

CANINE SPIROSERCOSIS IN GIZA GOVERNATE: WITH A REFERENCE TO ESOPHAGEAL AND AORTIC PATHOLOGY.

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SUMMARY

A survey had done on 78 dogs of different ages and both sexes in Giza Governate to detect the incidence of the infestation with *Spirocerca lupi* in dogs.

Fifty- eight cases were positively infected; only twenty-seven cases had the clinical disease with the master sign of vomiting.

The characteristic *Spirocerca* lesions were encountered mostly in aorta, esophagus and in few cases stomach involvement was also noticed.

The most pronounced P.M lesions were the tumor- like nodules in the last mentioned organs, those nodules contained cross- section of large number of the bright red worm in a yellow pus.

Deformative degenerative spondylitis with associated aortic adhesive lesions was observed in 5 cases. Neoplastic reactions mainly fibrosarcoma was noticed in 11 cases which had the tendency to metastasis to the lung in two cases.

INTRODUCTION

Spirocerca lupi is widely distributed through out the world and is most prevalent in tropical and subtropical countries (Dunn,1978).

It is spiroid nematode in dog and less commonly in cats.

The Nematode *Spirocerca lupi* is widely distributed parasite of dogs with beetles serving as intermediate host. Adult worms are formed in the terminal part of the esophagus where they deposited embryonated eggs which are voided in faces. The eggs are ingested by various species of Copropha-

gus beetles in which they hatch and develop to infective third stage larvae. The beetles are ingested by the definitive host or by parantic hosts such as any reptiles, mammals, or birds which preys on the beetles.

In the final host, the larvae migrate through the stomach wall and along the adventitia and fascia of the regional arteries and ascend the aorta and then migrate to the esophagus (Dunn, 1978, Jubb et al, 1993 , Jones et al, 1997).

The nematodes cause considerable tissue damage especially to the esophagus and thoracic aorta which may on occasion rupture leading to massive hemothorax (Hamir, 1986).

The close association of the parasite *S. lupi* with esophageal sarcoma suggests etiological involvement of *S. lupi*.

Further investigations may yield results of significance with respect to comparative oncology.

This paper records detailed observations made over 18 month period on male and female stray dogs caught from different localities in Giza governate, on the incidence and pathological lesions of *S. lupi* infestation.

MATERIALS AND METHODS

Between Aug.,2001 to Jan. ,2003, 78 male and female stray dogs were collected from different localities in Giza governate.

Animals were kept under clinical observation for 10-15 days, during this period they were clinically examined , and full data were recorded. Blood samples were collected from each animal in clean tubes containing 1% EDTA. Blood parameters including RBCs count, PCV and hemoglobin concentration (Drabkin, 1949), and hematocrite (Dacia and Lowis, 1991) were determined. Plasma samples were used for determining creatine kinase activity according to Doxey (1983).

Post mortem records of all *S. lupi* infected dogs were studied with respect to age, sex, and pathology of the disease.

All animals were sacrificed and thorough P.M examination was carried out to detect any metastatic reactions in cases where neoplastic lesions detected. Then specimens were collected from each lesion in the oesophagus, aorta ,stomach, lung and any other part showed any pathological lesion.

The collected specimens were fixed in formol saline 10%, and routinely processed for paraffin blocks, then sections of 4-5 um thickness were prepared and stained with Haematoxyline and Eo-

sin (Bancroft et al, 1996).

Occasionally other stains , particularly Van Giesons were done (Bancroft et al, 1996).

RESULTS

I - Clinical signs:

Twenty seven dogs out of the 78 collected dogs had clinical signs of spirocercosis including; emaciation, anemia, anorexia, respiratory embarrassment and vomiting. These symptoms either observed individually or in combination. Where a dog had a combination of two or more signs, it was possible to make a diagnosis. Paraplegia was observed in one dog.

Thoracolumber pain could be recorded in 5 dogs , whose P.M. examination showed spondylitis and spondylosis.

II- Blood parameters:

Measurements of different blood parameters (RBCs count, PCV, and hematocrite) revealed marked anaemia in 63% of the positively infected dogs as the count of RBCs ranged from 3.9 ñ 4.3, while pcv% ranged from 23 ñ 29 [Normal RBCs count for dogs is 5.5- 8.5 (6.4) and that of pcv for dogs is 37 -55(45)] (Doxey, 1983). . Concerning creatine kinase activity, 59% of the positively infected dogs showed high activity of the enzyme

(the increase was from 2 to 3 times the upper limit of normal).

