

***Spirocerca lupi* INDUCED ACUTE MYELOMALACIA IN THE DOG. A CASE REPORT**

MIELOMALÁCIA AGUDA POR *Spirocerca lupi* EM CÃO. RELATO DE CASO

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SUMMARY

A three-year-old crossbred male dog was brought to the Neurology Unit because of an acute paraplegia. A clinical neurological examination indicated a spinal thoracolumbar syndrome evidenced by spastic paralysis of the hind limbs with no signs of deep pain sensation. Whereas the radiographic exams did not show any abnormality, cerebrospinal fluid changes indicated inflammation and hemorrhage. Serum titer for *Toxoplasma gondii* was 1:1024. The bacterial culture of the cerebrospinal fluid was negative. Since the animal did not improve with symptomatic treatment, it was euthanized. The necropsy showed an extensive spinal hemorrhage from T8 to T11. Microscopic examination showed that paraplegia was due to the presence of an immature female *Spirocerca lupi* in the nervous tissue causing hemorrhagic myelomalacia.

UNITERMS: Spinal cord; Nematoda; Nervous system; Parasite migration; Spinal cord diseases

INTRODUCTION

Myelomalacia is the liquefactive necrosis of the spinal cord, and it can be caused by embolism, suppurative infections, intervertebral disk protrusion, trauma and occasionally neoplasia. Generally, the lesion is a combination of ischemic infarction and parenchyma hemorrhage of the spinal cord. In dogs, the myelomalacia is rarely caused by the presence of nematodes^{2,8}, although several species of parasites have been reported in the brain and spinal cord, causing granulomatous lesions². The neurologic signs found in dogs and cats are mainly convulsions, depression, circling, and paraparesis to tetraplegia, with or without hyperesthesia². The most common nematodes found in the brain were: *Toxocara canis*, *Dirofilaria immitis* and *Angiostrongylus cantonensis*^{1,5,10,12}. In the spinal cord *Angiostrongylus cantonensis*, *Ancylostoma caninum*, *Dirofilaria immitis* and *Spirocerca lupi* were found^{3,10,13,14}. This last nematode was inside a 3-mm diameter tunnel below the dura mater. This paper describes the presence of *Spirocerca lupi* in the spinal cord of a dog. The main purpose of this paper is to call the clinical attention to acute severe myelopathies that can be caused by the migration of this parasite.

THE CASE REPORT

A three-year old male, mixed-breed dog was brought to the

Neurology Unit because of an acute paralysis of 12 hours duration. There was no history of trauma or pain. The owner had acquired the dog as a pup from friends. The dog's habitat was mostly outdoors, but it was not used for hunting. Its nourishment was based mainly on bovine meat. It had been vaccinated against rabies only, but until the development of the symptoms no previous illness was noted. Clinical examination showed good health conditions, but neurological examination showed paraplegia. Whereas the response of the thoracic limbs was normal, the pelvic limbs had lost their postural reactions and had some degree of increased reaction on the following reflexes: patellar, cranial-tibial and gastrocnemius. There were no Babinski and crossed extensor reflexes. Flexor reflexes in the pelvic limbs and perineal reflex were normal, and there was analgesia in the pelvic limbs, yet without any atrophy. The panniculus reflex was depressed after T10 and there was no hyperesthesia. Both superficial and deep pain sensations were absent in the hind limbs, indicating a severe thoracolumbar spinal cord lesion.

Acute diseases of the spinal cord, such as fibrocartilaginous embolism and septic embolism were considered for the differential diagnosis. As a complementary examination to find the cause of the paraplegia, a complete haemogram, immunofluorescent antibody indirect test (IFA) for toxoplasmosis, survey radiographs and myelography, as well as analysis of the cerebrospinal fluid were performed. The radiographic results were unremarkable. The results of

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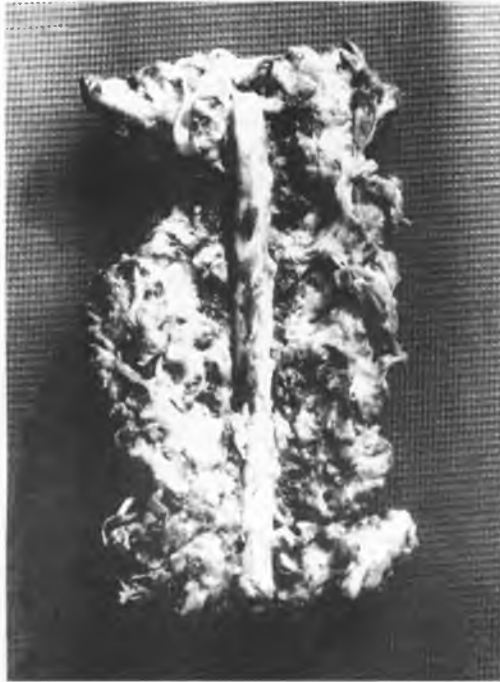


FIGURE 1

Subdural hemorrhages in the spinal cord between T8-T11. The spine didn't show any disorders.



