Case Report

Endomyocarditis, Meningoencephalitis and Septic Shock due to Disseminated Prototheсosis in a Dog

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ABSTRACT

A case of protothecosis causing endocarditis and septic shock in a dog is described. A four year-old male Labrador retriever was referred to the hospital with a history of two years of chronic diarrhea and several weeks of vestibular signs. The dog was started on antibiotic treatment but continued to deteriorate and was again presented within 3 weeks with multifocal neurological signs involving the central vestibular system and the forebrain. Several hours after admission to the hospital intensive care unit, the dog died due to cardiac arrest. Post mortem examination revealed infective endocarditis and myocarditis with the presence of prototheca species, and disseminated protothecosis. To the best knowledge of the authors this is the first report of disseminated prototheca infection in Israel in dogs.

Keywords: Prototheca; Endocarditis; Septic Shock; Dog; Israel.

INTRODUCTION

Protothecosis is a sporadic disease, reported in domestic animals (1, 2, 3, 4) and humans. (5) It is caused by a unicellular, achlorophyllous alga, present ubiquitously in the environment (4). Contamination of aquatic systems or food, may lead to ingestion by animals or invasion to wounds secondary to traumatic inoculation. (3)

In humans, clinical signs of protothecosis vary, and occur more often in patients with underlying immuno-suppression or concomitant disease. (5, 6) In disseminated protothecosis, various organs are affected. (1, 7) The most common clinical signs described in dogs include large bowel hemorrhagic diarrhea (2, 8) and ocular lesions (9). Reported neurological signs include lethargy, behavioral abnormalities, paresis, head tilt, cervical pain, circling, ataxia or seizures. (10, 11, 12) Since the prognosis of the disseminated disease is poor, many dogs are euthanized when systemic clinical signs first appear. In this report we describe a case of disseminated protothecosis leading to myocarditis, endocarditis and septic shock in a dog. This is the first report of canine disseminated prototheca infection in Israel.

CASE HISTORY

A 4.5-year old castrated male Labrador retriever was admitted to the emergency services due to anorexia, dull mentation, collapse and melena that started the prior evening. The dog's medical history included two years of chronic diarrhea and intermittent hematochezia and progressive neurological abnormalities over a month. Due to his chronic diarrhea a colonoscopy was performed and biopsy samples were obtained disclosing chronic inflammatory colitis. No pathogenic agent was noted in the sample. Several antibiotic regimes and food trials had been attempted with no improvement and diarrhea persisted. At the time of admission, the dog has been receiving Sulphamethoxazol-Trimethoprim (Resprim; Teva medical Ltd., Ashdod, Israel) for his colitis.

On first admission, neurological abnormalities included right head tilt, vestibulo-ocular nystagmus and leaning to the

right, suggestive of peripheral vestibular disease. The dog was treated with Amoxicillin/Clavulonic acid (Synulox; Pfizer, Herzlia Pituach, Israel), and Ofloxacin (Oflodex; Dexcel, Jerusalem, Israel) for possible otitis. Clinical signs progressed over the following 10 days and the dog developed vestibular ataxia of all four limbs, right circling, and a mild head tremor, supporting multifocal lesions involving the forebrain, cerebellum and medulla however, treatment was not changed, and the dog was discharged as further diagnostic tests were declined by the owner.

A week later, the dog was re-admitted to the intensive care unit. Physical examination abnormalities included pyrexia (40.6˚C), tachycardia (164 bpm) and tachypnea (80 breaths/min). The systolic and diastolic arterial blood pressures (Cardell 9401 blood pressure monitor, Mirom Medical & research equipment Ltd., Haifa, Israel), were 175 and 147 mmHg, respectively. The dog was non-ambulatory, mentally depressed, displayed a head tremor, and signs of bilateral facial paralysis were noted. Spinal reflexes were intact.

