

PREVALENCE AND PATHOGENESIS OF *Onchocerca fasciata* INFECTION IN CAMELS (*Camelus dromedarius*) IN IRAN

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ABSTRACT

Fifty camels of either sex in different age groups were examined soon after slaughter for the presence of *Onchocerca fasciata* over a period of one and half year. Twenty four camels (48%) were found to carry the nodules of *O.fasciata*. Older animals showed more infection rate and so also the males. The nodules were maximum on the sides of neck followed by sides of abdomen and thorax but rare in back region. Usually single nodule or in a group of 2 to 4 containing the worms were seen. Sections of the nodules showed filarial worms *O.fasciata* which were surrounded by fibrous connective tissue capsule. The nodules had number of cavities containing sections and fragments of worms in different planes. The inflammatory cells infiltrated in the area comprised of lymphocytes, eosinophils and histiocytes. In older lesions, there was more intense fibrous connective tissue with excessive granulomatous reaction surrounded by a zone of lymphocytes and giant cells.

Microfilarae were observed in the subcutaneous tissue near the lesions mostly parallel to the location of nodules containing adult parasites. The nodules were often mistaken as tuberculous infection of lymph nodes, the infected animals mostly had a low sale price and even condemnation of carcasses.

Key words : Camel, microfilariae, *Onchocerca fasciata*, pathogenesis, prevalence

Onchocerca fasciata, a filarial nematode, responsible for causing subcutaneous fibrous tissue nodules in camel has been reported mostly from Saudi Arabia (Bain and Nasher, 1981; Cheema *et al*, 1984; Nasher, 1986; Omar and Raouf, 1996) and recently from Egypt, Sudan and Somalia (EI-Massry and Derbala, 2000). Studies on the different stages of infection and histological deviations were carried out by Cheema *et al* (1984) and Ghandour *et al* (1991). Though *O.fasciata* infection in camel is self limiting, yet the heavily infected animals may not be suitable for sale as the nodular lesions resemble those of tuberculosis of lymph nodes (Cheema *et al*, 1984). The skin of the affected animals also loses its sale value and even the carcasses may be condemned. In recent past, camels are gaining much popularity in Iran due to their utility as draught animal in many provinces and also their use in agricultural operations. Camel meat and skin also have good market. The Government is encouraging their breeding and financing several projects to improve their breeds and health coverage. Considering the utility and popularity of camels in this country, the present investigations were undertaken to record the prevalence and pathogenic effect caused by *O.fasciata*

during tissue invasion phase in camels in Islamic Republic of Iran.

Materials and Methods

Fifty dromedary camels, of both sexes and above one year age, procured from different parts of Far province and adjacent areas of Iran for meat purposes, were examined immediately after slaughter over a period of one and half years. The skin, subcutaneous tissue, ligamentum nuchae and all other body parts of the slaughtered camels were examined carefully for the presence of *Onchocerca* nodules. The distribution of nodules according to the sex and age of the animals and the number, size and location of the nodules in the body, were recorded separately for each animal. The animals examined, were assigned to three groups according to their age i.e. 1 to 3 years (Group-1), 3 to 6 years (Group-2) and above 6 years (Group-3).

Nodules *in situ* and the area adjacent to nodules in the animal body were carefully examined grossly and then nodules were dissected and collected in physiological saline. One hundred nodules selected randomly while fresh, were measured and their length and width in millimetres were recorded. The

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nodules and the tissue from affected area, were fixed and preserved in 10 per cent formal saline. Suitable sections through the nodules and the affected tissues were cut, stained with Haematoxylin and Eosin and examined following routine techniques. The cut sections of nodules were examined carefully for the presence of adult *Onchocerca* worms, their sections or fragments in different planes. Tissues surrounding the nodules were also examined for the presence of microfilariae. Such tissue pieces were processed separately, sectioned, stained and examined microscopically. Blood samples of the camels showing nodules; were also examined for the presence of microfilariae.

