

Communication

Note on *Onchocerca armillata* in the Sudanese camel (*C. dromedarius*). A histological and anatomico-pathological approach

M.A.M. Awad¹

A.A. Osheik¹

M.H. Tageldin¹

A.M. Zakia¹

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L'onchocercose aortique due à *O. armillata* a été diagnostiquée dans 45 cas (41 p. 100) sur 109 examens de chameaux du Soudan. Bien que l'aorte thoracique ait été régulièrement concernée, d'autres vaisseaux ne sont pas à exclure (aorte abdominale, artères brachiocéphaliques, pulmonaires et costocervicales). Un examen général des vaisseaux affectés a révélé l'existence des cheminements tunnelloïdes et tortueux des parasites bien visibles à l'œil nu sur l'intima des vaisseaux. Les lésions nodulaires étaient plus fréquentes sur l'adventice. Au microscope, les lésions ont montré une hauteur irrégulière de la surface de l'intima. La tunique moyenne sous-jacente contenait un nombre variable de fragments de parasites encapsulés et partiellement minéralisés. La réponse inflammatoire a varié en intensité et dans sa localisation, se traduisant par la présence d'éosinophiles, de lymphocytes, de macrophages et, à l'occasion, de cellules géantes. **Mots clés :** Dromadaire - Onchocercose - *Onchocerca armillata* - Anatomico-pathologie - Soudan.

Introduction

The importance of animal onchocercosis, as a model for human onchocercosis, has stimulated much interest in this field. *Onchocerca armillata* is commonly found in the bovine aorta causing parasitic aortitis in Africa (1, 3, 5, 9). In camels information about the disease is scarce. Previous studies on *O. armillata* in this species were based on the presence of adult worms in the aorta and distribution of parasites in the skin (8, 10).

This work was conducted to determine the prevalence of parasitic aortitis among camels slaughtered in two abattoirs of the Sudan with special emphasis on the histo- and anatomico-pathological changes.

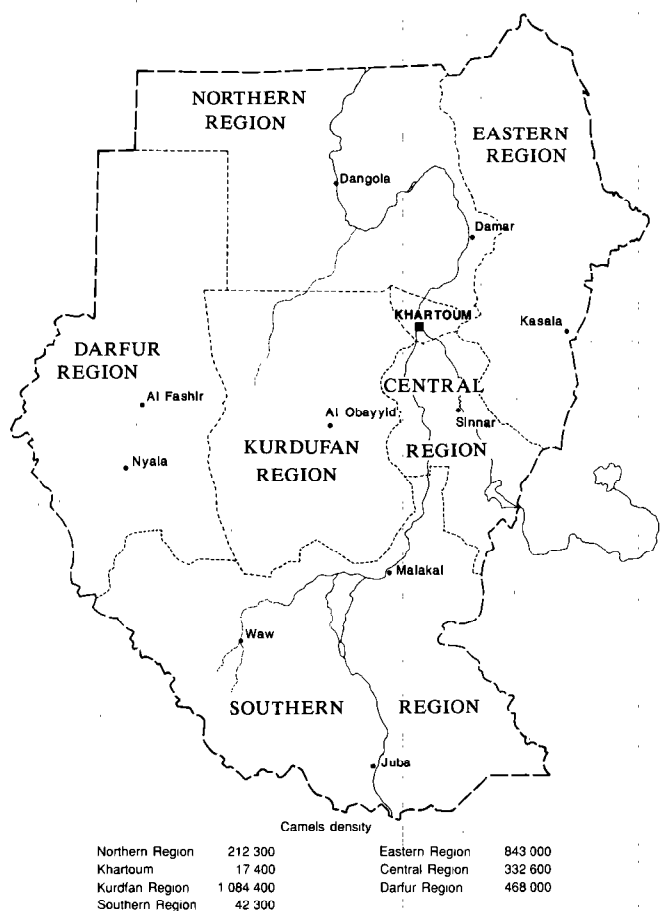
Materials and methods

A total of 109 adult camels of both sexes and different age groups were surveyed for aortic lesions. The

1. Central Veterinary Research Administration, Khartoum, POB 8067, El Amarat, Sudan.

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disease was studied in the Sinnar slaughterhouse and Omdurman central abattoir (map 1). Sixty-eight animals were examined at Sinnar and the remaining 41 were investigated at Omdurman. Animals slaughtered at Sinnar came from the Savannah grass-land in the Central region while those handled at Omdurman came primarily from Western Sudan.



Map 1 : The Sudan.

All animals were healthy, in a good to excellent general condition. At slaughter, the whole thoracic aorta, brachiocephalic trunk, costocervical and pulmonary arteries and in a few cases the abdominal aorta were examined at the slaughterhouse or taken to the laboratory for more detailed examination. In both cases, the vessels were carefully opened with a sharp scissor and the gross appearance of the lesions studied. Selected sections of affected vessels were fixed in 10% formalin and routinely processed for histological examination.

