

Case Report **Rapport de cas**

Omasal dilation and displacement in 4 Holstein dairy cows

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Abstract – Cases of omasal dilation and displacement in 4 dairy cows are described. The disease was initially diagnosed by a combination of history and clinical signs that included right-sided abdominal distension, rectal palpation, and decreased milk production. The condition was confirmed by laparotomy or necropsy.

Résumé – **Dilatation et déplacement du feuillet chez 4 vaches laitières Holstein.** Des cas de dilatation et de déplacement du feuillet chez 4 vaches laitières sont décrits. La condition a été initialement diagnostiquée par une combinaison de l'anamnèse et des signes cliniques qui incluaient une distension abdominale du côté droit, une palpation rectale et une réduction de la production de lait. L'affection a été confirmée par laparotomie ou nécropsie.

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Cow A

Cow A, a 2-year-old, primiparous Holstein cow, 60 d in milk (DIM), was examined first in November 2003 for right-sided abdominal distension (Figure 1) and low milk production. Cow A was from a 400 milking-cow, Holstein dairy farm. Cows were milked 3 times a day; the rolling herd average (RHA) was 11 172 kg of milk. The lactating cows were housed in freestalls on mattresses and bedded on sawdust. Cows were fed a total mixed ration based on corn silage, alfalfa silage, ground dry corn grain, and protein supplements.

Case description

Rectal temperature, heart rate, respiratory rate, and rumen contractions were within normal limits. No pings were auscultated, but a firm doughy viscus could be palpated per rectum on the right side. An exploratory laparotomy was performed in the field. The right flank was clipped, washed, and scrubbed with povidone iodine for surgery. The flank was anesthetized by using the distal paravertebral anesthesia technique (1) and an incision was made through the abdominal wall into the peritoneal cavity on the right flank. The abnormal structure palpated per rectum was found to be a large, round viscus on the right side of the abdomen medial to the greater omentum (Figure 2). The cecum and abomasum were located, exteriorized, and found to be normal. The rumen appeared to be normal and the rest of the

palpable structures were unremarkable. The large viscus was partially exteriorized and incised to drain and identify its structure. The structure was determined to be the omasum based on the appearance of the mucosal surface of the viscus and by ruling out other organs such as the abomasum and cecum. The omasal content was pasty and soft (Figure 3), with a large amount of frothy, foamy gas present in the lumen of the omasum. The omasum was greatly distended and the mucosa between the omasal leaves was smoothed. Contraction of the organ towards its normal size began immediately after emptying; however, the omasum did not return to its normal anatomic location. The incision was closed and the cow recovered uneventfully from the surgery; however, on follow-up examinations, the omasum had become dilated again. Cow A remained in the herd after surgery but was culled due to low milk production at 290 DIM.

Cow B

Cow B, a 4-year-old, 3rd parity Holstein cow, 120 DIM, was examined first in April 2005 for a sudden decrease in milk production (Figure 4) and marked right-sided abdominal distension. Cow B was from a 3000 head milking-cow, Holstein dairy herd. Cows in this farm were milked 3 times a day and had an RHA of 11 978 kg of milk. Lactating cows were housed in freestalls with mattresses and bedded with waste paper pulp. Cows were fed a total mixed ration based on corn silage, alfalfa silage, ground dry corn grain, and protein supplements.

Case description

On physical examination, the vital parameters and rumen motility were normal. A ping was not detected and a gas-filled viscus was palpated per rectum on the right side. A right flank exploratory laparotomy was performed, as described for Cow A, and the omasum was found to be dilated and displaced. The omasum was decompressed by using a 10-G needle to release free gas. The omasum was not incised and the cow recovered

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Figure 1. Physical appearance of a cow (Cow A) with dilation and displacement of the omasum. Note the distended right side of the abdomen and bulging of the right paralumbar fossa.



Figure 3. Photograph of the omasotomy performed on Cow A. Note the ability to exteriorize the omasum and the abnormal appearance of the ingesta.

from the surgery. The cow remained in the herd, but her milk production continued to be below expectations.

On a follow-up visit in February 2006, physical examination and palpation per rectum confirmed that the condition was still present. The cow calved uneventfully in March 2006, but her milk production continued to be low.

