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Clinical Report

A Rare Case of Esophageal Diverticulum with Unusual Foreign Bodies in a Dog

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ABSTRACT

A two-year-old, Mongrel, intact male dog was presented to Madras Veterinary College Teaching Hospital with a complaint of postprandial regurgitation that was repeated at each meal. On physical examination, the animal was below ideal weight and with mild respiratory distress. It was suspected of megaesophagus. Thoracic contrast radiography revealed the presence of an esophageal diverticulum along with foreign bodies at the level of the base of the heart. The diverticulum was surgically corrected and the animal made an uneventful recovery. Six months follow-up did not show any recurrence of symptoms. This paper describes an acquired esophageal diverticulum in a dog. Diverticulectomy is an effective surgical technique to remove a large esophageal diverticulum and can be performed with good outcomes.

Introduction

An esophageal diverticulum is the dilatation of a segment of the esophageal wall, forming of clearly circumscribed pouch that changes the normal motility of the esophageal wall. It can be congenital or acquired.[1] Acquired diverticulum can be classified further into pulsion and traction types. A pulsion diverticulum is formed by herniation of the mucosa through the muscularis and adventitial layers.[2,3] Traction diverticulum is formed as a result of inflammation and adhesion of the esophagus to an adjacent structure or organ causing outward traction and pouch formation in the esophageal wall.[4] The most indicated method of diagnosis of diverticulum is the association of complete history with the thoracic contrast radiography, in which esophageal dilation is seen.[5] The esophageal endoscopy is considered to be the most reliable method for diagnosing esophageal diverticulum.[6] Diverticulum can be surgically corrected by diverticulectomy through a lateral thoracotomy.[4] This paper records an acquired esophageal diverticulum in a dog and describes the surgical management and outcome of the case.

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Case Description

A 2 years old, male Mongrel dog was presented to Madras Veterinary College Teaching Hospital with history of chronic vomiting and regurgitation for last six months. On physical examination, the dog was below ideal body weight, dehydrated and showed mild respiratory distress. Complete blood count and serum biochemistry results were within normal limits except elevated PCV (Tables 1 and 2). This could be attributed to the relative dehydration in the dog. The plain right lateral and ventro-dorsal radiographic views of the thorax revealed a crescent shaped area of increased density at the base of the heart with the convex side ventral, along with accumulation of food material and foreign bodies (Figure 1).

Treatment and Outcome

The dog was premedicated with Butorphanol (0.2 mg/kg, IM; Butodol-2, Neon Laboratories, Mumbai, India) and Diazepam (0.25 mg/kg, IV; Lori, Neon Laboratories, Mumbai, India). General anaesthesia was induced with propofol (4 mg/kg, Neorof, Neon Laboratories, Mumbai, India) and maintained on 2% isoflurane (Forane, Neon Laboratories, Mumbai, India) in oxygen. Ventilation was controlled by intermittent positive pressure ventilation.

Table 1: Hematology results of the dog.

Hemogram		Reference range
Hemoglobin (g/dl)	14.6	11.9-18.9
PCV (%)	49	35-57
RBC (x 10^6 /µl)	8.11	4.95-7.87
WBC (x 10^3/ µl)	10.6	5.0-14.1
Platelets (x 10^3/ µl)	229	211-621
Neutrophils (%)	74	58-85
Lymphocytes (%)	20	8-21
Monocytes (%)	5	2-10
Eosinophils (%)	1	0-9
Basophils (%)	0	0-1

Table 2. Serum biochemistry results of the dog.

Biochemical Assay		Reference range
Glucose (mg/dl)	75	76-119
Cholesterol (mg/dl)	179.0	135-278
Total Proteins (g/dl)	7.3	5.4-7.5
Albumin (g/dl)	2.6	2.3-3.1
BUN (mg/dl)	22.26	8-28
Creatinine (mg/dl)	1.10	0.5-1.7
ALT (U/L)	41	10-109
ALP (U/L)	110	1-114

Reference range adapted from Duncan and Prasse's Veterinary Laboratory Medicine: Clinical Pathology, 5th ed., Wiley Blackwell, 2011.