Results

Forty-five (41%) out of 109 camels examined in both locations exhibited a gross and histological evidence

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of aortic lesions of varying degree, intensity and location. Among the animals slaughtered in the Sinnar area, 37 (54 %) were found to be infected. At Omdurman slaughterhouse, only 8 animals were affected (20 %).

The majority of the lesions was observed in the thoracic aorta near the bifurcation from the aortic arch. The other involved vessels included the brachiocephalic trunk, costocervical and pulmonary arteries but to a lesser extent and frequency, the anterior portion of the abdominal aorta.

The gross examination of the affected blood vessels showed two forms of parasitic infection. The dominant form was tortuous tunnels of varying size, number and length (photo 1). The intimal areas where the parasites were embedded were slightly elevated and coloured in green to yellow. The second form of parasitic invasion was nodules. This form, although present on both sides of the blood vessels, was more common on the adventitial surfaces. The nodules ranged from 2 to 5 mm in diameter and were either smooth and glistening or green to yellow with granular consistency. The section of the nodules contained yellowish caseated material with fragments of mineralized substances. A careful dissection of the nodules exposed a complete male and the anterior portion of female worms. Morphology, measurement and localization of the parasites were similar to *O. armillata*.

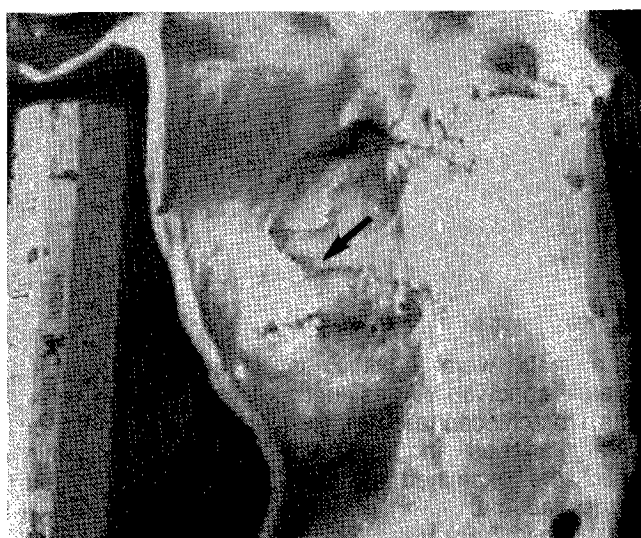


Photo 1 : Camel aorta. Note the parasitic tracks (arrow) located near the bifurcation from the aortic arch.

The histopathological examination of the affected blood vessels showed several encapsulated parasites or parasitic fragments located at different levels of the media of the vessels (photo 2). The intima was usually



Photo 2 : Encapsulated parasite with minimal inflammatory response (arrow) ($\times 100$).

visibly intact, but when the parasites were located in the subintima or upper media, it was irregularly elevated and presented a hump-like shape. The parasites were usually encapsulated and many of them were undergoing a varying degree of mineralization, fragmentation and lysis. In older lesions with advanced levels of parasitic disintegration, cavities were formed. The healing of such cavities involved their filling with fibrous tissue protruding from the surrounding capsules.

The inflammatory response was inconsistent and did not require the presence of the parasites in the proximity. In fact, areas devoid of parasites or of their fragments showed evidence of inflammatory reaction. This was more marked around the small-sized blood vessels (*Vasa vasorum*) in different areas of the media and adventitia of the vessels. Areas with disintegrated parasites usually showed an inflammatory reaction.

Regardless of the location, the inflammatory response was consistent in terms of cellular components. The prominent cellular infiltration consisted of eosinophils and mononuclear cells, the majority of which were lymphocytes and macrophages (photo 3). Neutrophils and giant cells were few or rare. In addition, the inflammatory reaction was accompanied by vacuolar changes, interruption and disorientation of the involved muscle fibres (photo 4).

Discussion

Camel onchocercosis has received much attention in recent years. In cattle, parasitic aortic lesions caused by *O. armillata* constitute a common finding in

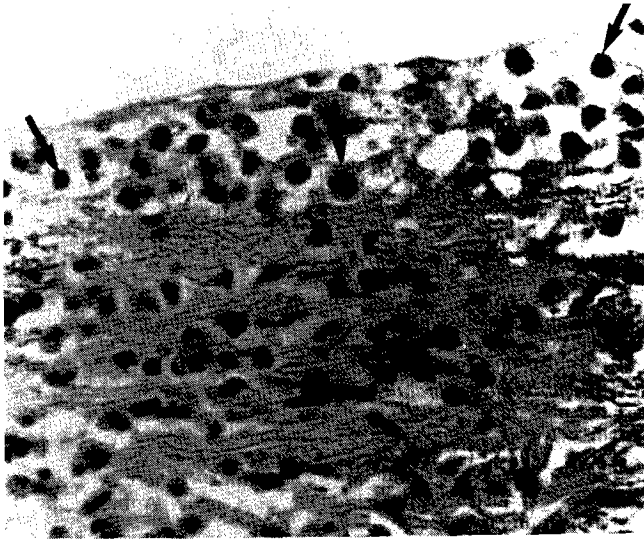


Photo 3 : Infiltration of inflammatory cells in the subintima (arrow) ($\times 400$).