Cow C

A 4-year-old, 3rd parity Holstein cow, 297 DIM, was examined in December 2005 for right-sided abdominal distension, presence of a right-sided ping, and low milk production. In July 2005, cow C was diagnosed with a simple indigestion event, at which time her milk production had declined from approximately 38 kg per day to 18 kg per day, according to herd records. Some improvement in production occurred following this episode but milk production continued to be far below expected levels. Cow C was from a 2300 head milking-cow, Holstein dairy farm with an RHA of 11 709 kg of milk. Lactating cows were housed in mattress freestalls and bedded with waste paper pulp. Cows



Figure 2. Initial view of the omasum during surgery (Cow A). Note that the dilated structure is medial to the superficial greater omentum.

were fed a total mixed ration based on corn silage, alfalfa silage, ground dry corn grain, and protein supplements.

Case description

Rectal temperature, heart rate, and respiratory rate were within normal limits. A gas-filled viscus was palpated per rectum on the right side. A right flank exploratory laparotomy revealed a gas-distended omasum that was also displaced dorsally on the right side of the abdomen. The omasum was decompressed by using a 10-G needle to release free gas. As with cow B, the omasum was not incised. The cow was culled 2 d later due to prolonged low milk production.

Cow D

Cow D, a 4-year-old, 2nd parity Holstein cow, 7 DIM, from the same dairy as Cow A was examined in February 2006 for right-sided abdominal distension and low milk production.

Case description

No pings were auscultated, but a gas-filled viscus could be palpated per rectum on the right side. Rumen contractions were normal. A blood sample was obtained to measure electrolyte levels. The sodium, potassium, calcium, and chloride levels were within normal limits. No other abnormalities were found at that time and no intervention was made. The cow remained in the herd for 5 wk, but her milk production was only 60% of that expected. In March 2006, the cow appeared markedly distended on both sides of the abdomen and was brought to Cornell University Teaching Hospital where a right flank exploratory laparotomy was performed by the attending surgeons. The left-sided abdominal distension was resolved by the time of surgery. No additional blood analyses were performed.

A standing right flank approach was used and upon entering the peritoneal cavity, an approximately 60 cm in diameter, round, gas-filled viscus was seen caudal to the 13th rib and ventral to the transverse processes of the lumbar vertebrae. The cecum and abomasum were both located and found to be in their normal anatomic positions with no distension. The dorsal

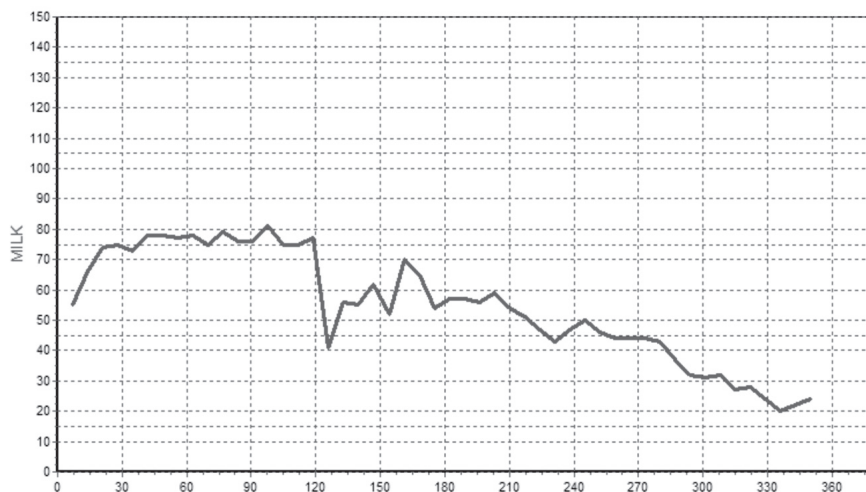


Figure 4. Graph of milk production of Cow B. The y-axis shows pounds of milk production per day and the x-axis shows days-in-milk. Condition was diagnosed at 120 days in milk, which corresponds to sharp decrease in milk production.



Figure 5. Close-up of the distended omasum of Cow D at necropsy. The cow is in left lateral recumbency and the image is taken looking caudal to cranial.



Figure 6. Photograph of the incised omasum in Cow D showing the leaves that were 3 to 4 times the normal length. The ingesta was quite watery.

and ventral sacs of the rumen were palpated and found to be normal. Palpation of the cranial part of the abdomen revealed a normal reticulum, but the omasum was not felt. The greater omentum covering the viscus was incised and the omasal leaves could be palpated through the serosal surface of the viscus. It was suspected that the gas-filled viscus was indeed a dilated and displaced omasum. The incision was closed, the cow euthanized, and a necropsy performed on the following afternoon.

