# Rectal Duplication Cyst in a Cat: A Case Report and Literature Review

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## ABSTRACT

A 3 year old, female spayed Manx cat was presented for a 5 day duration of straining to defecate with vocalization. A pelvic canal mass could be palpated during rectal exam. A soft tissue opacity mass superimposed within the pelvic canal, resulted in a ventral displacement of the rectum, with vertebral anomalies were observed on abdominal radiographs. Computed tomography (CT) of the caudal abdomen and pelvis was performed. There was a round, smoothly marginated, fluid attenuating mass with a contrast enhancing rim within the pelvic canal. This mass was causing severe ventral compression of the rectum. The caudal endplate of L4 and the cranial endplate of L5 were flared with multiple caudal vertebra being malaligned and malformed. The cystic mass was resected using a dorsal perineal approach, and histopathology of the resected tissue was consistent with a rectal duplication cyst, a rarely reported congenital anomaly in the cat. Rectal duplication cysts are a type of alimentary duplication cysts which are thought to arise from splitting of the notochord and herniation of the endoderm during embryogenesis.

**Key words:** Alimentary Duplication; Congenital; Anomaly; Obstipation; Feline

## INTRODUCTION

Alimentary duplications are rare congenital anomalies reported in humans, cats, dogs, horses, and a macaque (1–9). The requirements for classification as an alimentary duplication are as follows: be associated with the alimentary tract, have epithelium resembling some portion of the alimentary tract, and have a smooth muscle layer (10). They can be found in all segments of the gastrointestinal tract, from the oral cavity to the rectum. Alimentary duplication cysts can have a completely independent lumen, sharing a muscular only wall, or can communicate with the true gastrointestinal lumen (3). Historically, the cysts have been classified based on their location, shape or vascular supply(3–5,11,12); however, it is now recommended that classification be based on the histological appearance (13). This case report describes the history, physical examination, imaging findings, surgical treatment, fluid analysis and histology of a rectal duplication cyst in a cat.

## CASE DESCRIPTION

A 3-year-old, female spayed Manx cat was presented to the primary care veterinarian for a five day history of straining to defecate with vocalization. An enema was performed and abdominal radiographs were performed. A pelvic canal mass was observed on review of the abdominal radiographs, and the patient was referred to the Soft Tissue Surgery Service at Kansas State University for further diagnostic workup and treatment. The patient had no significant additional abnormal medical history and was otherwise healthy.

