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What Is Your Diagnosis?

In collaboration with the American College of Veterinary Radiology

History

An 11-year-old 2.2-kg spayed female Chihuahua was referred to the Auburn University Small Animal Emergency Service because of a 1-day history of signs of abdominal pain and decreased appetite. On initial examination, the dog was bright and alert and had vital signs within reference limits. Abdominal palpation elicited signs of pain and identified cranial organomegaly. Preliminary point-of-care ultrasonography revealed an abdominal mass with no associated free fluid. Baseline bloodwork revealed a mild leukopenia (WBC count, 4.77 X 10^3 WBCs/µL; reference range, 5.09 X 10^3 to 17.41 X 10^3 WBCs/µL), monocytopenia (0.143 X 10^3 monocytes/µL; reference range, 0.16 X 10^3 to 1.16 X 10^3 monocytes/µL), and a mildly high alanine aminotransferase activity (181 U/L; reference range, 13 to 151 U/L). All other results were within reference limits. Abdominal radiography was performed **(Figure 1)**.

Formulate differential diagnoses, then continue reading.

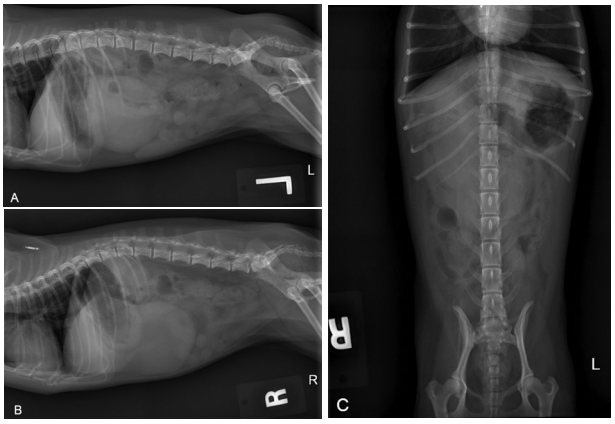

Figure 1—Left lateral (A), right lateral (B), and ventrodorsal (C) radiographic images of an 11-year-old 2.2-kg spayed female Chihuahua referred because of a 1-day history of signs of abdominal pain and decreased appetite.

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https://doi.org/10.2460/javma.20.12.0710

Diagnostic Imaging Findings and Interpretation

Abdominal radiography revealed a large (5.13 X 6.28 X 6.0-cm), well-defined, rounded, soft tissue opacity in the cranioventral aspect of the abdomen and displacing the stomach cranially **(Figure 2)**.

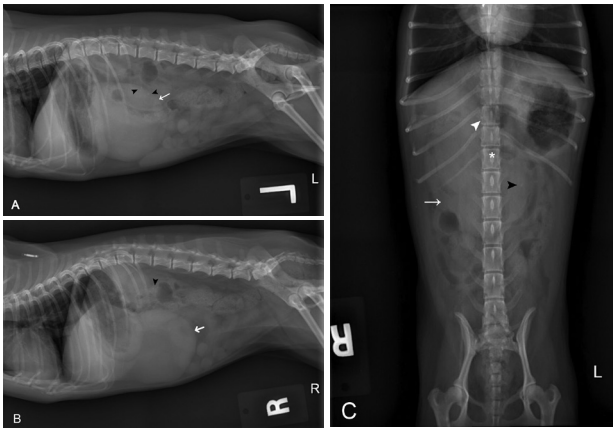

Figure 2—Same images as in Figure 1. A large, rounded soft tissue opaque mass (white arrows) is in the cranial aspect of the abdomen and displaces the stomach (white arrowhead) cranially and leftward, most apparent in the ventrodorsal projection. Ill-defined linear mineral opacities (black arrowheads) are in the left renal silhouette (black arrowheads), and L1 is a transitional vertebra (asterisk), marked by its elongated right transverse process.

There were ill-defined linear mineral opacities in the left renal silhouette, and L1 was a transitional vertebra. Peritoneal detail in the abdomen was radiographically normal. Results of thoracic radiography were unremarkable (not shown). Differential diagnoses for the cranial abdominal mass included a pedunculated liver mass or a mass of splenic, mesenteric, or pancreatic origin. However, as the head and tail of the spleen were clearly seen to be distinct from the mass on the ventrodorsal view, a splenic mass was considered less likely. As the mass was well delineated, a presumptive diagnosis of a pedunculated liver mass was made along with incidental renal diverticular mineralization.

Abdominal ultrasonography was performed and revealed a large gallbladder that was displaced from the hepatic fossa, extended caudally, and had elongation of the gallbladder neck and cystic duct

(Figure 3). The gallbladder contained intraluminal anechoic fluid bile surrounding a centrally fixed (nondependent) collection of hyperechoic organized bile. The gallbladder wall was intact, and no free fluid was noted. Incidental chronic renal disease and diverticular mineralization (not shown) were also seen. The remainder of the abdomen was considered normal.

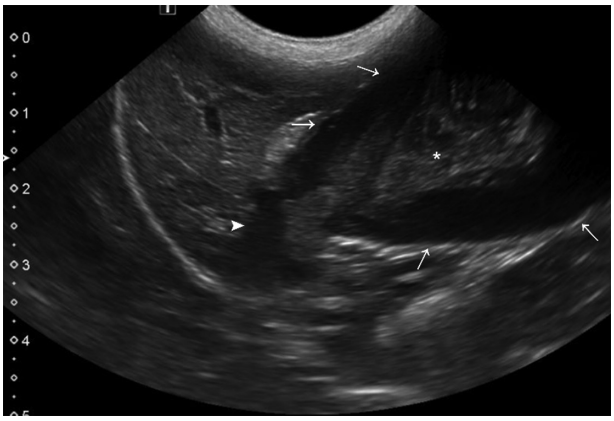

Figure 3—Ultrasonographic image of the gallbladder of the same dog, showing the evacuated hepatic fossa (arrowhead), enlarged gallbladder (arrows), and hyperechoic, amorphous mucocele (asterisk).

