A Case Study on Canine Heartworm *(Dirofilaria immitis)*

Pandey, K. and Paudel, S.
Nepal Polytechnic Institute, Bharatpur, Chitwan
Corresponding Email: pandeykhema5@gmail.com

Abstract

A four years old Japanese Spitz dog with a history of anorexia, vomiting, diarrhoea, weakness, reluctant to move, respiratory difficulty, and abdominal discomfort was admitted to the Veterinary Teaching Hospital, Nepal Polytechnic Institute, Chitwan, Nepal. The dog underwent clinical examination including hematological investigation. The hematological blood assays revealed severe anaemia, thrombocytopenia, leukopenia, lymphocytopenia, monocytopenia, and eosinopenia. A peripheral blood smear showed undulating movement of larvae of *Dirofilaria Immitis* which confirmed it as a canine *Dirofilaria immitis* (canine heart worm) disease. On the first day of presentation in the hospital, since the dog was dehydrated and anorectic, it was given fluids of 400 ml of normal saline and 200 ml of DNS (dextrose normal saline), pantoprazole at 0.7 mg/kg slow IV, ondansetron at 0.5 mg/kg slow IV, and haematinic agent (HB-RON®) at 5 ml BID PO (Iron, vitamin B12, Folic acid, Zinc, L-Lysin). The following day, the dog was dead, even before all the confirmatory diagnoses. That shows heartworm is prevalent in dog so strategic vector control and screening are recommended for the prevention and control of the disease in countries like Nepal.

Key words: Vector borne, dirofilariasis, heart worm and zoonosis

Introduction

Canine heartworm disease, caused by *Dirofilaria immitis*, is distributed worldwide but is more common in tropical areas (Taweethavonsawat et al., 2022) and subtropical climates, where temperature and humidity favor for nematode as well as mosquitoes (Rimal et al., 2021). Those nematodes have been found in Italy, Israel, Nigeria, Greece, and Spain (Lee et al., 2004) and also in Nepal (Rimal et al., 2021). Canine dirofilariasis is a vector-borne, non-contagious, parasitic zoonosis *(Adebayo* et al., 2020). Canine cardiopulmonary (heartworm disease) *Dirofilaria* is a serious and potentially fatal disease caused primarily by adult *D. Immitis* worms. Mostly, two species of *Dirofilaria* are zoonotic, responsible for human ocular/subcutaneous (*D. repens*) and

pulmonary (*D. immitis*) dirofilariasis (Rimal et al., 2021). Although humans are a less suitable host for these parasitic nematodes due to the specific immune response that destroys the worm in most cases (Kramer et al., 2005). The main hosts of *D. immitis* are both domestic and wild canids which is transmitted by various mosquitoes belonging to the genera *Aedes, Culex, Anopheles, Mansonia, Armigeres* (Sharifdini et al., 2022). When taking a blood meal from a microfilaremic host, the mosquitoes become infected and the microfilariae develop into the third-stage larvae (L3) in the Malpighian tubules of the mosquitoes. Subsequently, the L3 migrates to the host while the mosquito is suckling blood and completes the cycle by developing into an adult heartworm within 7–9 months in the pulmonary arteries (PAs), right atrium (RA), and right ventricle (Taweethavonsawat et al., 2022). Adult worms are observed mainly in the subcutaneous tissue of dogs and produce microfilariae that circulate in the blood streams of those dogs infected. Due to the complicated parasite life cycle, heartworm disease is chronic and asymptomatic in the primary stage of development. Veterinary clinicians in non-endemic areas lack experience in identifying the disease, therefore most cases are under diagnosed, microfilaremic dogs often do not get appropriate treatment and become the source of infection to the local mosquito population (McCall et al., 2008).The purpose of this case report is to know about the better diagnosis of disease, to describe the clinical case of *D. immitis* in the dog to give attention of veterinary practitioners and owners that the presence of *D. immitis* infected dogs could influence the spread of canine heartworm disease in Nepal.

Materials and methods

A four years old male Japanese Spitz dog weighing 5.5 kg was brought to Veterinary Teaching Hospital, NPI with the history of anorexia, vomition, diarrhoea, weakness, reluctant to move, respiratory difficulty and abdominal discomfort.

The dog's medical history revealed that symptomatic treatments were provided for anaemia, lethargy and anorexia for a few months. The clinical findings revealed apparently normal body temperature (101.7 °F), moderately tachypnoea (respiratory rate of 44/min), tachycardia (heart rate of 138/min), pale mucous membranes, capillaries refill time of 2 seconds and signs of dehydration. The peripheral lymph nodes were within normal limits.

Two blood samples were collected in EDTA vial from radial vein with 5 ml syringe. With the aid of a pipette, one drop of peripheral blood was placed on a clean glass slide, covered with cover slips, and examined under a compound (40X objective) microscope.

Results

Table 1: Hematological findings

Test	**Result**	**Units**
Haemoglobin	3	g/dl
Platelets	140000	/ mm^3
Total WBC count	3750	/ mm^3
Differential count		
Neutrophil	3260	/mm^3
Lymphocyte	300	/ mm^3
Monocyte	95	/ mm^3
Eosinophil	95	/ mm^3
Basophil	00	/mm^3

Haematological test performed using automatic analyzer revealed anaemia (3 g/dl), thrombocytopenia (140000 /mm^3), leukopenia (3750 /mm^3), lymphocytopenia (300 /mm^3), monocytopenia (95 /mm^3), eosinopenia (95 /mm^3), as shown in table (1).

