History

A 13-year-old 24-kg (52.8-lb) castrated male mixed-breed dog with a 3-month history of anorexia and vomiting was evaluated. On physical examination, the dog was slightly lethargic, yet alert and responsive, with 5% dehydration. The heart rate, respiratory rate, and capillary refill time were within reference ranges, and mucous membrane color was normal. The body condition score was 4 or 5 on a scale from 1 to 9. A systolic heart murmur (grade III/VI) over the left cardiac apex was detected. No abnormalities were detected on auscultation of the lungs. Hematologic and serum biochemical analyses revealed liver enzyme activities and renal function measurements within reference ranges. The dog, however, had lymphocytosis (8,673 lymphocytes/µL; reference range, 900 to 4,800 lymphocytes/µL), hyponatremia (132 mEq/L; reference range, 142 to 153 mEq/L), and hypochloremia (89 mEq/L; reference range, 110 to 120 mEq/L). Abdominal radiographs were obtained (Figure 1).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

Figure 1—Right lateral (A) and ventrodorsal (B) radiographic views of the abdomen of a 13-year-old neutered male mixed-breed dog with a 3-month history of anorexia and vomiting.

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Diagnostic Imaging Findings and Interpretation

In the right lateral and ventrodorsal abdominal radiographic images (Figure 2), various degrees of spondylosis deformans along T11-L4 and L7-S1 and degenerative new bone formation in the articular process joints from L1 to L6 are observed. A small ossification center cranial to the os penis is present. A gas-filled dilated fundus of the stomach located in the right cranial aspect of the abdomen is apparent in the ventrodorsal radiographic image, and the body of the stomach is filled with fluid within the midabdomen. A small amount of gas is present in the pylorus in the left middle portion of the abdomen. In the right lateral radiographic image, the fundus of the stomach is dilated and filled with fluid and is observed as a round soft tissue structure in the cranial aspect of the abdomen. The pylorus with peristalsis is evident as a gas-filled bilobed structure within the midabdomen. A normal-positioned pylorus should be fluid filled in the cranioventral portion of the abdomen on a right lateral radiograph. These radiographic findings support a diagnosis of gastric dilatation-volvulus. Moreover, a focal convex soft tissue filling defect is identified at the cranial aspect of the gas-filled area. The triangular soft tissue structure ventral to the gas-filled pylorus is the spleen; the organ is normal in volume. The contour and location of each kidney are not clearly defined, and the left kidney is presumed to be located at the level of L4-L5. Multiple uroliths are present in the urinary bladder. The location, size, and margin of the liver appear normal. The caudal vena cava is not seen cranial to the diaphragm, and the esophagus is mildly distended, both of which can be associated with a malpositioned stomach. Differential diagnoses for the focal convex soft tissue filling defect include neoplasia, gastric intussusception, granuloma, mucosal antral hypertrophy, or foreign bodies.

Ultrasonography was performed to characterize the mass in the pylorus further (Figure 3). The pylorus was found in the left middle portion of the abdomen, and a hyperechoic, asymmetric, inhomogeneous mass with irregular margins (approx 2 cm) protrudes into the fluid-filled gastric lumen, where the wall layering is completely lost. The layering of the caudal portion of gastric wall appears to be normal.
common cause of gastric volvulus in humans.3 Similar anchor the stomach is the primary etiology and is a returned to its normal anatomic position after gastric dog of the present report, the malpositioned stomach of functional ileus, megaesophagus, pneumatosis, and portion of the duodenum were resected. A biopsy specimen was obtained from an enlarged gastric lymph node. A histopathologic diagno-
sis of pyloric adenocarcinoma with lymph node metas
tasis was made.

Comments

Typically, gastric dilatation-volvulus is character-
ized by an acute onset, severely enlarged stomach filled primarily with gas but less fluid, a craniodorsal shift of the pylorus on the right lateral radiograph, and compartimentalization of the gas-filled stomach. Recognition of the pyloric location is essential for the diagnosis of gastric dilatation-volvulus. Splenomegaly may occur secondary to increased splenic portal vascular pressure. Other potential findings include radiographic evidence of functional ileus, megaesophagus, pneumatosis, and pneumoperitoneum.1 The dog described in the present report had a history of chronic gastrointestinal symp-
toms, a dilated but malpositioned stomach that pre-
dominantly contained fluid, and a spleen of normal size and shape. The history and imaging findings were not compatible with acute gastric dilatation-volvulus.

Chronic gastric dilatation-volvulus in dogs has been reported to involve incomplete volvulus and pos-
sibly has a dynamic nature. The malpositioned stomach has been observed to return to the normal anatomic position during endoscopy and surgery. Multiple imaging modalities, such as plain and contrast radiography, endoscopy, and ultrasonography, are valuable in the di-
agnosis of chronic gastric dilatation-volvulus.2 In the dog of the present report, the malpositioned stomach returned to its normal anatomic position after gastric decompression via an orogastric tube.

Stretching and laxity of the gastric ligaments that anchor the stomach is the primary etiology and is a common cause of gastric volvulus in humans.3 Similar to human chronic gastric volvulus, the cause of gastric dilatation-volvulus in the dog of the present report may have been associated with laxity of the gastric ligaments secondary to gastric content retention and chronic gastric distention. Gastric content retention, which is usually observed radiographically as fluid-filled gas-
tric distention, is caused by partial pyloric obstruction secondary to pyloric adenocarcinoma.1 Chronic gastric dilatation-volvulus in dogs may be subclinical or asso-
ciated with clinical signs (which may be intermittent) similar to those of partial pyloric obstruction, such as vomiting, weight loss, lethargy, or signs of abdominal pain.2 The history of the patient would also be consistent with partial pyloric obstruction. Although chronic gastric dilatation-volvulus associated with pyloric ob-
structive disease is proposed in this dog, an incidental finding of chronic gastric volvulus cannot be completely ruled out.

Ultrasonography is a useful modality for evaluat-
ing gastric wall thickness and layering definition in veterinary medicine. Gastrointestinal neoplasia com-
monly is associated with increased wall thickness and loss of layering definition.4 In the dog of the present re-
port, increased wall thickness and loss of wall layering in the pyloric region were consistent with neoplasias such as adenocarcinoma, lymphoma, leiomyosarcoma, or gastrointestinal stromal tumor. Although adenocar-
cinoma, lymphoma, and leiomyosarcoma are usually hypoechoic, the former 2 tumors are predominantly sessile masses affecting all layers, and the latter is often a large mass restricted to the muscularis layer of the py-
loric antrum.4 The pseudolayering pattern of the gastric wall is highly suggestive of gastric carcinoma.4 Gastro-
intestinal stromal tumor has been reported to have heter-
ogeneous echotextures with possible hypoechoic or anechoic necrotic regions.6 A histopathologic diagno-
sis of gastric adenocarcinoma was made. Cytologic or histologic evaluation of a fine-needle aspirate or biopsy specimen is always necessary for a definitive diagnosis.

In conclusion, the dog of the present report had chronic gastric dilatation-volvulus, which was evident on radiographic evaluation. This condition was in-
duced by a pyloric cancer that altered gastric outflow, resulting in gastric distention. The gastric distention caused stretching and laxity of the gastric ligaments with secondary gastric malposition.

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