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Post-mortem Detection and Pathology of Canine Esophageal Worm (*Spirocerca lupi* Rudolphi, 1809) Infecting Stray Dogs in Leyte, Philippines: a Case Report

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Abstact: *Spirocerca lupi* is a pathogenic esophageal worm of canids occurring primarily in tropical and subtropical regions. This paper presents a case of *S. lupi* infection in four stray dogs in Baybay, Leyte, Philippines. At least 3-year old mongrel dogs were presented for post-mortem examination in CVM VSU clinic as part of dog population control for rabies eradication program. All four dogs suffered from severe integumentary lesions and three with unilateral enlargement of the limbs indicating hypertrophic osteopathy. At necropsy, *S. lupi* infection was observed in distal esophagus and adjacent thoracic aorta causing esophageal nodulation and thoracic aneurysm, respectively. Number of nodule ranges from 1 to 5 with a diameter of 0.5 cm to 4 cm and an opening where parasite communicates into the esophageal lumen was observed. Dissection of each nodule revealed 1 to 4 red *S. lupi* of 3-6 cm in length. Histopathology showed section of parasites surrounded by neutrophils, eosinophils and lymphoplasmacytic cells, collagen, fibrocytes and necrotic cells. Fibrosarcoma was also noted as evident by proliferating interwoven bundles of pleomorphic and spindle-shaped cells. Histopathology of the aneurytic aorta showed granulomatous reaction with infiltration of mononuclear cells and replacement of the elastic tissue with collagen. To the author's knowledge, this is the first report of *S. lupi* infection in central Philippines and should raise awareness to all veterinarians, especially small animal practitioners.

Key words: Aortic Aneurysm · Esophageal Sarcoma · Philippines · *Spirocerca lupi*

INTRODUCTION

Spirocerca lupi, a spirurid nematode, is considered the most pathogenic esophageal worm of canids causing chronic esophageal nodulation and aortic aneurysm which may result to sarcomas and hemothorax, respectively [1, 2]. Aside from canids, *S. lupi* is also reported to infect wild felid, goat, donkey and man by ingesting either the intermediate host (coprophagous beetle) or the paratenic hosts (i.e. reptiles, amphibians, birds and small mammals) [3, 4].

In the Philippines, the report of *S. lupi* infection in dogs was firstly documented in the streets of Manila [5]. Since then, no report was published concerning *S. lupi* infection. This paper therefore presents a case of *S. lupi* infecting four stray dogs in Baybay, Leyte, Philippines, as well as, the gross and histopathologic lesion produced by the parasite in the affected organs. The findings presented in this report hope to stir awareness to all veterinarians, especially small animal practitioners and public health officers in the country.

Case Report: Four mongrel (Aspin) dogs aged 3, 4, 7 and 10 years were presented at the CVM VSU clinic for post-mortem examination. These dogs were free roaming, abandoned by owners and captured from selected villages of Baybay, Leyte, Philippines (coordinate 10.6521412 °N, 124.8525626 °E). The dogs were composed of three females and one male, weighed 7-12 kg and the body condition scores (BCS) ranged from 1 to 2 (under ideal BCS). Clinically, all four dogs possessed severe integumentary lesions, namely general hyperkeratosis, alopecia, scaling and erythema. Three of the dogs had unilateral enlargement of the forelimbs – an indication of

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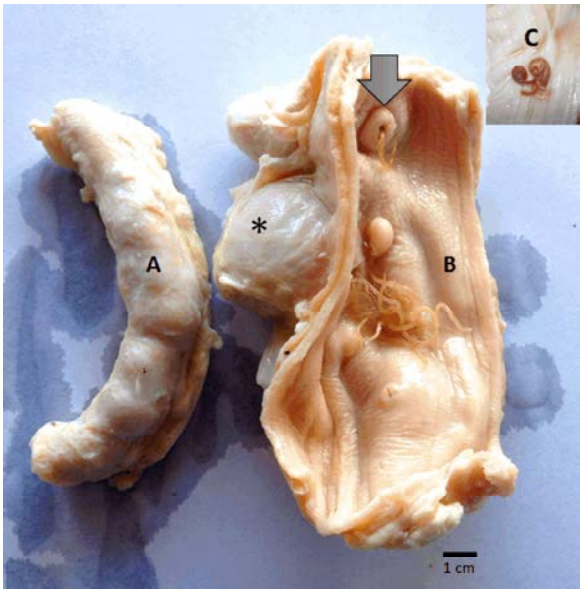