The increased activity level reached (2.5 -4.5 mg / dl), while the normal reference range is (40-130umol / l (0.5 -1.5 mg/ dl) (Doxey, 1983).

III - Pathological findings:

III- A- P.M. examination:

The P.M. examinations of all animals revealed lesions in 52 cases (66.7 %). These lesions were encountered mainly in the aorta and esophagus accompanied with or without lesions in the stomach , (Table I).

Aortic lesions: It occurs mostly in the terminal thoracic aorta, while in 4 cases, the whole length of the aorta was involved.

The most conspicuous aortic lesion was the aneurysms of varying sizes and depth, some of which showed calcified walls. In 5 cases, portion of the aneurysm was strongly adherent to the adjacent soft tissues of the thoracolumber vertebrae causing deformative degenerative spondylitis of thoraco-lumber vertebrae with varying degree of aortic adhesion.

Thrombotic mass was observed attached to the wall of the aorta of some cases.

Esophageal lesions: In all infected cases esophageal lesions were observed in the distal oesophagus near the cardia by 3-5 cm. The lesion constituted from solitary or multiple nodules up to five in one case, of varying sizes from 0.5-5cm in diameter surrounded by a thick fibrous wall.

The majority of the nodules were located within the esophageal wall and mostly protruded into the lumen. Larger nodules were prominent from both sides of the wall. Often the protrusion caused esophageal stenosis, obstruction, and sometime dilatation anterior to the lesion.

A fistula was observed through which the worms protruded into the esophageal lumen. The opening of the fistulae were often rough and ulcerative due to abrasions caused by the passage of solid food. The entire of the nodule formed cavity contained one or large number of bright -red coiled *S.lupi* in a yellowish pus Fig. (1, a and b).

Ulceration and hemorrhage of the esophageal mucosa was noticed in most of the large nodules. Some nodules had cauliflower appearance, firm with evident necrotic areas.

Post mortem examination of the stomach and lung of the infested cases revealed presence of *S. lupi* nodules of variable sizes in the stomach of 3 dogs, cross section of those nodules showed large num-

ber of the worm in inflammatory thick yellowish exudates. No lesions were observed in the lung of the infested cases by naked eye.

III- B- Histologically:

Aortic lesions: The affected aortic walls showed marked destruction of the muscular wall with hemorrhage. *S.lupi* nodules were observed in 5 cases which contained cross sections of the worm with heavy infiltrations with eosinophiles, plasma cells and varying degrees of large proliferating fibroblasts (Fig 2,a). Non of these nodules had evidence of neoplasia.

Esophageal lesions: The main conspicuous lesion was the esophageal nodules that formed from a central cross section of the worm in a mass of pus and neutrophiles admixed with esinophiles and some embryonal fibroblasts surrounded by a thick wall of connective tissue infiltrated with macrophages, lymphocytes, and plasma cells (Fig 2, b,c,and d). Strangely esinophiles were absent in the nodules of four cases.

In some nodules, large oval fibroblasts appeared increasing in size accompanied with large number of plasma cells with an attempts to neoplastic reactions, some of which had numerous distended blood vessels unlike those associated with granulation tissue (fig. 3, a). On the periphery of some of them were early whorl formation by fi-

broblasts .

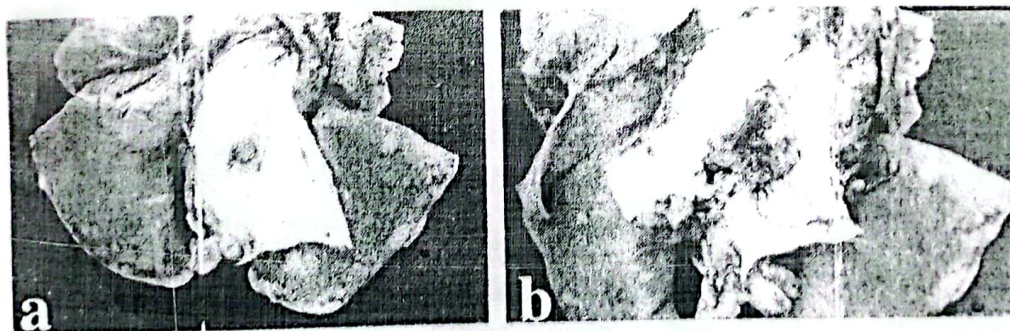
There were 11 esophageal fibrosarcoma defined on the basis of their histological appearance. Most of those tumors showed necrosis, hemorrhage , myxomatous degeneration, eosinophiles and plasma cells infiltration. The tumor was made of large undifferentiated cells with spindle-shaped nuclei, often arranged in groups , each of

which taking one direction.

