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Successful therapeutic management of dirofilariasis in dog

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Abstract
Canine heart worm infection is considered as a life-threatening disease of dog all around the world. The disease is caused by filarial nematode *Dirofilaria immitis* considered to be a re-emerging zoonosis, transmitted by mosquitoes. A four years old Labrador dog was presented at Teaching Veterinary Clinical Complex, OUAT, Bhubaneswar with the history of persistent coughing, hyporexia, weight loss and poor exercise tolerance. On examination of blood such as Wet Blood Smear examination revealed Serpentine movement of microfilaria of *D. immitis* confirmed by Modified Knot's Test. Haematology of the affected dog revealed marked leukocytosis, eosinophilia and thrombocytopenia. Serum biochemical parameters showed significant increase in liver enzymes and hypoglycemia. Radiogram reveals right ventricular hypertrophy, stenosis of pulmonary artery. On echocardiography there was a presence of hypertrophy of right ventrical. The therapeutic management were done with Di-ethyl Carbamazine (D.E.C.) @ 6.6 mg/kg BW P.O. Everyday, Ramipril @ 0.125 mg/kg BW P.O. everyday, Ivermectin tablet, 0.3 mg/kg BW Orally for 6 weeks, Tab. Doxycycline @ 5-10 mg/kg BW Twice Daily Orally.

Keywords: D.E.C., selamectin, Knot's test, wet blood smear, *Dirofilaria immitis*

Introduction
Canine heartworm disease (CHWD), also known as dirofilariasis, is caused by the parasitic nematode *Dirofilaria immitis*, commonly referred to as heartworm. It represents a significant parasitic threat to dogs globally, particularly in countries with temperate, subtropical, or tropical climates, such as those in North America, Europe, Australia, and Asia (Simon *et al.*, 2012) because of vector population. CHWD negatively impacts the health and well-being of dogs, The disease is also prevalent in India.

CHWD is a vector-borne disease, transmitted primarily by mosquitoes belonging to the genera *Aedes*, *Anopheles*, and *Culex*. These vectors acquire microfilariae during a blood meal from an infected animal. Once inside the mosquito, the microfilariae develop into infective third-stage larvae (L3), which are transmitted to another host during subsequent feedings. In dogs, these larvae moult into the fourth stage (L4) within 3 to 12 days post-infection. The L4 stage further matures into young adults between 50 and 70 days, eventually migrating to the heart and pulmonary arteries.

As the worms grow, they inhabit larger pulmonary arteries and may extend into the right ventricle and atrium, especially in cases of heavy worm load. Gravid female worms begin producing microfilariae approximately 6 to 9 months after infection.

An important aspect of the pathogenesis of CHWD involves *Wolbachia spp.*, a genus of endosymbiotic bacteria residing intracellularly within *D. immitis*. Although the exact role of *Wolbachia* is still under investigation, it is believed to contribute to the pathogenesis of the disease, possibly through endotoxin release. Notably, *Wolbachia* has a symbiotic relationship with the heartworm and is essential for the parasite's maturation, reproduction, and infectivity.

Eliminating *Wolbachia* through doxycycline therapy results in sterilization of the worms followed by their gradual death. Hence, doxycycline has become an integral part of heartworm treatment protocols. Treatment of CHWD requires a prolonged and carefully managed regimen, typically including exercise restriction, to ensure safety and effectiveness.

The present case reports heart worm infection in a dog with its effect on haemato-biochemical alterations and therapeutic management.

Clinical History and Observation: A four years old Labrador dog was presented at Teaching Veterinary Clinical Complex, OUAT, Bhubaneswar with the history of persistent coughing, hyporexia, weight loss and poor exercise tolerance. The dog was vaccinated and dewormed on regular basis. Clinical examination, of the dog revealed elevated rectal temperature (103°F). When the dog was made to walk for a faster pace severe panting and exercise intolerance was observed. The peripheral blood samples were collected for preparing smears and haemato-biochemical studies. Wet blood smears prepared and stained with Methylene blue (Modified Knot's Test) and observed under microscope. Modified Knot's test revealed presence of microfilaria (1-3 in number) in each field. Haematology of the affected dog revealed marked leukocytosis, eosinophilia and thrombocytopenia. Serum biochemical parameters showed significant increase of alkaline phosphatase, SGPT and serum creatinine whereas glucose level in the affected dog were found significantly decreased. The results are shown in table 1. Radiography of the thoracic region (Ventro-dorsal and left lateral) revealed cardiomegaly with right ventricular hypertrophy and stenosis of pulmonary artery. Echocardiography also revealed hypertrophic right ventricle with apparent absence of adult worm.

