Duodenal obstruction caused by malposition of the gallbladder in a heifer

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Malposition of the gallbladder is a rare cause of intestinal obstruction in cattle. Malposition of the gallbladder should be considered in atypical cases of obstruction of the proximal portion of the intestine and can be diagnosed via abdominal ultrasonography and exploratory laparotomy. Surgical fixation of the gallbladder to the liver may be an effective treatment for this condition.

An 11-month-old 340-kg (750-lb) Holstein heifer with a history of sudden onset of weakness and high-pitched, resonant pinging sounds detected via simultaneous auscultation and percussion of the right flank by the referring veterinarian was referred to the Centre Hospitalier Universitaire Vétérinaire de l’Université de Montréal. On admission, the heifer could be made to stand but with difficulty; and muscle tremors were observed in all limbs. Abnormal findings detected via physical examination included slow, labored breathing (10 breaths/min), moderate distension of the right ventral portion of the abdomen and paralumbar fossa, and severe dehydration estimated at 10% of body weight. Results of succussion of the right ventral portion of the abdomen were positive, indicating an interface of fluid and air. Simultaneous auscultation and percussion of the right abdominal wall revealed that the sounds produced were muted and variable in pitch. Auscultation revealed that ruminal contractions were weak and infrequent, and drainage of the ruminal contents via a gastric tube yielded approximately 20 L of fluid. Transrectal palpation failed to detect dilated intestinal structures or tight mesenteric bands. Feces were scant and watery. Ultrasonographic examination of the abdomen revealed a large (12 cm in diameter), round anechoic structure surrounded by a zone of granular, heterogeneous echogenicity in the dorsocranial region of the right flank, centered on the 12th intercostal space (Fig 1). Because of its position, the structure was believed to be a cyst or a distended, fluid-filled segment of the duodenum, possibly surrounded by an abscess. The gallbladder could not be located in its normal anatomic position in the 10th and 11th intercostal spaces in the middle third of the abdomen, close to the visceral and ventral border of the liver, although no particular importance was attributed to this finding at that time. Abnormalities of the position, size, or appearance of the contents of the abomasum were not detected. Severe hypochloremia (63.2 mEq of chloride/L; reference range, 96.0 to 109.0 mEq/L) and high bicarbonate concentration (56.2 mEq/L; reference range, 22.0 to 33.0 mEq/L) were detected via serum biochemical analyses. On the basis of these clinical and biochemical findings, a provisional diagnosis of obstruction of the proximal portion of the intestine was made. Treatment of dehydration and electrolyte imbalances was begun by use of isotonic saline (0.9% NaCl) solution administered IV as a 20-L bolus, then continued as needed for volume replacement and maintenance (3.7 mL/kg/h [1.7 mL/lb/h]) for the following 24 hours.

On day 2, the heifer was standing and appeared alert. Serum biochemical analyses revealed that chloride (80.0 mEq/L) and bicarbonate (42.8 mEq/L) concentrations were still not in reference range but had improved, compared with the previous day’s values. Mild hypokalemia (3.02 mEq of potassium/L; reference range, 3.86 to 5.28 mEq/L) was also present. Moderate clinical dehydration estimated at 7% of body weight was consistent with hyperproteinemia (9.1 g of total protein/dL; reference range, 6.0 to 8.0 g/dL), a serum albumin concentration at the upper limit of the reference range (4.7 g of albumin/dL; reference range, 3.0 to 5.0 g/dL), and azotemia (BUN, 61.1 mg/dL; [reference range, 4.5 to 18.2 mg/dL]; creatinine, 2.77 mg/dL; [reference range, 0.61 to 1.49 mg/dL]). Hyperbilirubinemia (1.11 mg of total bilirubin/dL; reference range, < 0.82 mg/dL)

Figure 1—Ultrasonographic image of an anechoic structure (the gallbladder [white arrows]) located in the dorsocranial region of the right flank centered on the 12th intercostal space in a heifer with obstruction of the proximal portion of the intestine. Notice that the cranial segment (black arrows) and sigmoid flexure (white arrowheads) of the duodenum are evident.

