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Scientific Report

A rare case of colonic diverticulum in a Bitch

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Abstract

Background: Colonic diverticulum is one of the rare findings in dogs characterized by an out-pouching of mucosal and submucosal layers through the defect in muscularis layer of the colon. **Case description:** A five years old intact female Labrador was presented with an anamnesis of dyschezia and tenesmus. **Findings/treatment and outcome:** Rectal examination was normal, and the survey radiograph showed an almost crescent shaped abnormal dilatation (10.52 cm × 6.21 cm) with gas and increased radiopaque material, dorsal to the urinary bladder and ventral to the descending colon suggesting fecal stasis. Ultrasonographic examination revealed gas-filled out-pouching with hyperechoic colon wall and acoustic shadowing. Exploratory celiotomy confirmed the diagnosis of colonic diverticulum, and diverticulectomy was performed. All four layers of the colonic wall were detected histopathologically in the biopsy sample and excluded neoplasia. The dog recovered uneventfully with no post-operative complications. **Conclusion:** This surgery produced an excellent resolution of clinical signs. To our knowledge, this is one of the few cases of colonic diverticulum reported in dogs.

Key words: Bitch, Colonic diverticulum, Diverticulectomy, Exploratory celiotomy

Introduction

Colonic diverticulum is one of the rare findings in dogs characterized by an out-pouching of mucosal and submucosal layers through the defect in muscularis layer of the colon. The main causative factor is not exactly clear; however, it occurs in the middle to older age group animals. The focalized less resistant or weak points in the intestinal wall are the sites of diverticulum development (Halpert *et al.*, 1989). This condition results in persistent tenesmus, animal discomfort, incomplete gut emptying, and impaired defecation. Acute diverticulitis is one of the most common complications of diverticular disease in humans (Salem *et al.*, 2006). Surgical correction is the only option to maintain the function of the intestinal compartment since this condition cannot be improved by either medical or conservative management. The surgical techniques for the diverticulum include diverticulectomy (Spodnick *et al.*, 1996) and resection followed by end-to-end anastomosis (Kazemi *et al.*, 2013). A similar case was recently documented by Lipar *et al.* (2021) in a male Labrador with prostatic involvement. This case reports the management of a colonic diverticulum in a bitch.

Case description

A five years old intact female Labrador bitch weighing 28 kg was presented to Small Animal Clinics-Surgery-Out-Patient Unit, Department of Clinics, Madras Veterinary College, Vepery, Chennai, India, with a history of dyschezia, discomfort, and tenesmus. The animal was bright, alert, and responsive on presentation.

Findings/treatment and outcome

The physical parameters such as heart rate, pulse rate, respiratory rate, and body temperature were within the clinical range. The finding of the rectal examination was normal. The survey radiograph showed an almost crescent shaped abnormal dilatation (Fig. 1) (10.52 cm × 6.21 cm) with gas and increased radiopaque material, dorsal to the urinary bladder and ventral to the descending colon, suggesting fecal stasis. Abdominal ultrasonographic examination revealed gas filled out-pouching with hyperechoic colon wall and acoustic shadowing (Fig. 2). Based on the findings, the case was suspected of colon diverticulum and scheduled for exploratory celiotomy. Venous blood samples were

collected for pre-operative haematology, and serum biochemistry estimation, and values were within the normal range.

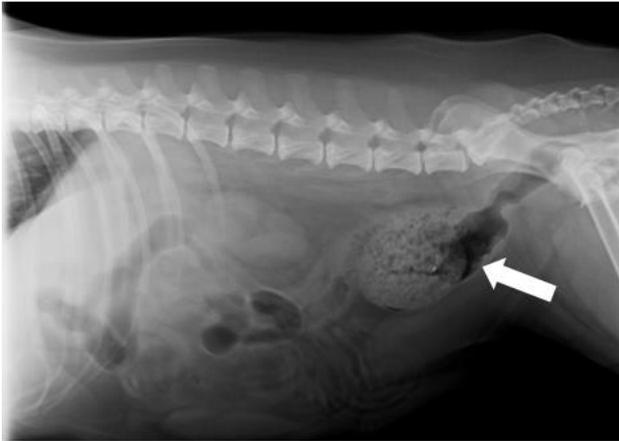


Fig. 1: Lateral abdominal radiograph, showing crescent shaped abnormal dilatation in the descending colon with fecal impaction and gas accumulation (arrow)