Fig. 1: Gross lesions produced by *Spirocerca lupi* infection in stray dog. A. Thoracic aorta showing serosal corrugation indicating aneurysm. B. Caudal esophagus showing multiple nodules (*) with *S. lupi* communicating through an opening in the esophageal lumen (arrow). C. Fresh *S. lupi* is pink to red in color.

Fig. 2: Posterior end of female *S. lupi* showing the vulval slit. Female parasite communicates into esophageal lumen through nodule's opening.

hypertrophic osteopathy. These stray dogs were euthanized as part of the rabies eradication program of the city.

Standard necropsy procedure was carried out and the collected aortic and esophageal tissues were fixed in 10% neutral buffered formalin, underwent series of dehydration, clearing and paraffin embedding and then stained with hematoxylin and eosin for light microscopy. Grossly, lesions of spirocercosis in dogs were observed in the distal esophagus and adjacent thoracic aorta causing esophageal nodulation and thoracic aneurysm, respectively (Fig. 1). Esophageal granulomas varied in numbers and sizes and were located at the distal part of the esophagus about 3 cm from stomach inlet. This lesion caused the narrowing of esophageal lumen and deformity. Three of the four dogs had one nodule with a diameter of 0.5 cm, 3 cm and 4 cm. The other dog suffered from severe esophageal worm infection, in which five visible nodules with a total of twelve *S. lupi* nematodes were recovered (Figs. 1 and 2). An opening from every nodule where the parasite communicates into the esophageal lumen was also observed. Dissection of the nodule revealed fibrinopurulent exudates and thick fibrous mass containing 1 to 4 red *S. lupi* nematode of 3-6 cm in length.

Histopathologic examination of the affected esophagus revealed section of parasites surrounded by inflammatory cells (i.e. mainly neutrophils, eosinophils and lymphoplasmacytic cells), matrix of collagen, fibrocytes and necrotic cells (Fig. 3).

Fig. 3: Light micrograph of the esophageal nodule showing the transverse and sagittal sections of *S. lupi*. The parasite is surrounded by polymorphonuclear (neutrophils and eosinophils), mononuclear cells (lymphoplasmacytic cells), collagen, fibrocytes and cell debris. Ocular calibration = 63µm. H and E stain.

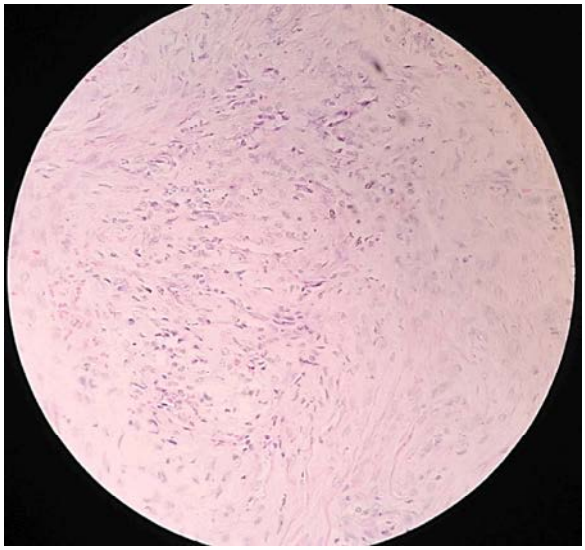

Fig. 4: Light micrograph of the esophageal nodule showing proliferation of interwoven bundles of pleomorphic and spindle-shaped cells, a characteristic lesion of fibrosarcoma. 100x. H and E stain.