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and high serum enzyme activities (aspartate aminotransferase [AST], 247 U/L [reference range, 30 to 104 U/L]; serum alkaline phosphatase [SAP], 350 U/L [reference range, 0 to 100 U/L]; and γ-glutamyl transferase [γ-GT], 310.0 U/L [reference range, 9.5 to 39.0 U/L]) were also detected. The leukogram indicated a stress response. Because the heifer’s clinical condition was stable, a standing exploratory laparotomy was performed via the right paralumbar fossa. Unexpectedly, manual examination of the proximal intestinal segment revealed an obstruction of the duodenum caused by abnormal positioning of the gallbladder. The neck of the gallbladder was elongated, and the gallbladder did not have its normal attachments to the visceral surface of the liver and was looped dorsally and caudally over the duodenum (Fig 2). The gallbladder was fully distended, and its weight had pulled it taut at the neck, causing occlusion of the intestinal lumen. The size and position of the gallbladder were consistent with those of the anechoic structure detected with ultrasonography. A laparoscope was inserted through the incision to view the gallbladder before any further abdominal manipulation. The gallbladder and duodenum appeared congested, but no color changes suggestive of ischemia and loss of viability were evident. The obstruction was relieved by manually repositioning the gallbladder over the duodenum. An abomasal omentopexy was attempted as a prophylactic measure for future abomasal displacement; however, tension on the greater omentum caused by overfilled forestomachs rendered this procedure impossible to perform. The abdomen was closed routinely. Ultrasonographic examination of the abdomen revealed that the gallbladder was in its normal anatomic position and empty, likely as a result of spontaneous contraction. Flunixin meglumine (1.0 mg/kg [0.45 mg/lb], IV) was administered, and treatment with procaine penicillin G (22,000 U/kg [10,000 U/lb], IM, q 12 h) was instituted. On the basis of serum biochemical parameters that were monitored daily, fluid therapy was maintained (2.4 mL/kg/h [1.1 mL/lb/h]) by use of isotonic saline solution with potassium chloride (0.125%) for the following 72 hours.

On day 3, the heifer’s appetite was improved, gastrointestinal motility was increased, and abdominal distension was decreased, compared with the previous day. No abnormal sounds were detected via simultaneous auscultation and percussion of the right portion of the abdomen. On day 4, serum total bilirubin concentration was 1.57 mg/dL, and serum enzyme activities remained high (AST, 278 U/L; SAP, 176 U/L; γ-GT, 233.0 U/L), suggesting persistent cholestasis. Fluid therapy had nearly corrected the imbalances in serum chloride (96.2 mEq/L) and bicarbonate (36.6 mEq/L) concentrations. Distension of the right paralumbar fossa was evident once again. Resonant pinging sounds during simultaneous auscultation and percussion of the right flank were detected, and results of percussion of the right ventral portion of the abdomen were positive. Ultrasonographic examination of the abdomen revealed the gallbladder in an abnormal position once again. The duodenum was distended proximal to the point of obstruction. The right abdominal wall was reopened at the site of the previous laparotomy, and malposition of the gallbladder and obstruction of the duodenum were confirmed via manual examination. Although cholecystectomy was considered, an improvised surgical fixation technique designed to maintain the gallbladder in its normal position without interfering with its function was used. After manual emptying of the gallbladder, a simple continuous suture (2-0 polypropylene) was placed to attach the freed neck of the gallbladder to the right hepatic lobe by use of a blind 1-handed tie technique. The suture was placed through the serosal mem-

Figure 2—Schematic representations of normal bovine abdominal viscera (A) and obstruction of the duodenum caused by a malpositioned gallbladder (B and C) in a heifer. Views are right lateral (A and B) and caudocranial (C). ab = Abomasum. ga = Gallbladder. li = Liver. om = Omasum. ru = Rumen.
brane and muscular layer of the gallbladder without penetrating the lumen and through hepatic parenchyma approximately 1 cm deep. An abomasal omentopexy was successfully performed because distension of the foreestomachs was considerably less marked than that present during the first surgery. A large hematoma (6 × 15 cm) was found on the lateral surface of the abomasum; the cause of the hematoma could not be determined. Flunixin meglumine was administered postoperatively. Because of the high serum total bilirubin concentration and enzyme activities that could suggest concurrent cholangiohepatitis, treatment with oxytetracycline (10 mg/kg [4.5 mg/lb], IV, q 12 h) was instituted, and procaïne penicillin G treatment was discontinued.