Results

Out of total 50 camels from different parts of Fars Province and adjoining areas, 24 (48%) were found positive to carry nodules in their body. The prevalence of *Onchocerca* nodules in camels with respect to their age and sex is presented in table 1. However, group wise percentages were 59, 42 and 33%, respectively. The age-wise break up of this infection in camels showed maximum infection rate (26%) in older animals above 6 years followed by 3-6 years age group (16%) and minimum (6%) in young animals below 3 years. Out of total 36 male camels examined, 20 (55.5%) were positive for the presence of variable number of nodules. However, four out of 14 female camels (28.57%) were found positive for this infection. The number of nodules recovered from the positive cases varied between one and 23 in an animal. The observations on the intensity of nodules in different body parts of positive camels revealed the maximum number of nodules on the sides of neck followed by sides of abdomen and thorax. A few nodules were also observed on the limbs. However, the nodules were rare in back region as only one nodule was observed on the back of one animal. The measurement of randomly selected nodules from different animals of all age groups showed marked variation in their size and shape as they ranged between 3 and 15 mm in length and 3 and 9 mm in width. They were mostly ovoid, oblong or occasionally flattened in shape. At places, 2-4 small nodules in a cluster were also observed.

The macroscopic examination of nodules showed their whitish calcarious appearance and contained coiled up worms in different stages of their development (Fig 1). The worms were densely surrounded by fibrous connective tissue and thus it was difficult to take out complete specimen of the worms from these nodules. Only cut portions

of the worms were obtained after sectioning the nodules in different planes. The parasites during the course of their development inside nodules produced gross pathological changes due to their presence and continuous irritation in the tissue. The nodules were mostly located within the fascia of different body parts of infected animals. The nodules were hard to touch and thickened and the adjacent area close to nodules also became hard and calcarious. Due to increase in the size of worms and also because of constant irritation caused by them, the fascia and the adjacent connective tissue became thickened to form these nodules. On sectioning, thin filarial worms were observed in nodules which were surrounded by the fibrous connective tissue capsule. In older lesions, the fibrous tissue capsules were much hard and thickened, containing necrosed tissue and the sections or fragments of the worms. In some cases, the tissue and the worms in the capsule were calcified.

Table1. Prevalence of *Onchocerca fasciata* nodules in camels with respect to their age and sex.

Groups	number examined			number positive			positive	
	Age	Male	Female	Total	Age	Male		Female
1	1-3	6	3	9	3	-	3	33
2	3-6	13	6	19	6	2	8	42
3	above 6 yrs	17	5	22	11	2	13	59
	total	36	14	50	20	4	24	48

Microscopic changes in and around nodules were variable and depended on the duration of infection. The nodules had number of cavities containing sections and fragments of worms in different planes (Fig 2). These cavities and nodule matrix were formed by connective tissue spreading from the capsule (Fig 3). In the sections of female worms, the uteri were seen filled with embryonated eggs and microfilariae (Fig 4). The inflammatory cells infiltrated in the area around nodules varied according to the stage/duration of infection. In early stages, the inflammatory reaction comprised of the infiltration of lymphocytes, eosinophils and histiocytes (Fig 5). In the later stages of infection as the lesions grow older, there was more intense fibrous connective tissue due to the presence of adult worms which caused severe damage and intense reaction. In advance lesions, there were intensive granulomatous reactions with large number of lymphocytes, histiocytes surrounded by a zone of giant cells (Fig 6). In some places, the worms were dead or degenerated surrounded by heavy infiltration with neutrophils (Fig 7). In very old nodules, where the worms were completely resolved, the tissue became degenerated,

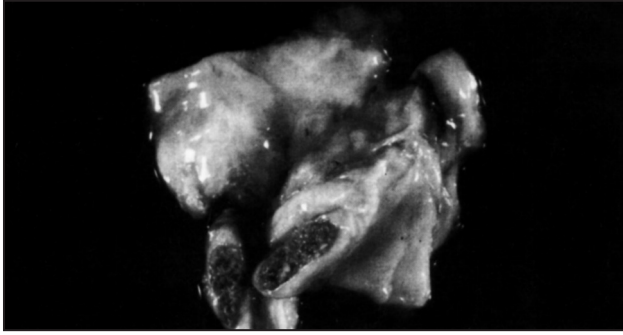


Fig 1. Cut section (Gross) of fresh nodules from camel showing thick edges and coiled *Onchocerca fasciata* worms.