In neoplasms with early malignant tendencies, many fibroblasts appeared large to more plump cells with ovoid nuclei were existed (Fig. 3, b), some were abnormally large with a few mitotic figures, whorl formation (Fig. 3, c), myxomatous degeneration (Fig. 3, d) and sometimes with the presence of a few multinucleated cells.

Table (1) showing the number of the infected cases, lesions distribution, and neoplastic lesions

Total No. examined	No. of infected cases	Percent of infection	No. of clinical cases
78	52	66.7%	27
Lesions distribution			
Aorta	Esophagus	Aorta and esophagus	Stomach
5	9	35	3
Neoplastic lesions		No. of cases	Metastasis
		11	2



Fig, 1, (a): Spirocerca nodules protruded through the esophageal lumen with fistulous opening. (b)- Cut section of the nodule notice: large number of bright- red coiled *S. lupi* in yellow pus.

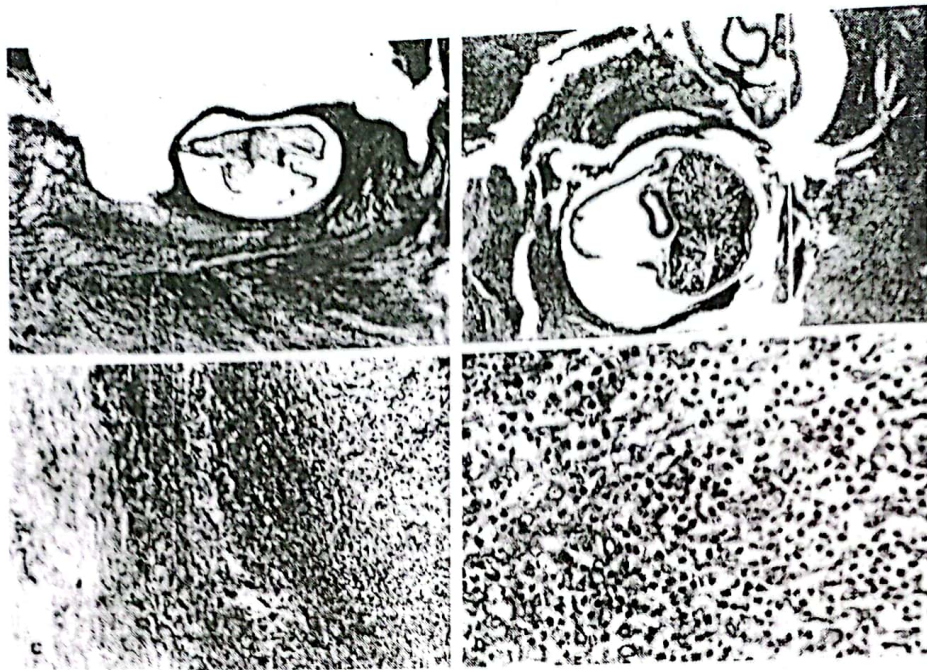


Fig. 2 , (a): Aorta showing cross- section of the *S. lupi* within the aortic nodule with. (b)- Cross-section in the esophageal nodule contain central cross-section of the worm in a mass of pus and neutrophiles. (c and d)- Thick wall of the esophageal nodule infiltrated with macrophages, lymphocytes and plasmacytes. (H&E, X 100 and 200).

