

A Buncha Bull....

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## **Introduction**

Cecal dilation and displacement is a disease that usually affects middle aged periparturient dairy cattle with uncommon occurrence in beef cattle.<sup>10</sup> Clinical signs depend on degree of obstruction. Common signs seen include anorexia, scant feces, lethargy and even acute colic.<sup>7</sup> Diagnosis includes abdominal percussion and auscultation, rectal palpation, and ultrasound.<sup>10</sup> Treatment usually requires surgical intervention. Prognosis with early uncomplicated surgical intervention is good to excellent.<sup>4</sup>

## **History and Presentation**

611 is a 4-year-old black Angus bull who presented to MSU CVM on July 1, 2019 for a history of anorexia and listlessness. On presentation 611 was quiet, alert, and responsive. He weighed 829 kilograms and was assigned a body condition score of 6/9. He appeared uncomfortable as he was reluctant to bear weight on his hind limbs. On physical exam he was tachypneic and tachycardic with a respiratory rate of 50 breaths per minute, and a heart rate of 90 beats per minute. He had increased bronchovesicular sounds in the cranioventral lung fields, but no crackles or wheezes were appreciated. No murmurs or arrhythmias were appreciated on cardiac auscultation. His rectal temperature was 102.5 F. He had injected sclera with 10% dehydration estimation. He had a markedly diffusely distended abdomen. There were no pings appreciated on abdominal percussion and auscultation. On rectal palpation, dilated loops of small intestine were felt just cranial to the pelvis. His clinical state declined after physical exam; he became laterally recumbent with markedly increased respiratory effort.

## **Diagnostic Approach**

A thorough physical exam is crucial in cases of acute abdomen in the bovine. Important diagnostic clues from the physical exam include abdominal contour, gait and posture, attitude,

respiratory rate and effort, perfusion parameters, pings, and rectal palpation.<sup>6</sup> Initial diagnostic work up for 611 included a physical exam, abdominal ultrasound, a chemistry panel, and a complete blood count (CBC). His abnormal physical exam findings included a bilateral mid and ventral abdominal distension, colic, tachypnea, tachycardia, dehydration, and pyrexia. Distended small intestinal loops were appreciated on rectal palpation. There were scant feces felt in the colon. These findings were consistent with a diagnosis of a small intestinal obstruction.<sup>2</sup>

611's abdominal ultrasound showed the dilated loops of small intestine measuring at 5 cm in diameter or larger. Anechoic fluid was present between the static loops of small intestine. Dilated, static loops of small intestine are the main diagnostic criterion for small intestinal obstruction.<sup>3</sup> An obstruction is diagnosed when the small intestine measures greater than 3.5 centimeters and motility is reduced or absent. The higher the number of dilated loops of small intestine seen, the more likely it is that the obstruction is distal. The degree of dilation depends on the site of the obstruction. With more proximal obstructions, i.e. the duodenum, the maximal diameter of the intestine when viewed from the 12<sup>th</sup> intercostal space ranges from 6.5-9.9 cm. With a more distal blockage, say, in the ileum, the maximal diameter of the intestine when viewed from the 12<sup>th</sup> intercostal space ranges from 4.4-5.5 cm.<sup>3</sup>

His chemistry panel showed he was hypokalemic at 3.16 mmol/L (3.9-5.8 mmol/L). This is most likely attributed to his anorexia. He had a mildly decreased CO<sub>2</sub> at 19.6 mEq/L (21-32 mEq/L). He was moderately hyperglycemic at 188 mg/dl (61-102 mg/dl). This could be due to stress or small intestinal volvulus. He was mildly azotemic with a BUN at 27 mg/dl (6-25 mg/dl) and increased creatinine at 2.31 mg/dl (1-2.1 mg/dl). This is most likely pre-renal due to dehydration. He had a mildly increased AST at 118 U/L (64-76 U/L) which could be due to absorption of toxic products from the gastrointestinal tract. He had increased total protein at 9.5

g/dl (7-8.9 g/dl) and increased globulin at 5.9 g/dl (2.5-4.4 g/dl) which could be explained by dehydration and inflammation, as globulin is a positive acute phase protein.

His complete blood count also showed several abnormalities: increased WBC at 23.87 K/ul (4-12 K/ul) and increased segmented neutrophils at 16,232/ul (2,500-7,500/ul). This is consistent with acute inflammation and stress. He also had an increased PCV at 48% (25-45%). This is consistent with dehydration.