On presentation, the patient was mildly uncomfortable

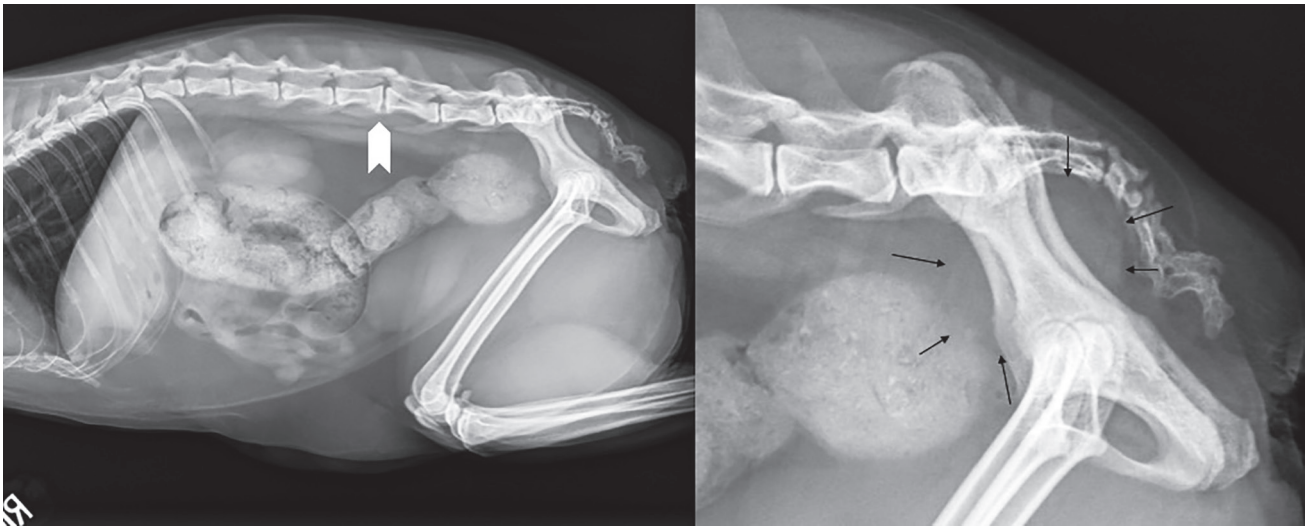

**Figure 1.** Right lateral abdomen. Left – There is a round, soft tissue opacity mass superimposed withIN the pelvic canal, resulting in ventral compression of the rectum and preventing outflow of fecal material. There is flaring of the vertebral end plates of L4 and L5 (arrow head), the caudal vertebra are malformed and malaligned. Right – Same right lateral abdominal radiograph, cropped to highlight soft tissue opacity mass superimposed with the pelvic canal.

on abdominal palpation with a large amount of hard feces palpated within the colon. A sedated rectal exam was performed and a large soft tissue mass was palpated dorsal to the rectum. An enema was accomplished, and a small amount of fecal material was removed manually. Abdominal radiographs were made, and a soft tissue, ovoid mass measuring 3.2 x 2.0 cm was observed within the pelvic canal dorsal to the rectum. The caudal endplate of L4 and the cranial endplate of L5 were flared. Multiple caudal vertebra were malaligned and malformed. Differential diagnoses for the mass were a cystic lesion, granuloma, abscess, hematoma or neoplastic mass (Figure 1).

Based on the severity of clinical signs and differential diagnoses, advanced imaging and surgical exploration were recommended and performed the following day. Preoperative bloodwork showed mild monocytosis (0.8 K/µL, 0.0-0.5 K/µL), mild eosinophilia (1.1 K/µL, 0.0-0.8 K/µL), and mild hyperphosphatemia (5.5 mg/dL, 2.6-5.3 mg/dL).

The patient was premedicated for anesthesia with dexmedetomidine (Zoetis, Parsippany-Troy Hills, NJ, USA) 3µg/kg and buprenorphine (Par Pharmaceutical, Woodcliff Lake, NJ, USA) 0.02mg/kg by intramuscular injection. Anesthesia was induced with alfaxalone (Jurox Animal Health, North Kansas City, MO, USA) 1.8mg/kg and maintained with isoflurane (Akorn, Lake Forest, IL, USA) 1-3%. Intravenous (IV) fluid administration of Lactated Ringer's Solution (LRS, Baxter Healthcare Corporation, Deerfield, IL, USA) at a rate of approximately 40 mL/hr was given. Additional analgesia was provided by a bupivacaine (AuroMedics, East Windsor, NJ) 0.5mg/kg and morphine (Hospira, Lake Forest, IL, USA) 0.1mg/kg via epidural injection.

The patient was positioned in dorsal recumbency and caudal abdominal including the pelvis computed tomography (CT, GE BrightSpeed 16 slice, 0.625 mm slice) was performed without and with contrast (Omnipaque® 300 mg I/ml, Amersham Health, Princeton, NJ, USA, 2.2 mL/kg IV). Within the pelvic canal there was a round, smoothly marginated, fluid attenuating mass measuring 24.1 x 17.8 x 24.1mm in dimension with a thin contrast enhancing rim. The mass occupied approximately 75% of the height, and greater than 95% of the width of the pelvic canal, resulting in severe ventral compression of the rectum. The contrast enhancing rim of the mass formed an obtuse angle with the serosa of the colon (shoulder sign). The caudal endplate of L4 and the cranial endplate of L5 were flared with multiple caudal vertebra being malaligned and malformed (Figure 2). Following CT, the differential diagnosis list was updated to alimentary duplication cyst, intramural abscess, and hematoma. The presence of a cystic structure associated with the rectum and vertebral anomalies on radiographs and CT made the diagnosis of an alimentary duplication cyst most likely.