A complete blood count (Abacus, Hematology impedance analyzer, Diatron, Wien, Austria) showed marked leukocytosis (white blood cell count [WBC] 38.96x10^9/L; reference interval [RI] 5.2-11.9x10^9 /L). The remaining hematological analytes were within reference interval (RI). Serum biochemistry (Cobas-Mira, Roche, Manheim,Germany, at 37˚C) showed mild hypoalbuminemia (24.3 g/L; RI 26-40 g/L), mild hyponatremia (135.5 mmol/L, RI 142-159 mmol/L), hypocalcemia (0.084 g/L; RI,0.09-0.117 g/L) and increased activities of aspartate aminotransferase (AST, 155.6 U/L; RI 0.0-50.0 U/L) and creatine kinase (CK, 1486U/L; RI 50-200 U/L). Serum glucose concentration was 113 mg/dL (RI 64-123 mg/dL). The prothrombin time was within RI, but the activated partial thromboplastin time (aPTT) was mildly prolonged (23.1 sec, RI 11.5-19.5 sec).

The dog was hospitalized and initially treated with IV fluids (Lactated Ringer's solution; Teva medical Ltd., Ashdod, Israel) Ceftriaxone (ceftriaxone-sodium; Teva medical Ltd., Ashdod, Israel) 25 mg/kg IV q8h and Clindamycin (clindamycin-phosphate; Rafa Laboratories Ltd., Jerusalem, Israel) 12.5 mg/kg IV q12h. Twelve hours later severe hypoglycemia (glucose 25 mg/dL) developed, (on admission 113 mg/dL) with tachypnea (respiratory rate (RR) 80 breaths/min) and neurological deterioration that included severe obtundation and partial seizures. Arterial systolic and diastolic pressures dropped to 70 mmHg and 40 mmHg, respectively. In light of these changes, the dog was considered to have developed septic shock. An intravenous dextrose bolus (20 ml, Teva medical Ltd., Ashdod, Israel; dextrose 20%) was supplemented via a central venous catheter. Additional therapy included IV colloids (Hetastarch, 1mL/kg/h [0.45 mL/lb/h], IV), Dobutamine (Hospira, Illinois, USA) constant rate infusion at10µg/kg/min and Dopamine (dopamine hydrochloride, Kamada, Nes Ziona, Israel); 10 µg/kg/min. Cardiac ultrasonography performed by an ACVECC

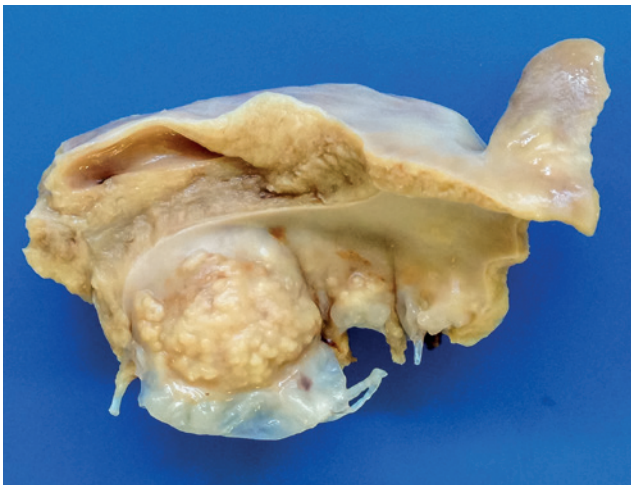

Figure 1: Gross, fixed specimen of a 4 years old Labrador retriever diagnosed with disseminated protothecosis. The heart cut, showing numerous 1-2 mm vegetative lesions are noted within the myocardium and the left mitral valve leaflet.

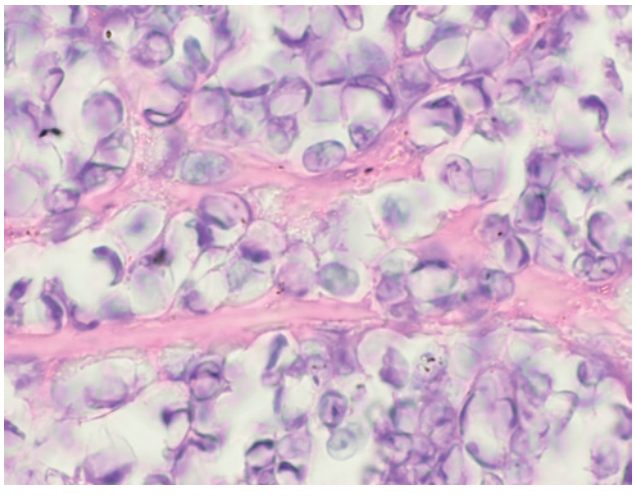

Figure 2: Microscopic figure of the mitral valve of a 4 years old Labrador retriever diagnosed with disseminated protothecosis. H&E stain. Several oval to kidney-bean shaped basophilic and granular Prototheca organisms with thin non-staining are abundant throughout the tissue.