FIGURE 3

Immature female of *Spirocerca lupi* inside the spinal cord causing myelomalacia and Wallerian degeneration. Glandular esophagum and pseudoceloma are clearly seen. (H & E stain, x 100).



FIGURE 2

Immature female of *Spirocerca lupi* inside the spinal cord causing myelomalacia, Wallerian degeneration and meningitis. Cuticula, muscle cells, intestine, lateral chord cells and ovary are clearly seen. (H & E stain, x 100).

the other tests are shown in Tab 1. The animal was treated for ten days with dexamethazone, sulfadiazine and trimethopim, while the results of serology for toxoplasmosis were not available. Also, the animal was groomed, its bladder was emptied, it was given an appropriate bed and was submitted to physiotherapy. Since the neurological signs showed no improvement, the owner requested euthanasia.

The necropsy showed subdural hemorrhage in the spinal cord (Fig.1) between T8-T11, and a vegetative endocarditis which increased the suspicion of an embolic process. The vertebrae did not show any disorders (Fig.1). In a histologic study an immature female *Spirocerca lupi* was found inside the spinal cord, having caused myelomalacia, Wallerian degeneration, fibrin accumulation, thrombosis and meningitis with mixed inflammatory infiltration (Fig. 2, 3).

TABLE 1

Results of complementary exams performed in the dog with myelomalacia induced by *Spirocerca lupi*. Londrina - PR, 1989.

EXAM	PARAMETER	RESULTS
HEMATOLOGY	Erythrocytes (millions/ μ l)	5.8
	Hemoglobin (gm/ μ l)	10.5
	Packed cell volume (vol %)	35.0
	Mean Corpuscular volume (fl)	60.34
	Mean Corpuscular Hemoglobine Concentration (gm/dl)	30.0
	Leukocytes (n ^o / μ l)	15,800
	Neutrophil (n ^o / μ l)	14,220
	Eosinophil (n ^o / μ l)	632
	Lymphocyte (n ^o / μ l)	948
CEREBROSPINAL FLUID	Aspect	turbid
	Color	xanthochromic
	Cytologic	
	Leukocytes (n ^o /ml)	64
	Erythrocytes (n ^o /ml)	368
	Diferential	
	Neutrophils (%)	92
	Lymphocyte (%)	8
	Glucose (mg/dl)	18
	Protein TCA (mg/dl)	390
	Pandy	+
Nonne Apelt	+	
Culture	negative	
TOXOPLASMOSIS	IFA	1:1024

DISCUSSION

Helminthiasis involving the Central Nervous System is rarely found clinically in dogs and cats². Aberrant migration of

parasites can result in extensive damage to neural parenchyma, including vascular rupture, necrosis, degeneration, atrophy and granulomatous lesions². Little is known about the migratory route of these parasites that invade the Central Nervous System, except for *Dirofilaria immitis*^{2,13}. The literature reviewed described only case of *Spirocerca lupi* in the CNS of a dog, and the parasite was found in a 3-mm diameter tunnel below the spinal dura mater without causing spinal cord lesions, and the neurologic dysfunction were caused by a motor vehicle trauma. Histopathologic studies of the spinal cord were not made, and the route of the *Spirocerca lupi* to the epidural space was not explained¹⁴. It is also known that spondylites of the thoracic vertebrae are considered common in spirocercosis and they can be caused by periosteal tissue irritation during the worm migration. Concerning the life cycle of this parasite, it is known that the infective larvae eaten by the definitive host are released in the stomach and penetrate the mucous membrane 48 hours after ingestion. Migrating through the gastric artery wall to the aorta, they arrive at the thoracic aorta after 21 days⁷. In this case we believe that the larvae (still in development), migrated from the aorta to the intercostal artery, passing to the dorsal branch of the intercostal artery, then following to the spinal branch and finally penetrating ventrally or dorsally the spinal cord. In this site it caused severe malacia, Wallerian degeneration and thrombosis, but no embolic process was observed.

Cerebrospinal fluid analysis showed different results related to involvement of the spinal cord during nematodes migration. In 38 cases of migration of *Angiostrongylus cantonensis* in the spinal cord, the CSF exam showed eosinophilia and protein levels ranging from normal to extremely increased⁹. When the parasite was *Dirofilaria immitis* the CSF showed recent hemorrhage, no inflammation and slightly increased proteins levels^{1,13}. In our patient, the *Spirocerca lupi* caused a considerable increase in protein concentration, erythrocytes and neutrophils numbers, indicating inflammation and hemorrhage. This finding is considered consistent with histopathologic studies, but is not diagnostic for parasitic migration.

The Toxoplasmosis titer of 1:1024 in our region is common in asymptomatic dogs and usually due to previous infection by ingestion of raw meat. Dogs with symptoms usually have titers > 1:4000. Paired samples 3 weeks apart are recommended, but in this case the dog was euthanatized.