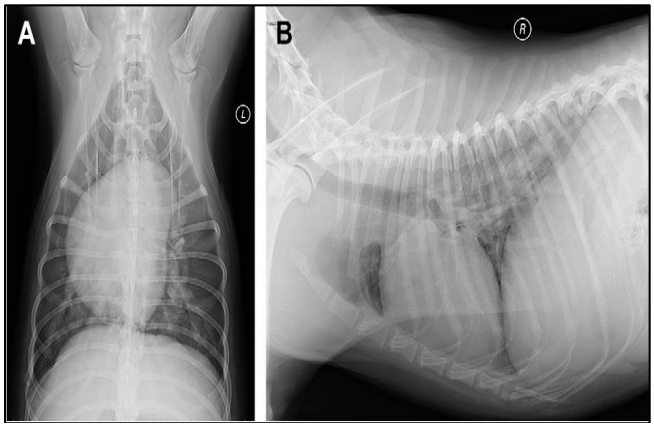

Fig 1: Radiography of affected dog

Table 1: Haemato-biochemical alterations in D. immitis affected dog

Blood Parameters	Values	Reference Standard
Hb (Gm%)	15.5	12-18
TEC (×10^6/mcL)	6.13	5-7.9
TLC(×10^3/mcL)	30.34	5-14.1
Neutrophils (%)	61.9	58-85
Lymphocyte (%)	35.9	8-21
Eosinophil (%)	09	0-9
PCV (%)	43.7	35-57
MCV (fL)	75.22	66-77
MCH (pg)	23.22	21-26.2
MCHC (g/dL)	36.25	32-36.3
Platelet count (×10^5/mcL)	2.58	2.11-6.11
Serum Creatinine (mg//dl)	1.14	0.5-1.7
BUN (mg//dl)	32.44	8-28
SGPT (IU/L)	125.40	10-109
Glucose	65.55	70-120

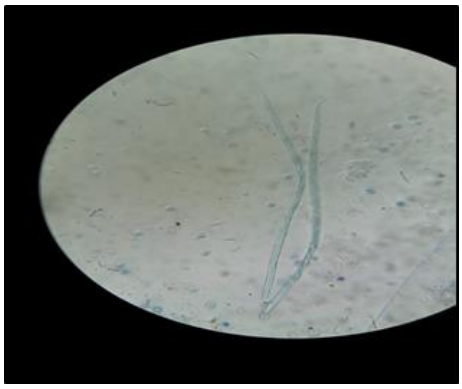

Fig 2: Modified Knot's Test

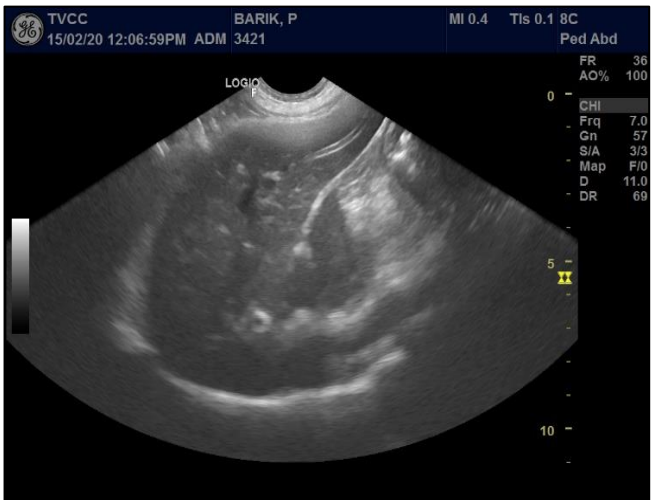

Fig 3: Echo-cardiography of affected dog

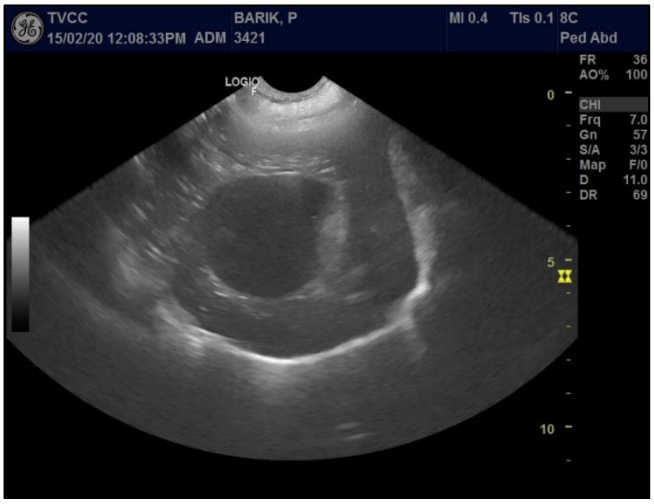

Fig 4: Echo-cardiography of affected dog

Treatment and Discussion

After confirmation of heart worm in the dog immediate treatment was started done with Di-ethyl Carbamazine (D.E.C.) @ 6.6 mg/kg BW PO, Ramipril @ 0.125 mg/kg BW PO OD Tab. Ivermectin 0.2 mg/kg BW Orally for 6 weeks, Tab. Doxycycline @ 5mg/kg BW Twice Daily Orally 10 days. The dog showed marked improvement in clinical symptoms from 4th day onwards. Blood samples were taken on 3rd day and 7th day post-treatment.

Haemato-biochemical showed gradual improvement and return to normal by 7th day. The blood smears were tested for presence microfilariae weekly for 4 weeks. 3

consecutive negative modified Knot's test revealed complete recovery of the dog. After 4th week of amelioration negative Modified Knot's test was observed.

Different literature reported that treatment with adjunct therapy of Ivermectin with Doxycycline and supportive therapeutic management resulted in proper recovery of the animal with the absence of circulating microfilaria (Bazzocchi *et al.*, 2008; Malatesh *et al.*, 2020) [2, 7]. In tropical conditions melarsomine (2.5 mg/kg) is recommended as the first-line heartworm adulticide (Dantas-Torres *et al.*, 2023) [4].

In conclusion Canine heart worm infection is considered as a life-threatening disease of dog all around the world, with variety of clinical observations. In chronic duration it may become very fatal for the affected animals. Eary detection and accepted treatment protocols shows recovery with any relapse.

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