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A CASE OF ENDOCARDIAL FIBROELASTOSIS IN A LLAMA (*Llama cria*)

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ABSTRACT

In this communication, we aimed to describe a case of endocardial fibroelastosis in a *Llama cria*. Macroscopic examination revealed that the endocardial tissue of the heart had a gray-white appearance. However, cardiovascular malformations and myocardial necrosis/injury were not seen. Microscopic examination of the heart showed severe endocardial thickening due to the proliferation of elastic and collagen fibres.

Key words: Endocardium, fibroelastosis, heart, histopathology, llama

Endocardial fibroelastosis (EFE) is a rare heart disease characterised by thickening of the endocardium due to collagenous and elastic tissue (Rodriguez *et al,* 2018). Primary EFE is a congenital heart disease with an unknown cause that affects humans and animals. No other anatomical cardiac or vascular anomalies are encountered in this condition (Paasch and Zook, 1980; Robinson and Robinson, 2016; Zook *et al,* 1981). In the secondary form, there may also congenital cardiovascular malformations, viral myocarditis (Noren *et al,* 1974), cardiomyopathy (Liu, 1970), myocardiosis, localised endocardial thickening which in secondary to myocardial necrosis and endomyocardial injuries (Zook and Paasch, 1982), myocarditis observed with carnitine deficiency (Wolfson *et al,* 1990) and glycogen storage diseases (Zook *et al,* 1981), left hypoplastic heart syndrome (Lurie, 2010; McElhinney *et al,* 2010) and autoimmune reactions (Aoki *et al,* 2011) but distinction between primary and secondary forms may be difficult (Krahwinkel and Coogan, 1971). First EFE was reported in cats and dogs (Eliot *et al,* 1958). This condition was also reported in people, horse, cattle, chicken, tiger and pallas cat (Bentley, 1999; Carvalho *et al,* 2019; Cushing, 2013; Gudenschwager *et al,* 2019; Hananeh and Ismail, 2018; Lurie, 2010; Pass, 1983; Rodriguez *et al,* 2018). In this case report, we aim to present an EFE case in *Llama cria* with histopathological findings.

Case Report

A 7 months old *Llama cria* of Antalya Zoo, was necropsied after death, and internal organs were sent to the department. Tissue samples was fixed in 10% formalin and then following routine follow-up procedure, tissues embedded in paraffin, 5 µm cut sections were made and stained with Haematoxylin-Eosin and Verhoeff-van-Gieson. Stained sections were examined under light microscope. Macroscopically, there was no myocardial necrosis, endomyocardial injuries or cardiovascular malformations, but endocardium was grey-white colour. Liver was diffusely pale. Microscopically, there was diffuse mild degeneration in liver and necrosis in some hepatocytes. In the heart, left endocardium was markedly thick due to dense connective tissue proliferation (Fig 1). With Verhoeff-van-Gieson staining, dark stained, dense elastic fibrils within the area of endocardial thickening was observed (Fig 2).

The microbiological analysis of fresh tissue samples did not reveal any bacterial or viral agent.

Discussion

Macroscopically, fibroelastosis was mostly characterised by diffuse opaque and whitish endocardial thickening in the left ventricle (Lurie, 2010). Similarly, we observed diffuse grey to white thickening of the left ventricle. Microscopically, ventricular endocardial thickening due to accumulation of elastic and collagen fibres was demonstrated by Verhoeff-van-Gieson staining which has been reported previously (Eliot *et al,* 1958). EFE should be distinguished from a heart tumour fibroelastoma which affects heart valves and adjacent

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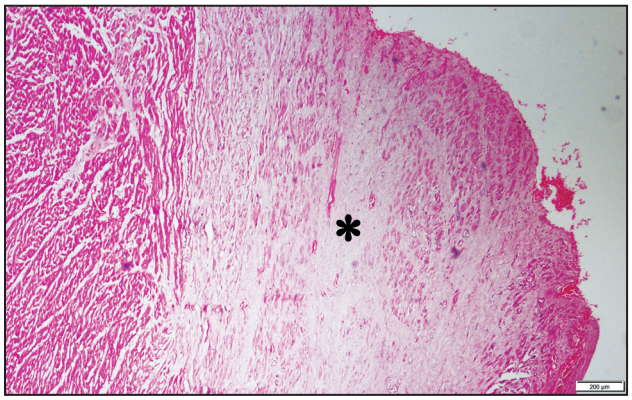

Fig 1. Wide fibroelastosis area in the endoardium extending into the myocardium. (asterisk). Haematoxylin-Eosin, Bar: 200 µm.

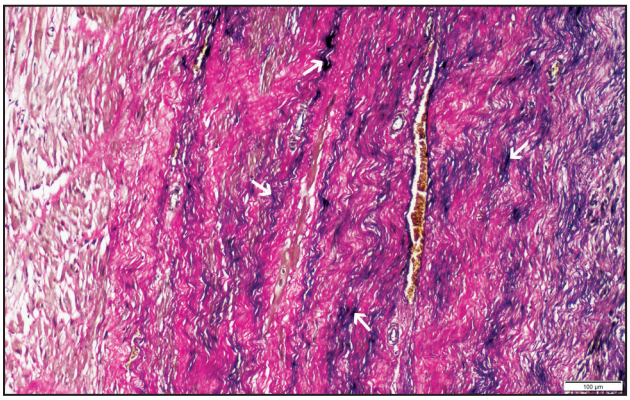

Fig 2. Elastic fibrils in the EFE area (arrows), Verhoeff-van-Gieson, Bar: 100 µm.

endocardium reported in humans (Lurie, 2010). We distinguished the case of fibroelastoma due to the diffuse appearance.

