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Case Report

Endocardial fibroelastosis in two related tiger cubs (*Panthera tigris*)☆

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Abstract Two tiger cubs (*Panthera tigris*) from the same litter were evaluated for suspected cardiac disease. Two cubs with a dilated cardiomyopathy phenotype were diagnosed with endocardial fibroelastosis based on necropsy and histopathologic examinations. Echocardiography revealed salient anatomic and functional aspects of this cardiac disorder. This is the first report of endocardial fibroelastosis in this species.

Two tiger cubs (*Panthera tigris*) from the same litter were presented to the University of Tennessee Veterinary Medical Center for cardiac evaluation. The hand-reared cubs had been recently obtained from a private breeder by an exotic cat sanctuary. The constituents of the hand-reared diet consisted of fresh, pasteurized goat milk. The queen was vaccinated with modified live

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Abbreviations

DCM	dilated cardiomyopathy
EFE	endocardial fibroelastosis

canine distemper—parvovirus combination vaccine[c] approximately 30 days before parturition.

Cub 1 was a 10-week-old, male intact tiger weighing 9.16 kg and presented for respiratory distress and pallor of the mucous membranes. Examination demonstrated an increased respiratory rate and effort. No murmurs or arrhythmias were auscultated. Thoracic radiographs were performed and showed marked, generalized cardiomegaly, pulmonary venous congestion, and pulmonary infiltrates consistent with left-sided congestive heart failure, and moderate to marked hepatomegaly. The cub was given one dose of furosemide (2 mg/kg intramuscularly) and was placed in oxygen overnight.

The following day, an unsedated, transthoracic echocardiogram[d] was performed using an 8-MHz transducer. Standard images were obtained from both right and left-lateral recumbency [1]. There was moderate to severe right atrial dilation, moderate right ventricular dilation, severe left atrial dilation, severe left ventricular dilation with decreased wall thickness, and severely decreased left ventricular systolic function (Video 1).

Based on the poor prognosis, the cub was euthanized. On postmortem exam, the heart weighed 143 g making up 1.5% of the body weight (normal for an adult domestic cat is 0.3—0.45% of body weight [2]). The heart was diffusely thin walled and dilated. The myocardium was pale pink to tan (Fig. 1A). The tricuspid and mitral valves were grossly normal. On histopathology, the endocardium lining of the left and right ventricles was diffusely thick ranging from 100 to 200 μm (Fig. 2B). The thickened endocardium was composed of excess collagen (seen on trichrome stain) and elastin fibers (seen on acid-orcein Giemsa stain). Based on the histopathology results, this cub was diagnosed with endocardial fibroelastosis (EFE). Formalin-fixed, paraffin-embedded heart and kidney tissues were negative for canine parvovirus detection by real-time PCR,[e] and the heart and the spleen were negative for canine and feline parvoviruses by *in situ* hybridization[f].

The second tiger cub (cub 2) from the same litter was an 11-week-old, intact male weighing 11.2 kg. He presented 1 week after cub 1 for screening due to the diagnosis of severe congenital cardiac disease in cub 1. The caretakers felt the animal was pale but otherwise was behaviorally normal. On presentation, mucous membranes were pale but no murmurs or arrhythmias were identified.

A transthoracic echocardiogram[d] was performed with an 8-MHz transducer. There was mild right atrial and ventricular dilation, severe left ventricular dilation with decreased wall thickness, and severely decreased left ventricular systolic function (Video 2). The cub was prescribed pimobendan (0.3 mg/kg PO q 12 h) and enalapril (0.5 mg/kg PO q 24 h), and his caretakers were instructed to monitor his respiratory rate and return in two weeks. Within a week, the cub's clinical signs progressed and humane euthanasia was performed.

At necropsy, the heart weighed 200 g (1.7% body weight) and both ventricles were dilated. The left ventricle had a diffusely thin ventricular wall with an opaque endocardium (Fig. 1B). The tricuspid and mitral valves were grossly normal. On histopathology (Fig. 2C) of the left and right ventricular walls, the endocardium and epicardium were diffusely thickened (250—300 μm and up to 450 μm). The thickened endocardium was composed of excess collagen, as determined by trichrome staining (Fig. 3A), and elastin, based on acid-orcein Giemsa staining (Fig. 3B). Based on the histopathology, which was remarkably similar to cub 1, the final diagnosis was EFE. Formalin-fixed, paraffin-embedded heart and kidney tissues were negative for canine parvovirus detection by real-time PCR.[e] FFPE heart and spleen were also negative for canine and feline parvoviruses by *in situ* hybridization.[f]

Discussion

To the authors' knowledge, this is the first report of EFE in a tiger. In addition, this report documents the finding of congenital cardiac disease affecting multiple tigers of the same litter. Echocardiography was useful in the diagnosis of cardiac disease in these tigers although necropsy and histopathology were necessary to make the definitive diagnose of EFE.

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