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Cecal Dilatation/-Dislocation – Medical and Surgical Approaches

Adrian Steiner, Dr med vet, FVH, MS, DECVS, DECBHMRuminant Clinic, VetSuisse Faculty of Berne, Bremgartenstrasse 109a, 3012 Berne, Switzerland

Introduction

Cecal dilatation/-dislocation (CDD) represents a common and economically important abdominal disorder that affects mainly dairy cattle. The pathogenesis of the disease remains poorly understood. Procedures to diagnose CDD are well established and various approaches to treatment of CDD are described.

It is the purpose of this paper to provide an overview of CDD, emphasizing on medical and surgical approaches and latest research results in this field.

Motility

Motility of the cecum, proximal loop of ascending colon (PLAC), and spiral colon have been studied in detail, using measurement and analysis of myoelectric activity. Myoelectric activity of the cecum has been found to be organized in a cyclic pattern and well coordinated with that of the PLAC and spiral colon. Myoelectric activity of the spiral colon showed the typical MMC organization, similar to the small intestine. The MMC in the bovine spiral colon (named bovine colonic MMC, or bcMMC) had a mean ± SD duration of 188.6 ± 30.8 minutes and was divided into 4 phases.[7]

Etiopathogenesis

In the past, atony or dysmotility of the cecum and PLAC, leading to accumulation of gas and digesta, and followed by dilatation and secondary displacement of the cecum, has been hypothesized to be of primary relevance in the pathogenesis of CDD. However, results of a recent study on myoelectric activity of the cecum and PLAC during the recovery period after surgery for correction of CDD suggested that a motility disturbance not of the cecum and PLAC, but of a more distal portion of the intestine, i.e. the spiral colon, may be implicated in the pathogenesis of the disease.[12] Several authors have reported the effects of increased VFA concentrations and/or high concentrate diets on ruminant gastrointestinal motility. The results are contradictory, with some studies showing inhibition of motility with increased VFA levels whereas others were unable to detect an effect on motility parameters. Concentrations of volatiles fatty acids were shown to be elevated in large intestinal contents of cows with CDD as compared to healthy cows fed similar diets.[1] In an *ex-vivo* study, the effects of several VFA concentrations and osmolarities of the organ-bath solution on the contractility of intestinal wall samples from the cecum and spiral colon of healthy dairy cows were compared.[2] Contractility in response to carbachol was not significantly affected by prior incubation with increasing

concentrations of sodium butyric acid or sodium valerianic acid, and after an increase in osmolarity. The effects of an abrupt increase of concentrates in the diet of healthy dairy cows on myoelectric activity of the spiral colon and on fermentation patterns in the rumen and large intestine were studied *in-vivo*.[6] The diet of the cows was changed abruptly (within 60 hours) from hay only to a ration of 50% hay and 50% starch-rich concentrates. For some traits of myoelectric activity, statistically significant, but biologically most likely not relevant differences among feeding regimens were found. It may be concluded from the mentioned studies that elevated concentrations of VFA do not appear to significantly inhibit large intestinal motility and, therefore, are not likely to play a significant role in the pathogenesis of CDD.

Epidemiology – Risk factors

In an epidemiologic study realized in Switzerland, similar prevalences of CDD and abomasal displacement (DA) were found.[4] Breed predilection for occurrence of CDD was not found, but an increased risk for development of CDD was evident during the production phase until the end of lactation and in cows without supplementation of stock salt and/or minerals.[4]

Classification

Cecal *dilatation* represents a distension of the cecum without twist. The cecal apex is directed caudad and positioned immediately in front of or within the pelvic cavity. Rotation along its long axis is referred to as cecal *torsion*, and rotation in the area of the ileo-ceco-colic (ICC) junction or the PLAC when viewed from the right side of the cow is referred to as clockwise or counterclockwise twist or volvulus. We usually prefer the terms *dorsal retroflexion* (retroflexio at dorsam) and *ventral retroflexion* (retroflexio ad ventram) to better define the previously used terms clockwise and counterclockwise twist/volvulus, respectively. The degree of rotation in cases of retroflexion may vary from 90° to more than 360°. The term *dislocation* refers to any torsion or retroflexion.