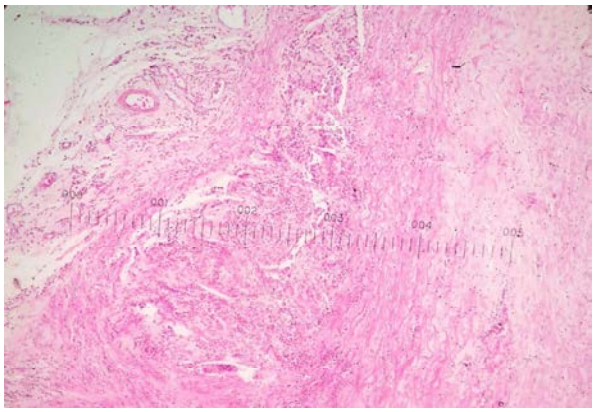

Fig. 5: Light micrograph of the tunica media and adventitia of aorta showing granulomatous reactions with infiltration of mononuclear cells and replacement of the elastic tissue with collagen. Ocular calibration: 25 µm. H and E stain.

Fibrosarcoma, a type of mesenchymal neoplasm, was also noted as evident by proliferating interwoven bundles of either pleomorphic or spindle-shaped cells (Fig. 4).

Lesion at the thoracic aorta adjacent to the affected esophagus showed multiple irregular outpouching visible when viewed at the tunica adventitia (Fig. 1) and the presence of excavated scarring at the tunica intima. Histopathologic examination showed granulomatous reaction with infiltration of mononuclear cells and replacement of the elastic tissue with collagen (Fig. 5).

DISCUSSION

The present case report of *S. lupi* infection in four stray dogs captured in selected villages of Baybay, Leyte, Philippines verified the occurrence of the parasite in the Philippines since it was reported in 1960s. Baily [5] actually detected 45.65% (147/322) of esophageal worm infection in Manila, Philippines. To date, report of *S. lupi* infection in the Philippines is dormant. This may be attributed to the difficulty in diagnosing subclinical and even clinical cases and partly by giving less importance to dog's health in rural areas where the parasite is more prevalent [6]. The diagnosis of *S. lupi* is not straightforward compared to other nematodes inhabiting the digestive system. Diagnostic sensitivity of coprological technique is hampered by the short and unpredictable period of oviposition, relative ineffective direct fecal preparations and routine flotation and the maturity of the parasite where female inside the nodule produced a passage in the esophageal lumen [7, 8]. Therefore, effective clinical diagnosis will involve serology, diagnostic imaging and PCR techniques [9, 10], which are relatively expensive and unavailable in the country. Detection therefore of *S. lupi* infection in dogs is commonly documented by post-mortem examination, as what the current study performed, which has also been conducted in few related studies [11- 13].

All infected dogs in this report are free roaming, homeless and scavengers. The condition predisposes the animal in acquiring the infective stage larvae (L3) by eating small birds, lizards and dung beetles [3, 14]. After ingestion, L3 enters the body by penetrating the gastric wall and migrating through gastric, gastroepiploic and celiac arteries reaching the caudal thoracic aorta, where they moult into L4 [4]. This explains the findings of outpouching aneurysm of the thoracic aorta adjacent to the affected esophagus. Later on, the immature adults migrate from aorta to the caudal oesophagus and the parasites form nodules at the tunica submucosa and adventitia. When the parasite matures, it creates an opening into esophageal lumen where eggs normally pass [4, 15]

The present study also found two important sequelae of spirocercosis, these are fibrosarcoma and hypertrophic osteopathy. Usually chronic and severe spirocercosis lead to neoplasm, in this case sarcomas. Fibrosarcoma is the common neoplasm associated with *S. lupi* infection. This is a malignant type of mesenchymal tumour originated from fibrous connective tissue. Dogs with sarcomas have also shown to develop hypertrophic

osteopathy which is characterized by tissue swellings of the limbs accompanied by the formation of new bone on the periosteal area [1, 15].

Despite the pathologic effect of spirocercosis, the parasite is often neglected and underestimated by many veterinary practitioners and researchers [6]. Nevertheless, *S. lupi* prevalence worldwide ranges from 10% to 85% where reports are common in tropics and subtropics [6, 13]. In conclusion, the present report should stimulate awareness to all veterinarians in the country and consider spirocercosis whenever presented with typical signs of dysphagia, regurgitation and dyspnoea in dogs greater than 6 months old.

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