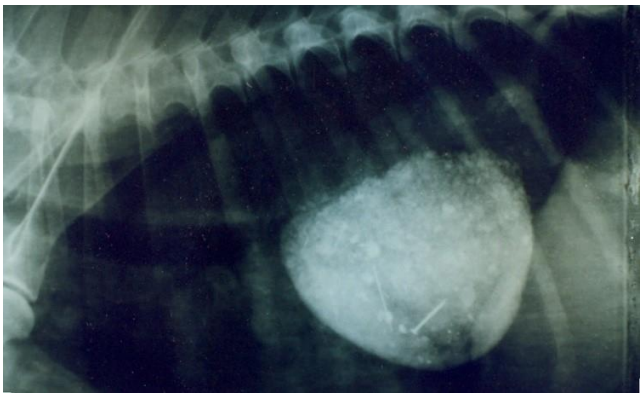

Figure 1: Survey radiography of esophagus revealing pendulous esophageal diverticulum along with foreign bodies extending from 4th intercostal space to 7th intercostal space.

The dog was positioned on the right lateral recumbency with padding beneath the chest to arch the left thoracic wall. The chest was approached through a thoracotomy at the left 6th intercostal space. There was no evidence of an inflammatory reaction in the pleural cavity and mediastinum. The diverticulum was isolated from surrounding structures and packed off with laparotomy sponges. Non-crushing forceps were placed across the proposed transection site. The diverticulum was transected at its base and removed along with its contents without contaminating the surgical site (Figures 2 and 3). The edges of the transected diverticulum were apposed in two-layers with in-out, out-in pattern for mucosa and simple interrupted pattern for muscularis by 4-0 Polydioxanone (Relyon PDS, MCo Hospital Aids Pvt. Ltd., Hubli, India) suture material. Utmost care was taken while suturing the mucosa and muscularis layers separately, in order to prevent tension at the surgical site. In addition, strict aseptic technique was adopted throughout the surgery. Closure was achieved without apparent stricture of the esophagus. The intercostal thoracotomy was closed by pre placing circumcostal sutures with 1-0 Polydioxanone to approximate the ribs. Lungs were inflated to maintain negative intrathoracic pressure before tightening of last circumcostal suture. The muscle layers were closed separately with a simple continuous suture pattern with 3-0 Polydioxanone. The subcutaneous tissue and skin were also closed in a routine manner.

On recovery from anaesthesia, the animal was bright and active. For first 48 hours after the surgery, the dog

underwent parenteral fluid therapy followed by supplementation with small volumes of water and easily digestible food. Ceftriaxone (20 mg/kg IV; Intacef Pet, Intas Pharmaceuticals Ltd., Ahmednagar, India) and butorphanol were administered parenterally for 5 days. The dog made an uneventful recovery and six months follow-up showed no recurrence of postprandial regurgitation.

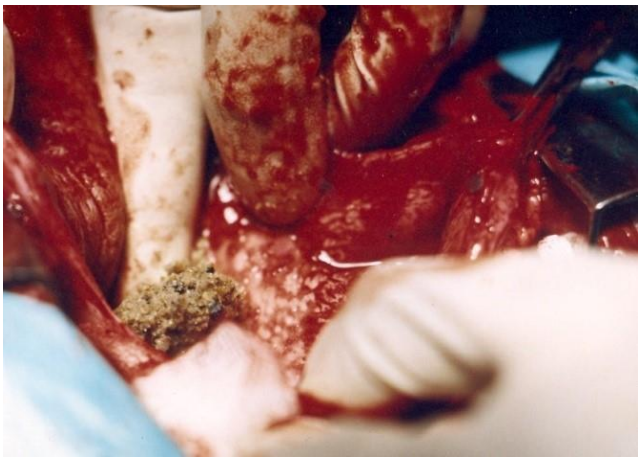

Figure 2. Transecting the esophageal diverticulum.

Figure 3. Transected esophageal diverticulum along with its contents and two metallic foreign bodies.