Prior to the surgical procedure and every 90 minutes

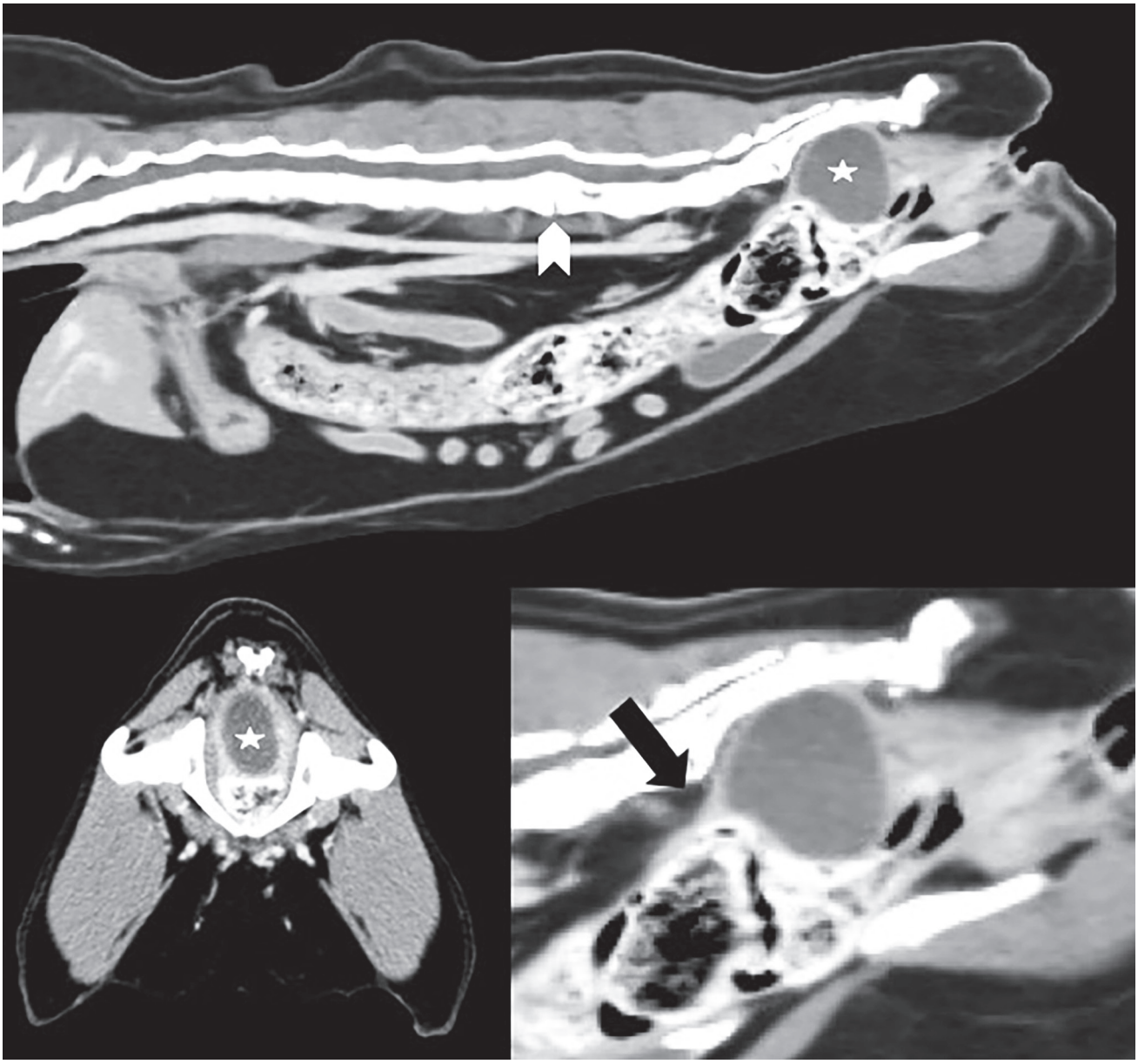

**Figure 2.** Top: Sagittal image in a soft tissue window. Within the pelvic canal there was a round, smoothly marginated, fluid attenuating mass with a contrast enhancing rim (star). The mass occupied approximately 75% of the height of the pelvic canal, resulting in ventral compression of the rectum. Note the flaring of the vertebral end plates of L4 and L5 (arrow head) Bottom left: Transverse image in a soft tissue window at the level of the pelvic canal. The cyst (star) occupies greater than 95% of the width of the pelvic canal. Bottom right: The contrast enhancing rim of the mass formed an obtuse angle with the serosa of the colon (arrow, shoulder sign).