Disturbances of the spinal cord induced by nematodes can be expressed by different clinical signs, depending on the location and on the nature of the lesion¹. The signs can include paraparesis to tetraplegia^{1,3,13} with or without hyperesthesia^{2,10}. In this case, the clinical history was that of a sudden onset and the paraplegia was compatible with spinal cord

embolism, intervertebral disk protrusion, contusion, fracture, intramedullary, intrameningeal, or epidural hemorrhage, granulomatous meningoencephalomyelitis, luxation and infections^{6,11}. The fact that the animal was not showing any hyperesthesia, no systemic clinical signs or trauma history, initially suggested the possibility of a relationship with fibrocartilaginous or septic embolism, which would be compatible with the observed cerebrospinal fluid changes but which was not confirmed by the histological studies.

The histologic identification of the parasite was based on the structure of the nematode in transversal histologic sections (Fig. 2,3). The glandular type esophagus, pseudoceloma contents, the kind of muscle mass with cells that present a

muscular and vacuolized portion, the cuticle, the bowel, the lateral cordon with excreting canals and the ovary type, (containing oocysts), were the clues that allowed the classification of the parasite as an immature female of *Spirocerca lupi*¹.

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RESUMO

Cão macho, sem raça definida, de 3 anos de idade, foi atendido no Serviço de Neurologia por apresentar paraplegia de início súbito. Ao exame clínico-neurológico constatou-se uma síndrome medular toracolombar, estando os membros pélvicos com paralisia espástica e com ausência de sensibilidade dolorosa profunda. Enquanto os exames radiográficos não evidenciavam nenhuma anormalidade, as alterações do líquido indicavam necrose ou hemorragia medular. O RIFI para Toxoplasmose foi de 1:1024. O exame bacteriológico do líquido foi negativo. Devido à falta de resposta ao tratamento, o animal foi sacrificado. Na necrópsia encontraram-se hemorragias no segmento medular compreendido entre T8-T11. No exame histopatológico constatou-se a presença de um exemplar fêmea imaturo de *Spirocerca lupi* no tecido nervoso causando mielomalácia hemorrágica e conseqüentemente o quadro de paraplegia.

UNITERMOS: Medula espinhal; Nematoda; Sistema nervoso; Migração parasitária; Doenças da medula espinhal

REFERENCES

- 01 - BLASS, C.E.; HOLMES, R.A.; NEER, M. Recurring tetraparesis attributable to a heartworm in the epidural space of a dog. *Journal of the American Veterinary Medical Association*, v.194, p.787-8, 1989.
- 02 - BRAUND, K.G.; BREWER, B.D.; MAYHEW, J.G. Inflammatory, infectious immune, parasitic and vascular diseases. In: OLIVER, J.E.; HOERLEIN, B.F.; MAYHEW, J.G., eds. *Veterinary neurology*, Philadelphia WB Sadlers, 1987. p.241-9.
- 03 - BUICK, T.D.; CAMPBELL, R.S.F.; HUTCHINSON, G.W. Spinal nematodiasis of the dog associated with *Ancylostoma caninum*. *Australian Veterinary Journal*, v.53, p.602-3, 1977.
- 04 - CHITWOOD, M.E.; LICHTENFELS, J.R. Parasitological review. Identification of parasitic *metazoa* in tissue section. *Experimental Parasitology*, v.32, p.407,1972.
- 05 - DONAHOE, J.M.V.; HOLZINGER, E.A. *Dirofilaria immitis* in the brain of a dog and a cat. *Journal of the American Veterinary Medical Association*, v.164, p. 518-9, 1974.
- 06 - ETTINGER, S.J. *Textbook of veterinary internal medicine*. Diseases of the dog and cat. 3.ed. Philadelphia, WB Saunders, 1989.
- 07 - FOX, S.M.; BURNS, J.; HAWKINS, J. Spirocercosis in dogs. *Compendium on Continuing Education for the Practicing Veterinarian*, v.10, p.807-22, 1988.
- 08 - LAHUNTA, A. *Veterinary neuroanatomy and clinical neurology*. 2. ed. Philadelphia, WB Saunders, 1983.
- 09 - MASON, K.V. Haemathological and cerebrospinal fluid findings in canine neural angiostrongylosis. *Australian Veterinary Journal*, v.66, p.52-154, 1989.
- 10 - MASON, K.V.; PRESCOT, C.W.; KELLY, W.R.; WADDELL, A.H. Granulomatous encephalomyelitis on puppies due to *Angiostrongylus cantonensis*. *Australian Veterinary Journal*, v.52, p.295, 1976.
- 11 - PENWICK, R.G. Fibrocartilaginous embolism and ischemic mielopathy. *Compendium on Continuing Education for the Practicing Veterinarian*, v.11,p.287-97, 1989.
- 12 - RICHARDS, M.A.; SLOPER, J.C. Hypothalamic involvement by "visceral" larva migrans in a dog suffering

from diabetes insipidus. **Veterinary Record**, v.76, p.449-51, 1964.

13 - SHIRES, P.K.; TURNWALD, G.H.; QUALLS, C.W.; KING, G.K. Epidural dirofilariosis causing paraparesis in a dog. **Journal of the American Veterinary Medical Association**, v.180, p.1340-3, 1982.

14 - SMITH, D.A.; KNOTTENBELT, D.C. *Spirocerca lupi* localization in the spinal cord of a dog. **Zimbabwe Veterinary Journal**, v.18, p.19-22, 1987.

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