Dramatic clinical improvements were seen on day 5. Simultaneous auscultation and percussion of the right portion of the abdomen failed to produce abnormal sounds, and abdominal distension was much less pronounced than that present on day 4. On day 3, high serum chloride (121.0 mEq/L) and low serum bicarbonate (12.3 mEq/L) concentrations were detected. Serum total bilirubin concentration had returned to reference range (0.31 mg/dL), and serum enzyme activities had decreased (AST, 235 U/L; SAP, 112 U/L; γ-GT, 134.0 U/L), suggesting that cholestasis was resolving. Clinical dehydration was resolved, and serum total protein, BUN, serum creatinine, and potassium (4.20 mEq/L) concentrations were within reference range. Fluid therapy was discontinued, and the heifer was allowed access to drinking water ad libitum. Ruminal transfaunation was performed by administration of 10 L of strained fresh ruminal juice from a donor cow via a gastric tube. On day 6, the heifer had normal appetite and normal gastrointestinal motility. Ultrasonographic examination of the abdomen revealed that the gallbladder was in its normal anatomic position and of normal size (only partially full); however, its wall appeared thickened. The size of the duodenal lumen had returned to a typical diameter, and normal movement of intestinal contents was observed. The heifer was discharged the following day with instructions to continue oxytetracycline treatment for a further 2 days (5 days total). The owner was contacted by telephone 12 months later and reported that no further complications or relapses had occurred and that the heifer was pregnant. In addition, no developmental differences from age-matched heifers from the same herd were observed.

Paradoxically, so-called intestinal obstruction in cattle is most often caused by intestinal distension secondary to the loss of the muscular action of a segment of intestine (ileus) and therefore occurs in the absence of any actual physical occlusion.13 True intestinal obstructions are typically the result of intussusception or, more rarely, volvulus, incarceration, intestinal adhesions, developmental anomalies, enteroliths, foreign bodies, neoplasms, and other causes.24 To our knowledge, this is the first report of involvement of the gallbladder in intestinal obstruction in cattle. In humans, nearly all cases of duodenal obstruction related to the gallbladder are caused by the passage of gallstones to the duodenum via cholecystoduodenal fistulae.2 Only a single case of duodenal obstruction by the gallbladder itself has been reported.2

Although the exact etiology of this condition is unknown, loss of attachment of the gallbladder to the liver was clearly a factor. In humans, gallbladder volvulus has been associated with putative congenital lack of connections between the gallbladder and liver, but this seemed unlikely in the heifer reported here because obstruction did not occur early in life. It is possible, however, that the gallbladder was not sufficiently distended (ie, heavy) to cause an obstruction until an event such as a period of anorexia caused it to become heavily distended. Alternatively, if the heifer was normal at birth, a traumatic event or violent movement may have freed the gallbladder from its attachments; detection of an abomasal hematoma suggested a prior traumatic incident.

Although cholecystectomy was considered a viable surgical option in this heifer, lack of information on postoperative nutritional management of cholecystectomized cattle rendered this option impractical; the need for a specialized diet or feeding regimen would have made this heifer unsuitable for dairy production. Furthermore, the general anesthesia required and complexity and length of the surgical procedure would have resulted in much greater expense to the owner and greater risk to the animal. The procedure described in this report (cholecystohepatopexy) is associated with minimal risk and expense, can be performed via a routine standing right flank laparotomy, and apparently preserves adequate gallbladder function.

Although never reported to the authors’ knowledge, gallbladder involvement should be considered as a cause of obstruction of the proximal portion of the intestine in cattle that cannot be attributed to a more common cause. Ultrasonographic examination of the alimentary tract should include an assessment of the size and wall thickness of the gallbladder, as well as its position relative to the duodenum. Involvement of the gallbladder can be easily confirmed by exploratory laparotomy, with or without laparoscopic examination.

References