diplomat (Y.B) revealed decreased myocardial contractility (shortening fraction 15%, RI 25-40%) with hyper-echoic myocardial foci and a proliferative vegetation on the mitral valve, suspected as a focus of infective endocarditis. Serum cardiac troponin I concentration (TNT- HSST, Roche) was markedly increased (0.509 ng/mL RI 0.0-0.03 ng/mL). Abdominal ultrasonography was unremarkable.

Collection and examination for cerebrospinal fluid (CSF) revealed organisms consistent with prototheca spp. (13) The total nucleated count was 650 cells/μL (RI <5 cells/μL) and the total protein concentration was 702 mg/dL (RI <25 mg/dL). Cytological examination of the CSF demonstrated mixed pleocytosis, consisting of mainly monocytes. Additionally, rectal scraping cytological examination revealed numerous prototheca spp. organisms as well. Several hours later, the dog developed cardiac arrest and died.

Gross pathology findings included an enlarged heart apex, whitish lesions spreading throughout the myocardium of both ventricles, and 1-2 mm thick vegetative lesions on the mitral valve left leaflet (Figure 1). Histopathology demonstrated abundant prototheca spp. near and on the mitral valve (Figure 2). The small intestine layers were mildly infiltrated by mononuclear and polymorph nuclear cells with no evidence of prototheca organisms. The forebrain, cerebellum, brainstem and meninges showed focal infiltrations of mononuclear cells, with numerous prototheca spp. organisms, which were also noted in the thyroid glands and both kidneys.

DISCUSSION

The current report depicts infective endocarditis (IE) and a septic shock caused by a prototheca spp. in a dog. Previous studies have reported yeast and fungal infections leading to IE in humans. (14, 15) A previous case report suggested IE due to prototheca spp. in a preterm neonate (16). Infective endocarditis is a life-threatening disorder caused by microorganisms colonizing the cardiac endocardium, commonly resulting in proliferative or erosive lesions in the cardiac valves, most frequently involving the aortic and mitral valves. (17, 18). The vegetation might also result in thromboembolism or dissemination of a metastatic infections to multiple body organs. The resultant clinical signs therefore vary, which makes the diagnosis challenging.

The incidence of IE in necropsies of dogs was reported to range from 0.09% to 6.6% (17). Medium to large breeds, middle-aged, male dogs, mainly purebred, are predisposed (18, 19). The mitral and aortic valves are the worst affected by (20). The present dog was a middle-aged, pure breed dog and the mitral valve was affected. The pathophysiology of bacterial IE is suggested to involve endothelial disruption with extrallular matrix proteins, thromboplastin and tissue factor triggering of coagulation, coagulum formation on the endothelium lesion, which binds bacteria, facilitating a vegetative growth. (18) The bacteria must be able to adhere to the coagulum, which is mediated by microbial surface components, expressed on the surface of some bacteria. (18) The pathophysiology of either yeast or fungal IE is less clear, however, the same rationale may apply. No other pathogens were found except for prototheca spp. in the heart or any other organ.

The present dog had suffered from chronic intermittent bloody diarrhea, due to chronic colitis. The histopathological diagnosis did not provide the basis for its etiology. The possibility that this inflammatory colitis was caused by protothecosis should not be overlooked, as the biopsy samples were possibly non-representative. However, invasion by prototheca spp. might have occurred secondary to mucosal damage, increased permeability and loss of integrity in the inflamed colon which predisposed the dog to invasion by an opportunistic pathogen such as prototheca spp. Antibiotic treatment possibly depressed the normal colonic biota, which may have further contributed to proliferation of the algae.

Protothecosis is an emerging algal disease of humans and animals. (4) Endocarditis associated with prototheca spp. should be included in the differential diagnosis of dogs with IE and should be considered a possible sequel in dogs diagnosed with systemic protothecosis. Further studies are needed to understand the progression of events allowing IE of alga to occur.

DISCLOSURE STATEMENT

The authors declare no conflict of interest related to this report.

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