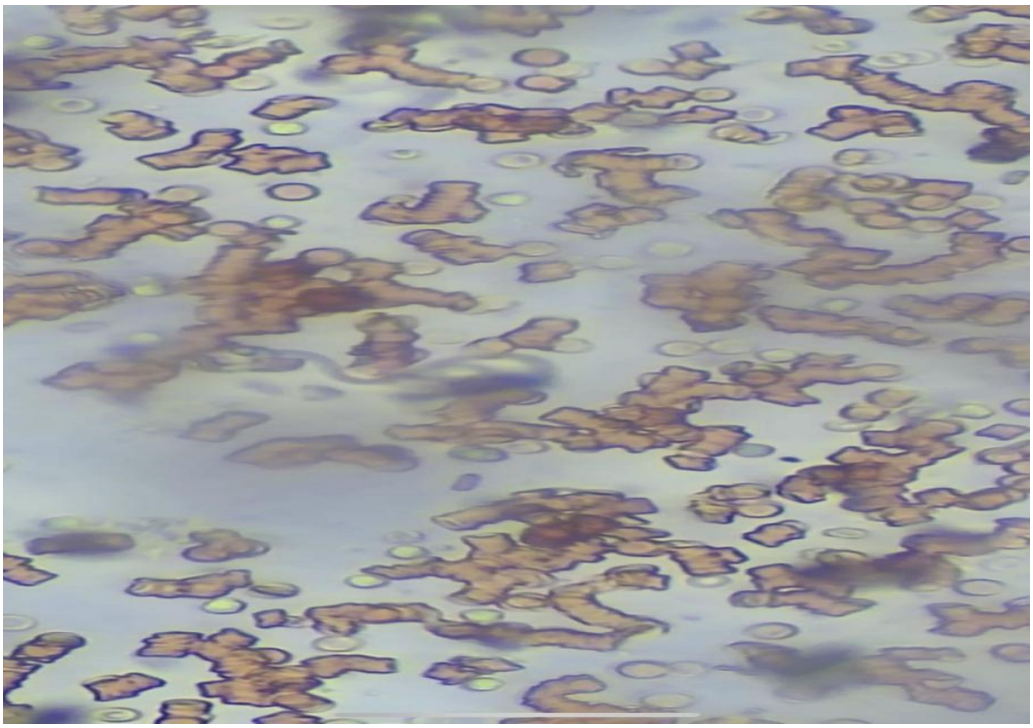

Figure 1: Peripheral blood smear showing larvae of *Dirofilaria immitis*

Peripheral blood smear showed undulating movement of larvae of *Dirofilaria immitis* as shown in figure 1.

Based on history, clinical sign and haematological profile and the detection of *Dirofilaria immitis* larvae in peripheral blood, the case was diagnosed as dirofilariasis.

Treatment

On the first day, the dehydrated and anorectic dog was administered 400 ml of normal saline (300 ml IV and 100 ml SC) and 200 ml dextrose saline (DNS), pantoprazole @1ml slow IV, ondansetron @0.2 ml slow iv and haematinic agent HB-RON® (Iron, vit. B12, Folic acid, Zinc, L-Lysin) at the dose rate of 5 ml two times daily orally.

The next day dog was found dead. The post-mortem examination was not performed due to unwillingness of owner.

Discussion

A sever weakness, lethargy, anorexia and pale mucous membranes were similar to the earlier study (Labarthe et al., 2014). Due to reduce feed intake there was rapid weight loss leading to dehydration. Absence of cough reflex suggested that the disease was in its initial phase (Bendas et al., 2022). Anaemia observed in the dogs, may have been related to the trauma that the movement of the parasites cause the red blood cells and vascular wall (Esteban-Mendoza et al., 2020). Parameters such as temperature, heart rate and capillary refile time were same as previous study (Taweethavonsawat et al., 2022). The alteration in respiratory rate (Sim et al,. 2013) might be during the arrival and subsequent death of immature adult worms into the pulmonary arteries and during the death of the adult worms, attributed to an acute vascular and parenchymal inflammatory response caused by specialized pulmonary intravascular macrophages in the capillary beds in the lungs whose activation is mainly responsible for the exacerbated pulmonary reaction (Carretón et al., 2017). Abdominal discomfort, vomition and diarrhoea might be due to heartworm migration to abdominal aorta and systemic arteriolitis (Grimes et al., 2016).

Heart worm are usually found to be in blood vessels and leads to disruption of blood flow which damages the blood vessels, which lead to haemolytic anaemia causing reduction in haemoglobin level. Thrombocytopenia can be related to the immune mediated destruction of platelets or the increased activity of thrombocytes during heartworm infection (Bendas et al., 2022). Eosinopenia may be a sign of acute infection in heartworm. Leukopenia may not make white blood cells because of the heavy infection of *Dirofilaria immitis* in (Bendas et al., 2022).

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