Treatment and Outcome

The dog underwent an abdominal explore and cholecystectomy, during which displacement of the gallbladder from its fossa was confirmed. Liver biopsy samples were obtained and submitted for histopathology. Bile was collected intraoperatively via a sterile swab of the gallbladder lumen after cholecystectomy for aerobic and anaerobic bacterial culture; cytology was not performed on the bile, and no bacterial culture of liver was performed. The gallbladder was submitted for histologic examination. The dog was hospitalized for 3 more days postoperatively and received fentanyl (3 µg/kg/h, IV), crystalloid IV fluid therapy, *N*-acetylcysteine (150 mg, IV, q 6 h), maropitant (1 mg/kg, IV, q 24 h), and ampicillin-sulbactam (30 mg/kg, IV, q 8 h) before being discharged with prescriptions of gabapentin (10 mg/kg, PO, q 8 h) and amoxicillin-clavulanic acid (20 mg/kg, PO, q 8 h).

No clinically meaningful liver pathology was found, and histologic results for the gallbladder were consistent with mucocele. Bacterial culture performed on bile yielded no growth; thus, antimicrobial treatment was discontinued. A low-fat diet and small, frequent meals were recommended.

Comments

Gallbladder mucoceles are relatively common findings in dogs and can often be incidental findings during evaluations for unrelated signs.[1] However, to the authors' knowledge, no previous cases of a displaced gallbladder in dogs have been reported. Signs relating to mucoceles include vomiting, abdominal pain, high liver enzyme activities (alkaline phosphatase, alanine aminotransferase, and γ-glutamyltransferase), icterus, lethargy, and inappetence.[1] Mucoceles can lead to gallbladder rupture due to irritation of the wall and extrahepatic biliary obstruction, resulting in life-threatening bile peritonitis.[1]

Ultrasonography is central to the diagnosis of gallbladder mucoceles and is highly sensitive (85.7%) and specific (100%) for the detection of gallbladder rupture.[2] A classic descriptor of the ultrasonographic appearance of a mucocele is a kiwi fruit pattern—a fixed, centrally hyperechoic bile with peripherally radiating hyperechoic striations. This pattern can range in its degree of organization and is not correlated with the severity of clinical signs or likelihood to rupture.[1] In the dog of the present report, the appearance of the mucocele was nonclassic, as it did not have the previously described stellate pattern. Instead, although the mucocele was hyperechoic and fixed in position, this mucocele appeared more amorphous.

The dog in the present report had nonspecific clinical signs. Differential diagnoses included hepatitis, pancreatitis, neoplasia, obstruction, and others. Results of initial survey radiography helped to narrow the list of differential diagnoses but were not highly suggestive of gallbladder disease. Ultrasonographic evaluation enabled the identification of the mucocele and intact walls of the gallbladder and the ability to trace the distended and misplaced gallbladder to its evacuated fossa. To the authors' knowledge, no previous case of displaced gallbladder in a dog has been reported.

In human medicine, displaced gallbladders are often referred to as floating gallbladders and are rare.[3] They are described as being pedunculated and hanging free from the liver, with attachment to the liver only via the cystic duct, the mesentery associated with the cystic duct, or other loose mesenteric attachments.[4] In human medicine, a floating gallbladder is considered a precursor to the development of gallbladder torsion. Although no sex-linked predilection for a floating gallbladder in humans seems to have been noted, elderly women appear to be more predisposed to torsion of the gallbladder,[4,5] and the dog of the present report was a geriatric female dog. The exact cause of a floating gallbladder is not known but speculated to be the result of either abnormal or incomplete development of the mesenteric attachment or secondary to relaxation and atrophy of the attachment leading to visceroptosis (sinking of an organ below its normal anatomic position). The latter may explain the tendency to diagnose this in elderly patients.[5] Both CT and ultrasonography have been used to diagnose floating gallbladders in humans. On ultrasonography, features suggestive of a floating gallbladder in humans include fluid collection between the gallbladder and liver, a gallbladder located outside of its fossa, and a stretched cystic duct and gallbladder neck.[4,5] No free fluid was seen in the dog of the present report; however, the gallbladder met the

other 2 features: an elongated gallbladder neck and an evacuated fossa.

Although rare in small animals, floating gallbladders containing mucoceles should be considered as a differential diagnosis for cranioventral abdominal masses. In such cases, ultrasonography is extremely useful as a next diagnostic step for further investigation.

References

1. Choi J, Kim A, Keh S, Oh J, Kim H, Yoon J. Comparison between ultrasonographic and clinical findings in 43 dogs with gallbladder mucoceles. *Vet Radiol Ultrasound*. 2014;55(2):202–207.
2. Pike FS, Berg J, King NW, Pennick DG, Webster CRL. Gallbladder mucocele in dogs: 30 cases (2000–2002). *J Am Vet Med Assoc*. 2004;224(10):1615–1622.
3. Kitagawa H, Nakada K, Enami T, et al. Two cases of torsion of the gallbladder diagnosed preoperatively. *J Pediatr Surg*. 1997;32(11):1567–1569.
4. Reddy PK, Muralidharan M, Venkatasubramanian R, Yuvaraja S. Laparascopic derotation and cholecystectomy for torsion gallbladder. *JSLS*. 2005;9(2):238–240. Accessed December 30, 2021. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3015590/
5. Boonstra EA, van Etten B, Prins TR, Sieders E, van Leeuwen BL. Torsion of the gallbladder. *J Gastrointest Surg*. 2012;16(4):882–884.