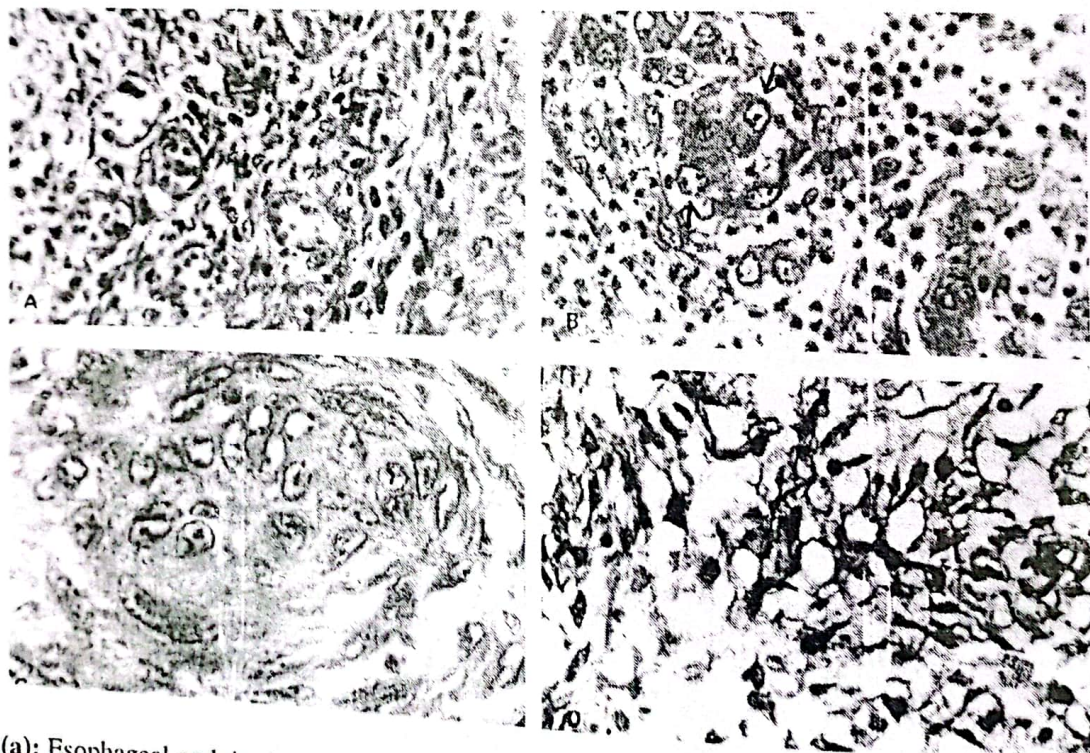


Fig. 3, (a): Esophageal nodule showing numerous distended blood vessels in its wall. (b, c, and d) Esophageal fibrosarcoma showing (b)- abnormally large ovoid fibroblasts (arrow) within the cellular content of the nodule. (c)- Whorl appearance of the neoplastic fibroblasts. (d)- Myxomatous degeneration in the vicinity of the tumor. (H&E, X 400).

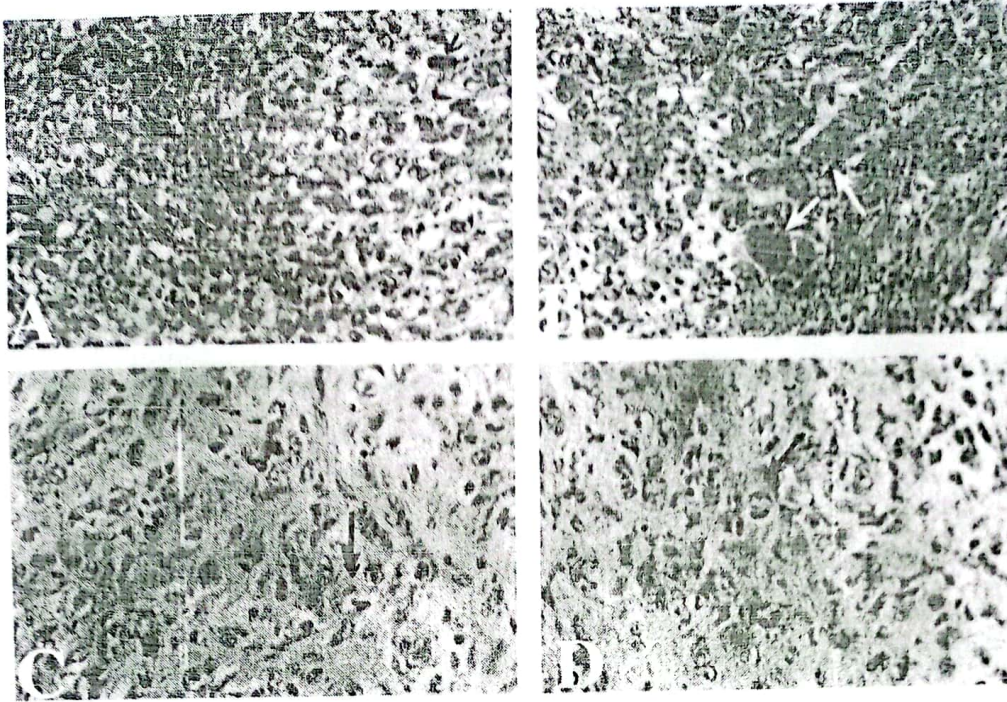


Fig. 4, (a and b): Esophageal fibrosarcoma showing (a)- The neoplastic cells run in different directions with numerous mitotic figures (arrow). (b)- The criss-crossing of the neoplastic cells with multinucleated cells formation (arrow). (c and d)- Metastatic fibrosarcoma in lung showing the different phases of mitosis (arrow), pleomorphism of the cells. (H&E, X 400).