Symptoms

Symptoms of simple cecal *dilatation* are not specific. They include a drop in milk yield, reduced appetite and amount of feces, and occasionally discrete signs of colic. The right paralumbar fossa is distended. These signs become more severe in case of *retroflexion* or *torsion*. Animals are anorectic with more obvious signs of colic. Reduction of milk yield is more pronounced and feces are absent or very sparse and of dry consistency covered with mucus.

Diagnosis

Differentiation of the different types of dislocation is important as to the adequate therapy being advocated. In cases of simple cecal *dilatation*, percussion (ping) and succussion auscultation in the right flank are positive, extending from the tuber coxae to the last rib. The distended cecum is identified through rectal examination. The apex of the cecum reaches the pelvic cavity and can be palpated as a tense dome-shaped hollow organ with a smooth surface. Hematological and serum biochemical parameters are usually within normal range. In case of *retroflexion*, heart rate is elevated, and atony of the rumen is common. The area of the "ping" and the positive succussion auscultation is larger, extending further craniad, as compared with simple *dilatation*. Upon rectal examination, the body, but not the apex, of the cecum can be

palpated in the right upper quadrant as a tense tubular-shaped hollow organ with a diameter of about 15-20 cm. Biochemical analysis of blood may in some instances reveal a hypochloremic, hypokalemic metabolic alkalosis due to stasis or even reflux of intestinal contents. Cecal *torsion* can be diagnosed through rectal examination: The cecal apex is directed caudad and the tense ICC ligament, which may have pain elicited upon palpation, is identified as a tense structure spiralling around the cecum.

Medical treatment

Medical therapy is indicated if the general condition of the animal is only slightly disturbed, defecation is still present, and rectal examination does not reveal any torsion or retroflexion.[3,5] If the prerequisites for medical therapy are not fulfilled or medical treatment has revealed unsuccessful within 24 hours after initiation, surgical therapy is indicated.

Medical treatment consists of intravenous fluid administration supplemented with potassium chloride as needed, purgatives (3 liters of liquid paraffin), and NSAIDs as needed. Bethanechol may be administered subcutaneously at 0.07 mg/kg Bwt, TID for 2 days.[11] Supplementary medication may include correction of calcium deficiency, and treatment of ketosis. Feed is completely withheld for at least 24 hours, and small amounts of hay are then gradually offered, provided defecation is present and CDD has resolved. In a retrospective study, only thirteen out of 111 cows (12%) with spontaneous CDD fulfilled the criteria for medical treatment, one of which, surgical treatment had to be initiated at 2 days after initiation of medical treatment, because of deterioration of the general condition.[3] If recovery does not become evident within 24 to 48 hours after initiation of medical treatment, surgical intervention is recommended.

Surgical treatment

Cecomtomy (typhlotomy) and evacuation of intestinal contents is usually the surgical treatment of choice. Cecal amputation is indicated only in cases of recurrence of CDD or in cases of devitalization of the cecal wall.