Fig. 2: Abdominal ultrasonograph revealed hyperechoic colonic wall with acoustic shadow

The animal was fasted for 24 h pre-operatively but had free access to water. Rectal contents were evacuated manually after administering a warm water enema 24 h before surgery. Intravenous cefotaxime sodium injection (Taxim[®], 500 mg/vial, Alkem Laboratories Ltd., East Sikkim) was given pre-operatively at the dose rate of 40 mg/kg body weight, 1 h before surgery and continued 5 days post-operatively at 12 h time interval.

The animal was premedicated with midazolam (Mezolam[®], 1 mg/ml, Neon Laboratories Ltd., Mumbai) (0.2 mg/kg body weight, I/V) and butorphanol (Butodol-1[®], 1 mg/ml, Neon Laboratories, Thane) (0.2 mg/kg body weight, I/V). Anaesthesia was induced with propofol (Neorof[®], 10 mg/ml, Neon Laboratories, Mumbai) (3 mg/kg body weight, I/V) titrated to effect and maintained under 2.5% isoflurane with an oxygen flow rate of 40 ml/kg/min in rebreathing circuit.

The surgical site was prepared aseptically. A 15 cm long caudal midline celiotomy incision was made, and the abdominal cavity was entered. Abdominal examination revealed no free fluid. The falciform ligament was dissected and cut with electro-cautery. The

colon was isolated, and a sac-like diverticulum was identified in the descending colon (Fig. 3). Adhesions were noticed between the cranial part of the uncompressible diverticulum and the caudal aspect of the body of the uterus and the urinary bladder (Fig. 4). Transrectally a gastric tube was passed cranial to the lesion to assess the colon direction and to detect the probable presence of obstruction. A full-thickness circumferential incision was made, and the out-pouching of the colon was resected (diverticulectomy) (Fig. 5). The colon wall was reconstructed after diverticulectomy using polydioxanone 3-0 (PDS[®]II, Ethicon) in single layer simple interrupted pattern (Fig. 6) and checked for leakage. The linea alba was closed with polyglycolic acid 1-0 (Relyon pga[®], Mco hospitals Aids Pvt Ltd., Hubli) by a simple continuous pattern, followed by subcutaneous and subcuticular suturing with polyglycolic acid 2-0 (Relyon pga[®], Mco hospitals Aids Pvt Ltd., Hubli). The skin was sutured with polyamide 2-0 (Netplast, Suture Planet, Bangalore) in the cruciate pattern.

The dog was maintained on parenteral fluids (Ringer's lactate[®] 500 ml, I/V, q 12 h), antibiotics (Cefotaxime sodium[®] 40 mg/kg body weight, I/V, q 12 h) and opioids (Buprenorphine, Burigesic[®], 0.3 mg/ml, Neon Laboratories Ltd., Mumbai[®] 0.02 mg/kg body weight, I/V, q 6 h) for 72 h. The animal had free access to water after 12 h and canned wet food (Hills i/d) after 36 h of surgery. Elizabethan collar was recommended to prevent self-mutilation. Lactulose was prescribed (1