thereafter, 30 mg/kg of ampicillin/sulbactam (Sagent Pharmaceuticals, Schaumburg, IL, USA), was given intravenously. A dorsal perineal approach was used. The tissues were dissected away until a firm, soft tissue mass was visible dorsal to the rectum (Figure 3). A Foley urinary catheter was inserted into the rectum and the balloon inflated cranial to the portion of the rectum compressed by the mass. Caudal traction was placed on the catheter to assist in retraction and dissection around the mass. The cyst was aspirated in an attempt to reduce its size; however, the material was too viscous for an effective volume to be removed. This sample however, was saved for fluid analysis. A stay suture was placed in the caudal aspect of the cyst, and upon gentle traction the cyst ruptured. Suction was used to remove the cystic contents

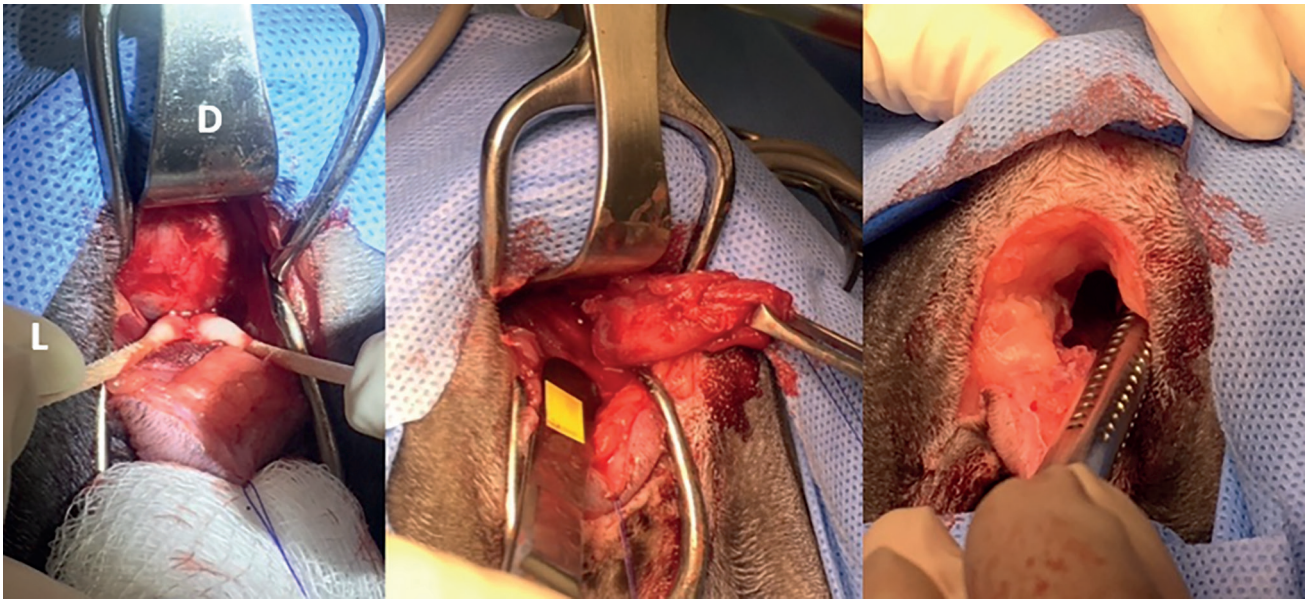


**Figure 3:** Dorsal perineal approach to access the rectal duplication cyst. D-dorsal, L-left Left – Cyst in situ. Center – The cyst has been manually ruptured and is being retracted caudally to allow for blunt dissection around the cyst. Right – The cyst has been completely excised.

from the surgical area. The cystic capsule was freed from remaining attachments, removed, and submitted for histopathology. There was no evidence of communication with the rectum or other surrounding tissues. The tissues were closed routinely. Minor hypotension was recorded during the procedure and was treated with glycopyrrolate (Amneal Pharmaceuticals, Bridgewater Township, NJ, USA) 0.01 mg/kg IV.