Clinical Relevance

Esophageal diverticulum is a rare condition in canines and there are no reports of predilection for age or sex of the animals affected by the diverticulum.[7] A breed predilection for esophageal fistula has been reported in Cairn terriers and Miniature poodles.[8,9]

Washabau and Day suggested that small diverticula could be asymptomatic where as large diverticula were associated with clinical signs like postprandial regurgitation, intermittent anorexia, hypersalivation, thoracic or abdominal pain, and respiratory distress.[10] In the present case, the clinical findings were consistent with previously published cases.[11] Mild respiratory distress could be attributed to the difficulty in lung expansion as diverticulum was occupying considerable space in thoracic cavity.

Hill *et al.* evaluated plain radiographs for signs of aspiration pneumonia, esophageal dilatation, and possibly the presence of a soft tissue density representing the impacted diverticulum.[7] Iwasaki *et al*. have used contrast radiography for the definitive diagnosis of esophageal diverticulum. Fluoroscopic and manometric studies may be useful to determine the presence of an underlying neuromuscular disorder.[12] Endoscopic examination can also be used to evaluate the esophageal wall for ulceration and to examine the entrance of the diverticulum.[5] Esophagoscopy is the gold standard in order to confirm the diagnosis.[6] Park *et al.* mentioned that computed tomography could possibly determine the type of an acquired diverticulum and was a less invasive procedure.[13] In this case, the diverticulum was readily diagnosed once an investigation of the upper alimentary tract was undertaken. Barium swallow enabled a confirmatory diagnosis of the thoracic esophageal diverticulum in the present study.

Foreign bodies have frequently been described in association with esophageal diverticula. It is often difficult to determine from the history whether the foreign body caused the diverticulum or was retained as a result of it.[5] Here, the diverticulum wall was made up of full thickness esophagus in which the deeper layers were largely replaced by scar tissue. At surgery, there was no evidence of similar changes in any adjacent organs or tissues. From this, it is hypothesized that the inflammation resulted from an intra-luminal source (foreign bodies) that incited a focal, low grade and chronic esophagitis, in turn weakening the wall and allowing it to bulge and pouch.

Small diverticula can be treated conservatively by feeding a liquid or semi-solid diet with the animal in an upright position.[14,15] Large diverticula generally require surgical resection through a lateral thoracotomy or transdiaphragmatically through a ventral celiotomy. Partial resection and esophageal in-lay patch, complete resection and anastomosis, or esophageal substitution have been reported to remove large or multiple diverticula.[4,16] Muste *et al.* suggested the use of prosthesis to prevent the occurrence of scars or strictures and increase support and stability of the affected esophagus portion without hindering the food transit.[17] Markar *et al.* found stapled repairs to be faster and associated with significantly less intraoperative

hemorrhage.[18] In the present study, diverticulectomy was successfully performed through thoracotomy approach and the esophageal edges were apposed using double-layer closure as suggested by Oakes *et al*.[19]

Prognosis in animals with esophageal diverticula depends on their size and etiology and consequently on management. The short-term prognosis for dogs and cats that survive surgery for treatment of esophageal lesions is favorable.[20] Sutton *et al.* observed that the dogs that undergo more extensive esophageal resection, including partial esophagectomy and esophageal resection with anastomosis, were significantly more likely to develop complications during the immediate postoperative period.[21] Nawrocki *et al.* found esophageal surgery more demanding due to the lack of an esophageal serosa and omentum for support.[22] Historically, veterinary patients undergoing esophageal surgical procedures have been documented to experience high postoperative complication rates, most commonly dehiscence of the surgical site and stricture formation.[23] In cases of traction diverticulum, prognosis depends on the cause of the extra-esophageal inflammation. A possible explanation for the positive outcome in the reported case could be ascribed to the improvement of esophageal motility after healing. Long-term prognosis is guarded due to possible development of chronic aspiration pneumonitis.[24] However, in this case, no significant complications were identified. The strict aseptic surgical technique, use of fine suture material and exact apposition of mucosa and muscularis layers separately without any tension at the site, helped prevent esophageal stricture. The dog made an uneventful recovery with no clinical signs of postprandial regurgitation for a period of six months follow up.

Based on the results of this study, diverticulectomy is an effective surgical technique to remove a large esophageal diverticulum and can be performed with good outcomes. Meticulous surgical technique and patient management can minimize most of the possible intra-operative as well as post-operative complicating factors.

Conflict of Interest

The authors declare that they have no competing interests.

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