On postmortem examination, the omasum was found to be markedly distended with gas and displaced laterally (Figure 5). The leaves of the omasum were 3 to 4 times the normal length (Figure 6); the ingesta within the omasum were watery, except in the region near the reticulo-omasal orifice. The abomasum contained approximately 1.5 kg of sand and the proximal part of the duodenum was mildly dilated and congested. Histopathologic examination of the omasal specimens revealed a superficial neutrophilic omasitis that was speculated to be attributable to altered omasal flora. The portions of the vagus nerve that were examined were normal.

Discussion

Disease processes of the omasum are relatively rare; primarily, they include omasal impaction, 1 case of omasal distension, and type II vagal indigestion. Omasal impaction was described in several papers published in the 1960s (2–5). Most of the omasal impactions were diagnosed at necropsy, but McDonald and Witzel (6) were able to diagnose 2 cases and treat the impaction surgically by both massaging the omasum to break up the impacted material and performing an omasotomy to remove the material. Necropsy findings in a cow with an impacted omasum included an enlargement of the omasum, tightly packed ingesta, and thin, necrotic omasal leaves (5). In the cases described herein, the omasal contents were soft, and although the omasum was enlarged, no evidence of impaction was found.

Hughes and Cartwright (7) described a case of distension of the omasum in an 8-year-old dry cow. Necropsy revealed a grossly enlarged omasum with fibrin on the omasal and abomasal surfaces and a very narrow omasal-abomasal opening. It was determined that the cause of the distension was a narrowed

omasal-abomasal opening, likely due to traumatic reticuloperitonitis, and that gradual distension of the omasum had resulted in a perforation leading to localized peritonitis, which further decreased the lumen of the omasal-abomasal opening.

Type II vagal indigestion is defined as a failure of omasal transport (8). The most common cause is a blockage of the omasal-abomasal opening by an adhesion or abscess, both of which are usually due to traumatic reticuloperitonitis (9). Alternatively, a blockage of the opening due to an ingested placenta or formation of a tumor or granuloma is possible.

The cause of omasal dilation and displacement is unknown. We hypothesize that in the cases in this report, omasal dilatation and displacement occurred secondary to either vagal indigestion or simple indigestion. The omasum is primarily innervated by the branches of the ventral vagus nerve (9), and it is plausible that if damage to the parts of the vagal nerve that innervate the omasum occurred, a functional disturbance of motor control of ingesta movement would follow. If the omasum was unable to contract and move ingesta through properly, it could slowly enlarge over time, further damaging the nerves due to over stretching from the distension of the organ. This theory is partially supported by the "vagal syndrome" appearance of Cow D in early March before transportation to the teaching hospital. However, results from microscopic evaluation of the vagus nerve samples that were collected were normal. It is possible that the vagus nerve did have lesions and that appropriate samples were not collected and examined.

Alternatively, omasal dilatation and displacement may occur after simple indigestion. Simple indigestion commonly happens after a sudden change in or overingestion of feed, which may result in distension of the rumen (9). Distension of the omasum may cause irreversible damage to the vagus nerves directly innervating the omasum or the myenteric plexus that propagates contractions over the surface of the omasum. The organ may remain enlarged and result in a loss of functional contractility and motility. Cow C was diagnosed with a simple indigestion event in July 2005, which was 5 mo before she was examined for right-sided abdominal distension. Her milk production decreased suddenly, but improved modestly, and remained far below expected levels. We feel that the link between this disorder and milk production is that of poor feed efficiency due to a lack of omasal function.

All 4 cases presented with the chief complaint of a right-sided abdominal distention and low milk production. The condition was diagnosed by the rectal palpation finding of a large viscus located in the right side of the abdomen and confirmed by exploratory laparotomy. Rectal palpation findings need to be interpreted with caution, as a right displacement of the abomasum may also present similarly. A ping was auscultated in only 1 case (Cow C) and can be explained by the presence of free gas in the omasum. The other cases did not ping because the contents of the omasum were either foamy, frothy gas, or fluid. At the time of surgery, if gas was present, the only intervention made was to deflate the omasum. In Cow A, the omasotomy was performed to examine the ingesta and mucosal surface. In all cases, no attempt was made to replace the omasum to its normal anatomic position. It is important for practitioners to be aware of this condition, which can be diagnosed based on the clinical signs and/or findings during surgery.

Authors' contributions

Drs. Bicalho, Cheong, Rosa, and Guard were the clinicians responsible for the case descriptions and worked together with Dr. Mayers, a senior veterinary student at the time, to put together this manuscript. CVJ

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