruled out based on the results of blood work. Inflammatory bowel disease and food intolerance were deemed to be highly unlikely following interpretation of the dog's abdominal radiographs, contrast studies and histopathologic results.

The present case demonstrates that while uncommon, long-term complications associated with prophylactic gastropexy can occur and should be taken into consideration when this elective surgical procedure is pursued. Care must be taken to ensure adequate visualization and appropriate anatomic positioning of the stomach within the abdominal cavity in order to minimize the risks of post-operative gastrointestinal complications, including chronic vomiting and gastric motility disorders. CVJ

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