Typhlotomy: Surgery is performed through a right flank approach, preferably in the standing animal under local anaesthesia. The abdomen is opened through a 25 cm long incision starting dorsally about 8 cm below the lateral processes of the lumbar vertebrae and 8 cm cranial to the tuber coxae, extending slightly oblique in a cranioventral direction parallel to the internal oblique abdominal muscle. The abdomen is then thoroughly explored and the cecum, PLAC, and spiral colon positions identified. The cecum and as much of the PLAC as possible are exteriorized by gently pushing from the inside toward the outside of the abdomen with the palm(s) of one or both hands in order to reduce the risk of rupture and/or perforation of the distended bowel. The apex of the cecum is isolated from the rest of the abdomen, and a typhlotomy is performed at the most ventral location. Digesta are first passively drained from the extraabdominal part of the cecum and then gently milked out from the intraabdominal part of the cecum and the PLAC to the incision site. The exteriorized cecum is rinsed with copious amounts of prewarmed 0.9% saline solution and the incision site closed with a simple inverting continuous or an inverting seromuscular suture pattern (i.e. Cushing or Lembert), using size USP 3-0 monofilament resorbable suture material. The exteriorized sections are again copiously rinsed and placed back into their physiologic position within the supraomental recess. The cecum is evaluated again 10 minutes later; and if it has refilled, a second

typhlotomy is done to relieve the cecum and PLAC of digesta that may have accumulated within these segments by propulsion from the ileum or reflux from the spiral colon. The typhlotomy site is finally oversewn twice. Closure of the abdominal wall is performed in a routine manner. Postoperatively, bethanechol (0.07 mg/kg Bwt, SC, TID, for 2 days) may be administered to help restore intestinal motility.[11] Antimicrobials (for example sodium penicillin, 30,000 IU/kg Bwt, IV) are administered perioperatively. If necessary, intravenous or oral rehydration, correction of electrolyte imbalances, and treatment of ketosis should be performed. Operated cows are set on a restrictive diet for 24 to 48 hours, followed by a medium coarse forage ration of increasing quantity to finally reach the normal ration within 5 to 7 days.

Cecal amputation (typhlectomy): In case of recurrence of CDD or devitalization of the cecal wall, cecal amputation immediately distal to the ICC junction is recommended.[3,5,8-10] This procedure may be performed in the standing animal after local analgesia of the right flank. The cecum is evacuated as described before, and the ICC ligament is anesthetized by infiltration of 30 ml of a 2% lidocaine solution, injected near the ICC junction to block the cecal nerve. The cecal branches of the cecal artery and vein are ligated close to the attachment of the ICC ligament to the cecum to preserve blood supply to the ileum. Ligature of the blood vessels may be accomplished either by direct visualization after blunt dissection of the overlying fat, or by blind mass ligatures of the ligament. The ICC ligament is transected. Two 15 cm intestinal clamps, one from the mesenteric and one from the anti-mesenteric side, are placed a few centimeters aboral to the intended site of amputation, just apical to the ICC junction. The cecum is transected, and the cecal stump closed with two continuous inverting seromuscular suture patterns (i.e. Cushing or Lembert), using size USP 3-0 resorbable suture material.[9,10] Alternatively, the stump may be closed using two linear 90 mm cartridges of 3.5 mm staples with the staple lines overlapping in the center of the stump.[10]

Abstract
This paper describes anatomy, physiology, motility, etiopathogenesis, risk factors, classification, symptoms, diagnostic procedures, treatment, and prognosis of cecal dilatation/-dislocation. Medical treatment consists mainly of intravenous fluid administration and bethanechol, administered subcutaneously at 0.07 mg/kg Bwt, TID for 2 days. Feed is completely withheld for at least 24 hours. Surgical treatment usually consists of cecotomy and evacuation of cecal contents, followed by a similar postoperative care as described for medical treatment.

Résumé
Le présent résumé décrit l'anatomie, la physiologie, la motricité, l'étiopathogénèse, les facteurs de risque, la classification, le diagnostic, le traitement et le pronostic de la dilatation et dislocation du cécum. La thérapie médicale comprend surtout des perfusions intraveineuses et du béthanéchol administré par voie sous-cutanée à un dosage de 0.07 mg/kg trois fois par jour durant 2 jours. Les animaux atteints sont mis à la diète stricte pendant au moins 24 heures. Le traitement chirurgical consiste en une caecotomie avec vidange du contenu du caecum, suivie d'un traitement post-opératoire similaire à la thérapie médicale.

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