The previously mentioned findings supported a diagnosis of small intestinal obstruction.<sup>2</sup> Differentials for small intestinal obstruction are numerous and can be separated into either mechanical or functional obstructions. Mechanical obstructions are caused by a blockage such as foreign body, intussusception, strangulation, root of mesentery torsion, or extra-luminal compression. Functional obstruction, also known as ileus, is uncommon in cattle and is most commonly post-operative.<sup>8</sup> Ileus can present with similar clinical signs as a mechanical obstruction. Cecal dilation and volvulus is a form of mechanical obstruction as it prevents the flow of ingesta through the intestines. The occurrence of cecal dilation and volvulus in beef cattle is so low, it was not at the top of the differential list.

A colic workup would also typically include a peripheral and abdominal lactate as well as an abdominal fluid analysis. However, his declined clinical state and dilated loops of small intestine were confirmation enough that 611 needed immediate surgery.

### **Treatment and Management**

Treatment of intestinal obstruction is focused on alleviating the obstruction, whether it be functional or mechanical so that ingesta can begin to pass freely again. 611 underwent an exploratory laparotomy to discover the cause of his intestinal obstruction. He was placed under general anesthesia in left lateral recumbency for a right flank exploratory laparotomy. A standing

right paralumbar fossa laparotomy is the approach of choice in suspected small intestinal obstruction as it allows for access to most of the gastrointestinal tract.<sup>2</sup> A standing laparotomy was not feasible for 611 due to his weakness and inability to stand for the duration of the surgery. Upon routine entry into the abdomen, copious amounts serous to serosanguinous fluid was appreciated as well as generalized distension of the rumen, small and large intestine, and cecum. Exteriorization of the small intestines revealed them to be diffusely hypervascularized and purple/dark in color. The cecum was torsed cranioventrally, was extremely dilated with a large amount of fluid, and was 5-6 times the normal size. The contents were evacuated via typhlotomy. There was no evidence of small intestinal obstruction. The small intestinal distension was presumably due to the cecal displacement and backflow of ingesta. 611 recovered without complication and was standing in his stall eating hay within 3 hours. He was started on flunixin meglumine at 1.1 mg/kg intravenously, oxytetracycline at 4.5 ml/100 lb intravenously, and procaine penicillin G at 2200 IU/kg subcutaneously. He was started on Ringers at maintenance and a lidocaine CRI at 0.036 mL/kg/hour.

### **Case Outcome**

At 3 AM, 10 hours post exploratory laparotomy, 611 became anorexic and anxious. On rectal palpation there were dilated loops of small intestine as well as scant feces in the colon. Ultrasonographically, there was abdominal free fluid as well as dilated loops of small intestine. There was a dorsal, right sided ping on abdominal auscultation caudal to the last rib. His lidocaine was increased to 0.07 ml/kg/hour. Seventeen hours post-op, his glucose dropped to 35 mg/dl. Boluses of 50% dextrose were given through the day when his glucose dropped which happened to be every 2 hours. His fluids were supplemented with dextrose and KCl. To stimulate gut motility, he was walked. Thirty hours post-op his glucose was 137 and remained high

through the night. Thirty six hours post-op he became ataxic and began head pressing. At 38 hours post-op he became laterally recumbent and tachypneic and an hour later at 9 am two days post-op he died.

On necropsy, 611 had petechial to ecchymotic hemorrhage present on the axillary body wall, which extended the entire length of the axilla. The abdominal cavity had fibrin covering the entire surface and covered every organ. Yellow to clear slightly cloudy fluid filled the abdomen and all the gastrointestinal organs were very dilated. A counterclockwise mesenteric volvulus of 180 degrees was present affecting approximately 5 meters of mid jejunum. The small intestine affected was dilated and dark red to purple black and was filled with hemorrhagic fluid. The serosal surface was covered by abundant tan fibrin. When the volvulus was reduced, there was a sharp line of demarcation between the normal colored proximal mesentery and the dark red to purple distal mesentery and attached small intestine. The morphologic diagnosis was acute intestinal volvulus with venous infarction resulting in septic peritonitis and endotoxic shock.

### **Pathophysiology**

611 was diagnosed with cecal dilation and volvulus with secondary post-operative ileus and subsequent mesenteric volvulus. The pathogenesis of cecal dilation and dislocation in cattle is poorly understood.<sup>7</sup> Historical proposed mechanisms of cecal dilation included dysmotility of the cecum or proximal loop of ascending colon. This would cause backup of ingesta and gas to accumulate in the cecum and eventually result in displacement.<sup>7,9</sup> A more recent study has shown a decreased motility in the spiral colon that prevents ingesta to move through the gastrointestinal tract resulting in back up of ingesta into the cecum.<sup>7,11</sup>