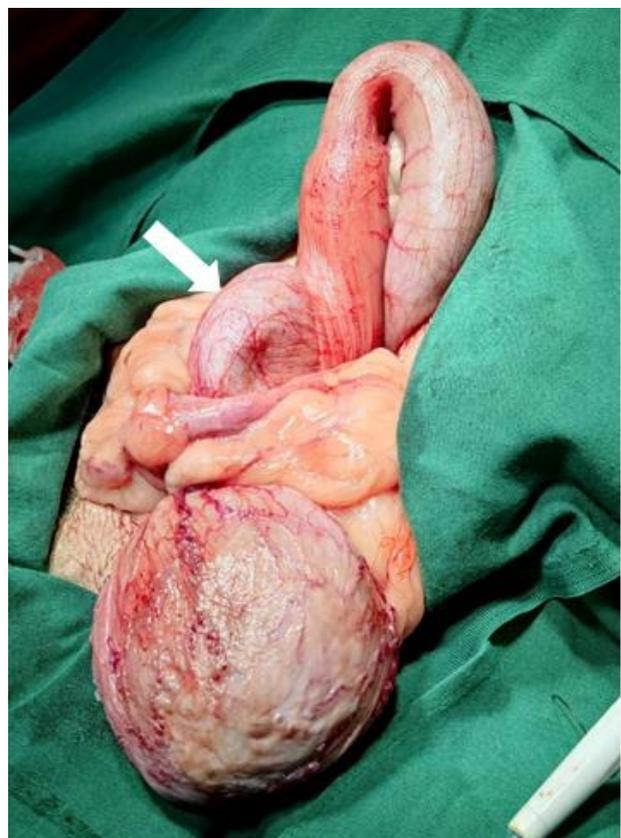


Fig. 3: Abnormal dilatation/out-pouching in the wall of descending colon (arrow)

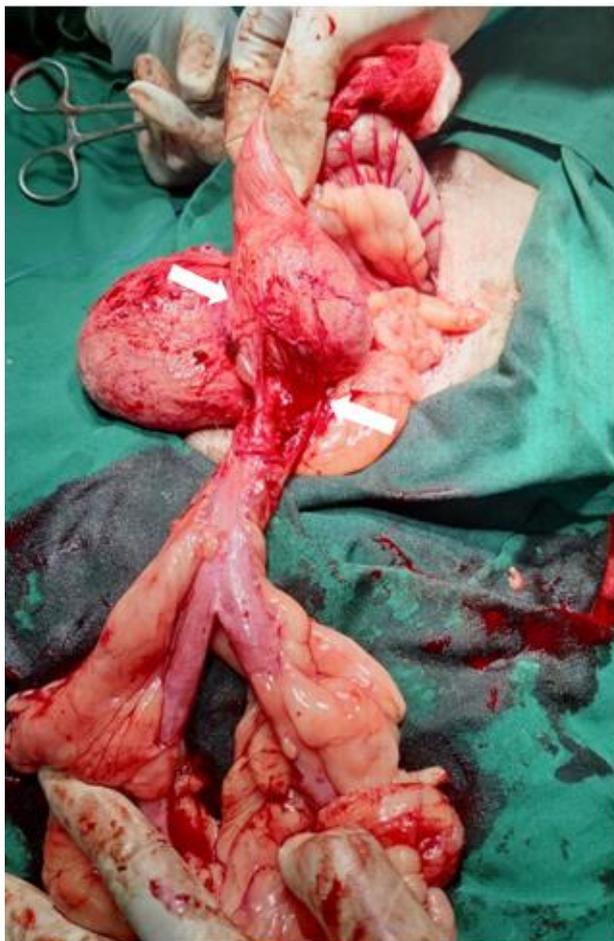


Fig. 4: Abnormal adhesions noticed between the dilated part of the descending colon and body of the uterus and urinary bladder (arrows)



Fig. 5: Resection of the dilated part of the descending colon (diverticulectomy)



Fig. 6: Closure of the descending colon after resecting the diverticulum using absorbable monofilament suture material in a single layer of full-thickness simple interrupted pattern

ml/4.5 kg body weight) for two weeks post-operatively. The animal recovered uneventfully and no post-operative complications were reported by the pet owner.

Histopathology revealed all four layers of the colonic wall with hyperplastic mucus membrane and fibrous proliferation. As there were no tumor-related findings, the colonic diverticulum was confirmed.