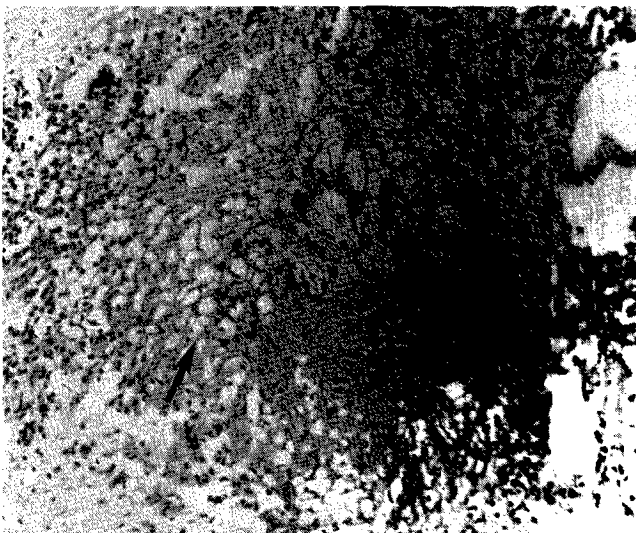


Photo 4 : Fragmentation and disorientation of muscle fibres due to inflammatory infiltration (large arrow) and vacuolation changes (small arrow) ($\times 100$).

slaughtered animals in the Sudan (1, 7). This study, however, indicates a relatively high incidence of similar aortic lesions in Sudanese camels. In Nigeria a low rate of infection (1 %) was reported in camels imported from Nigeria (10). This may be attributed to the small number (52) of animals investigated. It could be possible that climatic and ecological conditions in the Sudan provide an environment for more efficient transmission of the disease. Furthermore, it is impor-

tant to note that the co-existence of camels and cattle in the same grazing area, a common practice in the Sudan, may facilitate and maintain this high rate of cross-infection between species.

Compared to the bovine aortic onchocercosis (2, 3, 4, 6), the pathology of infection in camels has been insufficiently studied. This may be due to the small number of camels usually available for slaughter, as for most of town-dwellers, camel meat is not the prime choice. Principally, the pathology of this disease in camels was not different from that described for aortic onchocercosis in cattle (3, 4, 6). Based on the limited available information, lesions in camels, however, were fewer and smaller.

The inflammatory infiltrates were fairly consistent with the location of the parasites and comprised eosinophils, lymphocytes, macrophages and occasional giant cells. The location and intensity of the reaction could vary from one area to another even within the same blood vessel. Partially or completely digested parasites triggered a varying degree of inflammatory reaction, especially those with thin or discontinued capsules. In some cases, encapsulated, apparently intact parasites with prominent capsules did not always initiate a visible cellular infiltration. Similarly, the inflammatory reaction, in other cases, did not require the presence of parasites in the vicinity. Inflammatory aggregates not directly associated with parasites were seen scattered in a random pattern but more frequently they were seen as vascular cuffs around the small-sized blood vessels of the aorta. The endothelium of these vessels had prominent nuclei and an abundant foamy cytoplasm. It appeared that breaking down of the parasites with a simultaneous release of parasitic by-products into the surrounding environment may be responsible for stimulating an inflammatory response and this could be via inflammatory mediators.

Regardless of lesions with sizeable pathological changes, the camels were healthy and in good physical form. This confirms previous observations in cattle (3, 4, 5, 11) where the disease occurs silently without exerting any health problem or apparent clinical manifestations.

Conclusion

The incidence of onchocercosis in camels is relatively high although not as frequent as in cattle. This high rate of infection could be explained by cross infection between species especially those sharing the same grazing localities.

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Aortic onchocercosis due to *O. armillata* was diagnosed in 45 (41 %) out of 109 Sudanese camels. Although the thoracic aorta was regularly affected, involvement of other vessels such as the abdominal aorta, brachiocephalic, pulmonary and costocervical arteries was not excluded. Gross examination of the affected blood vessels revealed tortuous tunnels of parasitic tracks readily visible in the intimal surface of the vessels. Nodular lesions were more common on the adventitia. Microscopically, the lesions showed irregularly elevated intimal surfaces. The underlying tunica media contained a varying number of encapsulated and partially mineralized parasitic fragments. The inflammatory response varied in intensity and location and consisted of eosinophils, lymphocytes, macrophages and occasional giant cells. *Key words* : *Camelus dromedarius* - Onchocercosis - *Onchocerca armillata* - Anatomo-pathology - Sudan.

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