The patient recovered uneventfully from anesthesia. The patient was hospitalized for 3 days following the procedure for post-operative care. A tapering fentanyl (Hospira, Lake Forest, IL, USA) continuous rate infusion was used for two days post-operatively for pain control, with a transition to buprenorphine (Par Pharmaceutical, Woodcliff Lake, NJ, USA) 0.02 mg/kg IV. Robenacoxib (Elanco Animal Health, Greenfield, IN, USA) 1.4mg/kg by mouth (PO) every 24 hours was also given for three days post-operatively. Ampicillin/sulbactam injectate was given 30mg/kg IV every 8 hours (q8hr) and lactulose (Akorn, Lake Forest, IL, USA) 0.5mL/kg PO q8hr. LRS was delivered at a variable rate, depending on the patient's hydration needs. While in hospital the patient was able to pass soft stools. The patient was discharged with oral ampicillin/sulbactam (Zoetis, Parsippany-Troy Hills, NJ, USA) 15 mg/kg PO every 12 hours for 10 days, Buprenorphine 0.02mg/kg transmucosally q8hr for three days, and lactulose 0.5mL/kg PO q8hr for two weeks.

Fluid aspirated from the mass intra-operatively was submitted for cytological evaluation revealing a high protein, low cellularity fluid. The nucleated cells present consisted primarily of very rare polygonal to angular cells arranged individually and in very small aggregates. The cells had oval nuclei, with a finely stippled to coarse chromatin pattern, frequently 1-2 small round prominent nucleoli and moderate to abundant amount of blue smooth cytoplasm with pink granulation. Occasionally the nuclei seemed large and with very open chromatin (probable degeneration). Rarely markedly degenerate cells are observed that were most likely neutrophils and macrophages. The background was pink fibrillar to granulated (indicating high protein), with an abundant amount of round dense dark blue structures (about 0.2-1 micron, most likely pyknotic nuclei), and an abundant amount of blue round to polygonal, variable size islands (possibly keratin, cytoplasmic fragments and necrosis). Rarely thick areas with purple to refractile pale round material were present (probable mineralization). No organisms were identified. The cells present were consistent with necrosis and inflammation. Aerobic and anaerobic culture of the fluid was negative.

Histopathology of the tissue (Figure 4) showed a cystic structure lined by cuboidal epithelium which multifocally formed tufts of glandular epithelium, goblet cells and deep glands similar to rectal epithelium. Underlying the epithelial

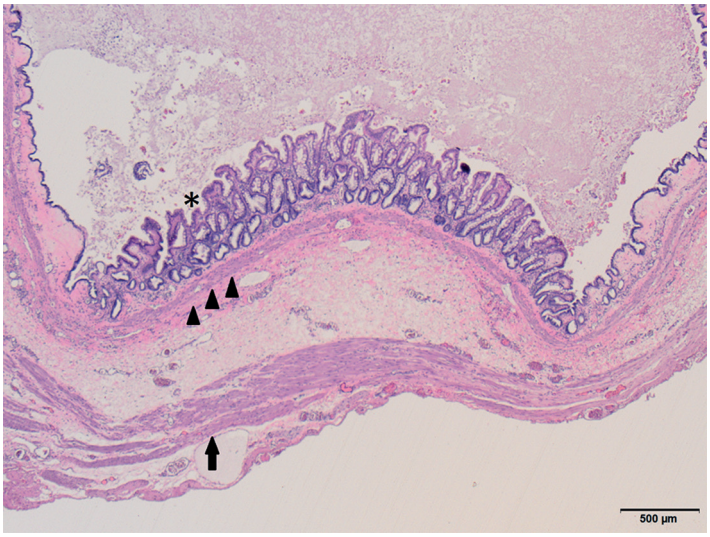


**Figure 4.** Histology of the cyst wall showing tufts of glandular epithelium with numerous goblet cells (asterisk), a discontinuous muscularis mucosa (arrow heads) and muscular wall (arrow). The lumen is filled with paucicellular proteinaceous material. H&E staining 200x.