While in highly malignant neoplasms, some nuclei were abnormally large and pleomorphic with moderate to numerous mitotic figures (Fig. 4, a). The cells grew in all directions, criss-crossing, some forming whorls and others tend to crowd together stimulating multinucleated cells formation (Fig. 4, b). The adjacent normal connective tissue reacted by producing more collagen fibers on the periphery leading to increase the size of the whole tissue. Gradually the esophageal tissue in both directions were destroyed.

In one case, early osteoid formation was evident by appearance of homogenous pink staining patches associated with fibroblasts. Two cases had metastatic fibrosarcoma to the lung at which the cells run in all directions, showing severe pleomorphism and mitotic figures (Fig. 4, c and d)

The stomach nodules had the same histology of that found in the esophagus, none of the stomach nodules had neoplastic changes.

DISCUSSION

On a survey on 78 dogs , 52 dogs revealed pathognomonic lesions of spirocercosis, with an incidence of 66.7%

This is very high percent, no specific age or sex was identified to be at a high incidence . Trueman et al, 1980 had reported also a very high incidence among stray dogs. This may be said for warm countries where the parasite is endemic. Mazaki et al, 2002, observed a seven- fold increase in the annual number of dogs diagnosed with spirocercosis from 1991- 1999 in Hebrew Univer., Israel indicating an emerging outbreak of this infection, and many other authors have mentioned a very high incidence among stray dogs as Evans (1983), Harrus et al (1996)and Lobetti (2000).

Although the worm takes five months or more to mature, the immature forms have been found in dogs aged six months.

The clinical signs observed in this study were in agreement with those observed by many authors as Harrus et al, 1996 and Lobetti, 2000. It was observed that the master clinical sign of spirocercosis infection was vomiting, this agreed with many authors as Evans (1983) and Berry (2000).

Measurements of blood parameters of positively infected dogs revealed severe anaemia and an in-

crease in the creatine kinase activity, a result which come in accordance with that mentioned by Mazaki et al, 2002.

The most conspicuous P.M and histological lesions in all of the infected dogs at different ages, were the tumor-like nodules in the aorta, esophagus, and sometimes stomach. It reached 5 nodules in the esophagus of some cases. This comes in a harmony with the lesions observed by Evans, 1983, Berry, 2000 and Mazaki et al, 2002.

The existence of the worm in a tumor-like nodule in the aorta may be the cause of initiation of aneurysm (Jones et al, 1997). The migration of the larvae through the periosteal tissue and its encystment being the cause of the observed varying degrees of deformative spondylitis. The later causes destruction of the adjacent intervertebral discs and their collapse, with subsequent compression on the spinal cord , which is the cause of paraplegia that was observed in one dog.

The aortic lesions in dogs are stated to be pathognomonic of *S. lupi* infection, as they are not duplicated by any other parasite (Wondera,1976 and Minnaar and Krecek, 2001).

Concerning the esophageal lesions, the size of the esophageal nodules did not necessarily indicate the type of histological appearance. In most of the early and long standing nodules, the worms

formed the center for a mass of neutrophils, plasma cells, eosinophiles and some lymphocytes.

Strangely, eosinophiles were absent in some of both aortic and esophageal nodules, a result which is similar to that mentioned by Jones et al, 1997. The presence of plasma cells indicate an immunological reaction is taking place.

Moreover fibrosarcoma was observed in 11 cases, which come in accordance with that mentioned by many authors as Melendez and Suarez-Pellin (2001) and Mazaki et al (2002). Metastatic fibrosarcoma in the lung was observed in two dogs, an observation that agreed with Stephens et al (1983), Jones et al (1997), and Jubb et al (1993).

The pathological changes encountered tended to suggest that fibrosarcomas were the terminal lesions to be expected in long run. The presence of metastatic fibrosarcoma in lung tissue gives a strong probability that most of the fibrosarcomas in spirocercosis have the potential of undergoing metastatic reaction. This indicates the need for taking several representative sections from most of the organs.

CONCLUSION

Infection with *S. lupi* in the living animal is confirmed by the identification of the embryonated

ova in the faeces. Post mortem diagnosis is easily made by demonstrating the characteristic lesions in the aorta and esophagus.

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