There have been studies that show alterations in mRNA expression of adrenergic, serotonergic, and muscarinic receptors in the spiral colon in cattle with cecal dilation and

displacement. It is uncertain if these alterations were involved in pathogenesis of cecal dilation and displacement or a result of the disease.<sup>7</sup>

Increased amount of volatile fatty acids in the cecum of cows with cecal dilation and displacement has been reported in the literature, however the role of increased volatile fatty acids in the disease process is unknown.<sup>1,7</sup>

It is suspected that 611 had post-operative recurrence of cecal dilation and displacement or severe post-operative ileus. Partial typhlectomy is indicated if there is necrosis of the cecum, cecal distention is severe, or if cecal dilation and displacement reoccurs.<sup>7</sup> One should see profuse watery feces within 12 hours of surgical treatment. Absence of feces 24 hours post surgical intervention is indicative that a second surgery is necessary.<sup>5</sup> This was not feasible for 611 due to financial constraints. The distended small intestine resulted in a jejunal mesenteric volvulus. This led to septic peritonitis, endotoxic shock, and ultimately death.

It is possible that a primary ileus caused the initial distension and displacement of the cecum however, unlike the equine species, primary paralytic ileus in cattle is extremely uncommon and is most likely post-operative in origin.<sup>8</sup>

## **Prognosis**

Prognosis for cattle with cecal dilation and volvulus is dependent on multiple factors such as: clinical state on presentation, duration of illness, surgical management vs conservative management, and vascular compromise of the cecal wall. Conservative treatment is not rewarding in cattle considered surgical candidates with suspected cecal torsion or retroflexion and surgery should not be delayed in these patients.<sup>4</sup> Cattle that are considered surgical candidates are as follows; cattle that have a poor general condition and demeanor, colic, absence of feces, cecal torsion or retroflexion of the cecum.<sup>4</sup> In cattle that show these signs and surgical

intervention is not pursued, prognosis is guarded. When surgical intervention is pursued, survival rates are 75-85%.<sup>5</sup>

## **Conclusion**

Cecal dilation and displacement is most common in middle aged, peri-parturient dairy cattle.<sup>10</sup> Clinical signs of cecal dilation and displacement include lethargy, anorexia, colic, scant feces in the colon, and an enlarged “bread loaf” like cecum in the pelvis on rectal palpation.<sup>7</sup> Diagnostic work up is largely dependent on state at presentation. If the animal is decompensating, immediate surgical intervention is recommended.<sup>5</sup> Definitive diagnosis and treatment is via exploratory laparotomy followed by typhlotomy. Subsequent surgery is indicated in cases of devitalized cecum or recurrence after initial surgery.<sup>7</sup> Conservative treatment for these patients is often unrewarding. Prognosis for these patients is good following uncomplicated surgical intervention.<sup>4</sup>

## **References**

1. Abegg R, Eicher R, Lis J, Lischer CJ, Scholtysik G, Steiner A. Concentration of volatile fatty acids in digesta samples obtained from healthy cows and cows with cecal dilatation or dislocation. *Am J Vet Res.* 1999;60(12):1540-1545.
2. Anderson DE, Constable PD, St Jean G, Hull BL. Small-intestinal volvulus in cattle: 35 cases (1967-1992). *J Am Vet Med Assoc.* 1993;203(8):1178-1183.
3. Braun, U. Ultrasound as a decision-making tool in abdominal surgery in cows. *Veterinary Clinics of North America: Food Animal Practice*; 21:33-53.
4. Braun, U., Beckmann, C., Gerspach, C. et al. Clinical findings and treatment in cattle with caecal dilatation. *BMC Vet Res* 8, 75 (2012).
5. Constable P. Surgical management of the right-sided ping (Proceedings). 2011.



6. Depenbrock S. Management of the Colicky Cow, in Proceedings. Penn Conference 2017.
7. Meylan M. Surgery of the bovine large intestine. *Veterinary Clinics: Food Animal Practice*; 24(3)479-496
8. Navarre B, Roussel A. Gastrointestinal Motility and Disease in Large Animals. *Journal of Veterinary Internal Medicine* 1996; 10:51-59.
9. Pearson, H. Dilatation and torsion of the bovine caecum and colon. *Vet Rec.* 1963; 75: 961–964
10. Singh G, Udehiya RK, Mohindroo J, Kumar A, Singh T, Verma P, Devi NU, Anand A (2018) Differential diagnosis and surgical management of cecal dilatation vis-a-vis cecal impaction in bovine, *Veterinary World*, 11(9): 1244-1249.
11. Stocker S, Steiner A, Geiser S, Kündig H. Myoelectric activity of the cecum and proximal loop of the ascending colon in cows after spontaneous cecal dilatation/dislocation. *Am J Vet Res.* 1997;58(9):961-968.