Discussion

The colon comprises ascending, transverse and descending colon. A diverticulum presence in the colon is called diverticulosis (Tursi *et al.*, 2015; Walker and Harris *et al.*, 2017). Diverticular disease includes both diverticulum and diverticulitis (Schieffer *et al.*, 2018). The colonic diverticulum is one of the rare findings in dogs. Although the exact agent of the colonic diverticulum is not clear, persistent tenesmus and constipation are considered as supporting causes, making a particular part of the intestine weaker than other parts. Predisposing factors of colonic diverticulum include fatty changes in the intestinal wall of obese patients, congenital defects in the colon, abnormal motility, muscular atrophy, intestinal infections/inflammation, increased fecal stasis/impaction, decreased water consumption and fiber intake, etc (Halpert *et al.*, 1989; Stollman and Raskin, 2004; Chen *et al.*, 2005). Heise, (2008) reported that chronic use of non-steroidal anti-inflammatory drugs and opioids might result in diverticulum formation. Excitatory neurotransmitters such as serotonin and acetylcholine increased in

diverticulum disease, which could be the reason behind hypersegmentation of the colon followed by diverticulum in humans. In humans, colonic muscle dysfunction, due to abnormal parasympathetic activity, is related to diverticulosis disease and has a positive correlation with aging (Jeyarajah and Papagrigroriadis, 2011). Obesity, hypertension, and hyperlipidemia are associated with an increased risk of diverticulum disease, while diabetes mellitus has a decreased effect, as per human reports (Kopylov *et al.*, 2012).

Large bowels can be identified in survey radiographs based on finely distributed gas bubbles. Even though the colorectal junction is not well defined in animals, it can be found at the level of the seventh lumbar vertebra, the pelvic brim, and the pelvic inlet (Tobias, 2016). The colonic diverticulum is more common in humans than rectal diverticulum but vice-versa in animals. It can be classified as complicated and uncomplicated diverticulitis based on the presence of fistula or perforations. There is a strong relationship between symptomatic uncomplicated diverticular disease (SUDD) and colonic microbiota (Scaiola *et al.*, 2016; Tursi *et al.*, 2020). Uncomplicated type of colonic diverticulitis is more common (up to 75-80%) in humans (Joel, 2013). A complicated colonic diverticulum is characterized by a variety of symptoms, whereas an uncomplicated diverticulum is primarily an incidental finding (Liekens *et al.*, 2021). Based on histopathological morphology, the colon diverticulum can be classified into three types such as pseudodiverticulum (pulsion diverticulum), inflammatory diverticulum (due to perforations), and true diverticulum (congenital origin) (Kam *et al.*, 2013). Since no previous illness/surgery was reported by the owner and all four layers of the intestine were identified histopathologically, the colonic diverticulum observed in this case could be uncomplicated, pulsion type of congenital origin. The most common clinical findings in the colonic diverticulum are abdominal pain and discomfort (Nigri *et al.*, 2015). Chronic colon inflammation affecting mucosa segmental colitis associated with diverticulosis (SCAD, prevalence of less than 1%).

Only the surgical option is considered for colonic diverticulum since not much of a conservative medical plan is available (Tursi *et al.*, 2015). Feuerstein and Falchuk (2016) reported that an increase in diet fiber content might prevent the recurrence. Plication is one of the techniques used to treat rectal diverticulum (Larson, 1966; Szabo and Bilkei, 2001), and it decreases the rate of contamination during surgery. The gold standard therapy for colonic diverticulum is en bloc resection/lateral resection of diverticulum followed by anastomosis, followed in this case (Maghrebi *et al.*, 2018; Nanaboina *et al.*, 2018). A full-thickness colonic diverticulum flap, documented by Lipar *et al.* (2021), was not used in this study since it is risky and might consist of tumor cells in case. Lee and Kim (2021) documented the flattening of the lesion after submucosal saline injection into the pseudodiverticulum.

To conclude, colonic wound healing is delayed compared to the small intestine due to lack of collateral vascularisation, more intraluminal anaerobic bacteria (10^{10} bacteria per g of faeces), and surgical stress during manipulation. The common complications of intestinal surgeries are wound dehiscence and leakage, which may result in peritonitis (Theresa, 2019). Antibiotics have advantage of treating complicated diverticulitis, but no effect on uncomplicated diverticulitis.

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Conflict of interest

The authors declare no conflict of interest.

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