layer was a discontinuous muscularis mucosa. Multifocally, the mucosa is partially denuded and the underlying tissue consists of granulation tissue. The wall of the cyst is composed of an inner circular and outer longitudinal muscle layers, similar to intestinal wall. The layers are variably thick in the section, and between the layers were areas of irregular vasculature and multifocal ganglia similar to the myenteric plexus. Multifocally, the submucosa was edematous or infiltrated by moderate numbers of lymphocytes and plasma cells. The histological diagnosis was rectal duplication cyst.

## DISCUSSION

Enteric duplication cysts in cats have been infrequently reported. The first was an incidental finding on physical exam for a 1 year old female intact, domestic short hair presented for ovariohysterectomy. Abdominal radiographs and abdominal ultrasound were used to confirm a cystic, caudal abdominal mass adjacent to the small intestine. The mass was removed by resection and anastomosis of the mid-jejunum, and had a histological appearance similar to the esophagus. The cat recovered with no complications (1).

The second case was a 2 year old male castrated Manx cat who was presented for obstipation and a cystic soft tissue mass associated with colon was found on abdominal radiographs and ultrasound. The mass was causing ventral displacement of the colon and intraluminal compression. On abdominal explore a cystic structure associated with the dorsal colon was identified. The cyst was drained and omentalized. Clinical signs reoccurred 44 months later, and abdominal radiographs and ultrasound confirmed the reoccurrence of the mass. Computed tomography was performed prior to surgical explore which showed a non-contrast enhancing cystic structure extending into the pelvic canal, causing ventral displacement and compression of the colon. Similar to the previous surgery, the cystic structure was drained and omentalized. Seventeen months after the second procedure, the cat was once again obstipated. A mass associated with the pelvic canal could be palpated on rectal exam. The presence of a cystic structure associated with the colon was confirmed with abdominal ultrasound. A third abdominal explore was performed and 3 cm long cystic structure associated with the seromuscular layer of the colon was removed. Histopathology of the tissue was similar to normal colon. The cat recovered uneventfully with no reoccurrence of clinical signs (14).

The third reported case of an alimentary duplication cyst was in a 7 year old female intact domestic short haired cat who was presented for evaluation of constipation and tenesmus. A pelvic mass was palpated on rectal exam, and abdominal radiographs, ultrasound and CT were performed which confirmed the presence of cystic structure located dorsal to the rectum which was causing occlusion of the lumen. The cyst was completely removed during surgical exploration from a standard dorsal perineal approach and the cat recovered without complication. Histopathology of the resected cyst demonstrated that it was rectal duplication cyst (15).

The most recently reported case was a 15 year old male castrated domestic short haired cat who presented for a 3 day history of lethargy and vomiting. Abdominal ultrasound showed a bi-lobed cystic mass with altered wall layering that was closely associated the duodenum. The cystic structure was causing a mechanical obstruction of the duodenum, so it was surgically resected with a resection and anastomosis. Histopathology of the cystic mass was consistent with an adenocarcinoma, and notably, the lumen of the cystic structure was lined with mucosa. Approximately 3 months after the initial surgery, the cat returned for further evaluation of recurrent vomiting. Abdominal ultrasound showed evidence of a mass at the previous surgical site with loss of wall layer-

ing, and new abdominal wall masses. Fine needle aspiration of the masses was consistent with an epithelial neoplasia, so given the progression of disease, humane euthanasia was elected (9).

Clinical signs associated with the alimentary duplication are non-specific and dependent on their location and relative size. Esophageal cysts have been reported as a cause of choke in a horse (8). Cysts involving the small intestine have presented with clinical signs associated with colic, small intestinal obstruction, vomiting or chronic weight loss. Constipation, tenesmus or rectal prolapse have been reported with cysts associated with the rectum (2-4,9,14). Small cysts may be an incidental finding (1) however, they have been reported to undergo malignant transformation in humans and in one cat (9,16,17).