Primary EFE is a familial disease in humans (Paasch and Zook, 1980), feline species (Paasch and Zook, 1980; Rozengurt, 1994; Zook and Paasch, 1982). There have been suggested mechanisms of genetic transmission in some reports (Hanukoglu *et al,* 1986; Westwood *et al,* 1975). Most patients with primary EFE die due to congestive heart failure within 1 year after birth (Rozengurt, 1994). We believed that our case is primarily congenital EFE because of absence any other cardiac and vascular anomaly. However, genetic analysis could not be performed. There is a report of atrioventricular septal defect in llama (Cebra *et al,* 2015) but according to the authors' knowledge, there is no any report of EFE in llamas.

References

Aoki H, Inamura N, Kawazu Y, Nakayama M and Kayatani F (2011). Foetal echocardiographic assessment of endocardial fibroelastosis in maternal anti-SSA antibody-associated complete heart block. Circulation Journal 75:1215-1221.

Bentley DM (1999). Congenital endocardial fibroelastosis in a dog. Canadian Veterinary Journal 40:805-807.

Carvalho TP, Oliveira AR, Duarte MS, Rezende LA, Oliveira MS, Ribeiro BNT, Reis AMS, Serakides R and Ocarino NM (2019). Cardiac fibroelastosis associated with thromboembolism and paresis in a cat - Case report. Brazilian Journal of Veterinary Pathology 12:63-68.

Cebra ML, Cebra CK, Garry FB, Boon JA and Orton EC (2015). Atrioventricular septal defects in three Llamas (*Lama glama*). Journal of Zoo and Wildlife Medicine 29:225–227.

Cushing TL (2013). Endocardial fibroelastosis in a quarterhorse mare. Journal of Comparative Pathology 149:318-321.

Eliot TS, Eliot FP, Lushbaugh CC and Slager UT (1958). First report of the occurrence of neonatal endocardial fibroelastosis in cats and dogs. Journal of the American Veterinary Medical Association 133:271-274.

Gudenschwager EK, Abbott JA and LeRoith T (2019). Dilated cardiomyopathy with endocardial fibroelastosis in a juvenile Pallas cat. Journal of Veterinary Diagnostic Investigation 31:289-293.

Hananeh WM and Ismail ZB (2018). Concurrent occurrence of acute bovine pulmonary oedema and emphysema and endocardial fibroelastosis in cattle: A case history and literature review. Veterinary World 11:971-976.

Hanukoglu A, Fried D and Somekh E (1986). Inheritance of familial primary endocardial fibroelastosis. Clinical Pediatrics 25:272-275.

Krahwinkel DJ and Coogan PS (1971). Endocardial fibroelastosis in a Great Dane pup. Journal of the American Veterinary Medical Association 159:327-31.

Liu SK (1970). Acquired cardiac lesions leading to congestive heart failure in the cat. American Journal of Veterinary Research 31:2071-88.

Lurie PR (2010). Changing concepts of endocardial fibroelastosis. Cardiology in the Young 20:115-23.

McElhinney DB, Vogel M, Benson CB, Marshall AC, Wilkins-Haug LE, Silva V and Tworetzky W (2010). Assessment of left ventricular endocardial fibroelastosis in foetuses with aortic stenosis and evolving hypoplastic left heart syndrome. American Journal of Cardiology 106:1792-1797.

Noren CR, Staley NA, Kaplan EL and Jankus EF (1974). Cardiomyopathy. Comp. Pathol. Bull. 6:2-4.

Paasch LH and Zook BC (1980). The athogenesis of endocardial fibroelastosis in Burmese cats. Laboratory investigation; A Journal of Technical Methods and Pathology 42:197-204.

Pass DA (1983). A cardiomyopathy (Sudden death syndrome) of adult hens. Avian Pathology 12:363-369.

Robinson W and Robinson N (2016). Cardiovascular System. In: Pathology of Domestic Animals Vol. 3. Eds K. Jubb, P. Kennedy, *et al,* Elsevier. pp 572

Rodriguez KT, Cushing AC, Bernal C, Ramsay EC, Craig LE and Gompf RE (2018). Endocardial fibroelastosis in two related tiger cubs (*Panthera tigris*). Journal of Veterinary Cardiology 20:73-77.

Rozengurt N (1994). Endocardial fibroelastosis in common domestic cats in the UK. Journal of Comparative Pathology 110:295-301.

Westwood M, Harris R, Burn JL and Barson AJ (1975). Heredity in primary endocardial fibroelastosis. Heart 37:1077-1084.

Wolfson DJ, Pepkowitz SH, Velde R van de and Fishbein MC (1990). Primary endocardial fibroelastosis associated with hydrops foetalis in a premature infant. American Heart Journal 120:708-711.

Zook BC and Paasch LH (1982). Endocardial fibroelastosis. Endocardial fibroelastosis in Burmese cats. American Journal of Pathology 106:435-438.

Zook BC, Paasch LH, Chandra RS and Casey HW (1981). The comparative pathology of primary endocardial fibroelastosis in burmese cats. Virchows Archiv A Pathological Anatomy and Histology 390:211-227.