Alimentary cysts can be detected on physical exam as a firm mass associated with the gastrointestinal tract (1). Cysts arising from the most distal portion of the colon or rectum are often palpable on rectal exam (3,15). On abdominal radiographs, a soft tissue opacity mass may be identified. If associated with the rectum, this mass can be superimposed with the pelvic inlet causing displacement of the colon and large amounts of desiccated fecal material consistent with constipation may be present (3,14,15). Barium contrast studies can be used to demonstrate that there is no communication with the true gastrointestinal tract (3,4). Ultrasound of the mass may be met with variable success depending on the location of the cyst. Cysts that are located primarily within the pelvic canal may not be amenable to ultrasound. Alimentary cysts that have been successfully imaged with ultrasound are characterized by a mass with a well-defined wall and hypoechoic fluid, typical of cysts, in close association with the gastrointestinal tract (1,14,15).

Computed tomography, with its ability to differentiate between soft tissue and fluid and cross-sectional imaging capabilities, provides the most complete information regarding the position and extent of the alimentary cyst. On CT, the alimentary cyst appears as a well demarked mass associated with the gastrointestinal tract with a thin, mildly contrast enhancing soft tissue opacity rim (14,15). Another key finding on diagnostic imaging are vertebral anomalies (14). Differential diagnosis for a pelvic canal mass include: cyst, abscess, granuloma, hematoma or neoplastic mass. Sampling of the mass should help to further define the differential diagnosis list. Fluid obtained from the cysts should be proteinaceous with few cells present and no evidence of infectious organisms, however due to the close association with the gastrointestinal tract, accidental contamination is possible (14,15).

Alimentary duplication cysts are categorized based on the histological appearance of the epithelial lining of the cyst. The four types are enteric, enterogastric, gastric, or esophageal cysts, with the enteric category further subdivided into small intestinal, colonic or rectal (13). Although the type of alimentary duplication cyst often parallels the section of alimentary tract with which it is associated, there have been reports of cysts being differentiated into other sections of the gastrointestinal tract. There is a report of an esophageal duplication cyst found associated with the duodenum of a foal and a similar esophageal cyst associated with the jejunum in a cat (1,2).

The embryological origins of the alimentary duplication cysts are unclear; however, splitting of the notochord with herniation of the endoderm has been postulated and supported by a few amphibian embryonic models (18). The endoderm is the innermost embryonic germinal layer and is responsible for the development numerous organs, including the gastrointestinal tract. The notochord eventually becomes part of the vertebral body and forms the intervertebral discs, explaining why alimentary duplication cysts have also been associated with lumbar vertebral anomalies (14).

Reported treatment options for alimentary duplications are complete surgical removal of the cystic tissue (1,14,15) with submission of the tissue for histopathologic analysis for definitive diagnosis or removal of the septum between the cysts and true lumen of the alimentary tract if the duplication is incomplete (3). Complete resection of the cyst has an excellent prognosis for resolution of clinical signs; however, incomplete resection may result in reoccurrence of clinical signs and need for repeated procedures (2,14). Advanced imaging provided by CT allows for accurate presurgical planning, as complete removal of the cystic tissue is considered critical for preventing reoccurrence of clinical signs. The surgical approach can be technically challenging depending on the location of the cyst. If surgical resection is not possible, the authors postulate that draining of the cyst and ethanol sclerotherapy may be attempted. This has not been reported as a treatment for enteric duplication cysts, however it has been successful in resolving renal cysts (19).

## CONCLUSIONS

Alimentary duplication cysts should be considered a differential diagnosis in an animal presenting for evaluation of a soft tissue mass(es) associated with the gastrointestinal tract, especially if vertebral anomalies are present. Alimentary duplication cysts can be diagnosed with radiographs and ultrasound; however, CT is highly recommended for surgical planning. Prognosis for animals with complete resection is considered excellent.

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