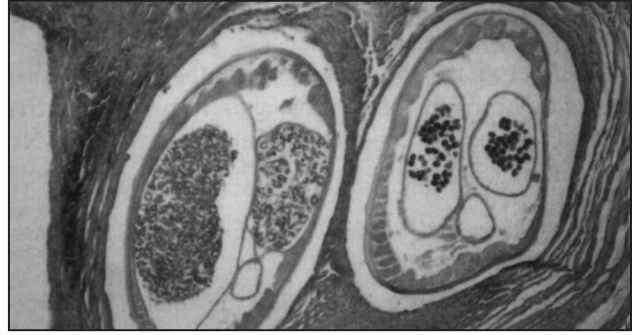


Fig 2. Microphotograph of section of nodule showing cavities filled with sections of *O. fasciata* adult worms at different levels (HEx500)

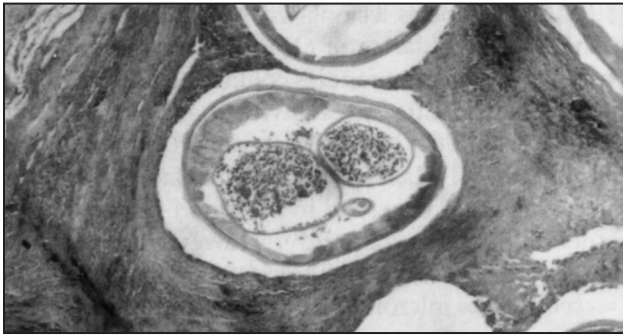


Fig 3. Microphotograph of section of nodule showing extensive tissue damage, nodule matrix and connective tissue capsule due to *O. fasciata* infection (HEx500)

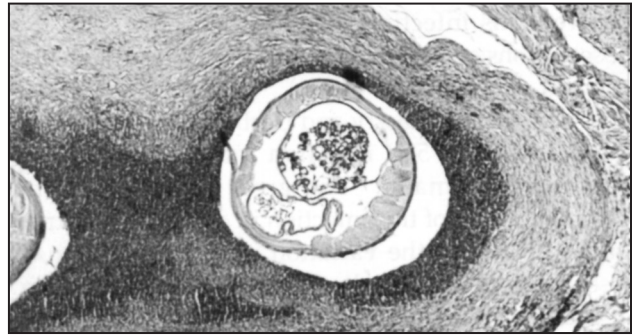


Fig 4. Microphotograph showing uterus of *O. fasciata* filled with embryonated eggs. The zone of inflammatory cells surrounded the cavity (HEx500)

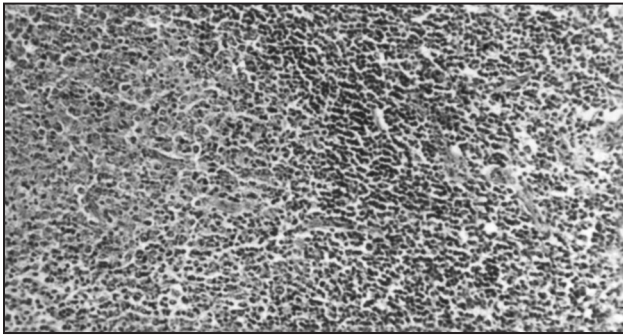


Fig 5. Microphotograph of tissue around nodule of *O. fasciata*, showing heavy cellular infiltration due to inflammatory reaction (HE x 125)

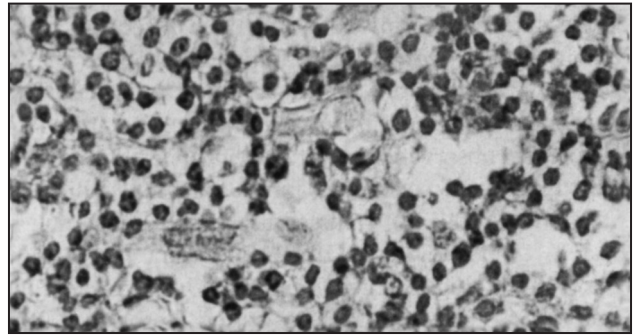


Fig 6. Microphotograph showing inflammatory tissue reaction and infiltration with lymphocytes, eosinophils & macrophages (HEx1250)

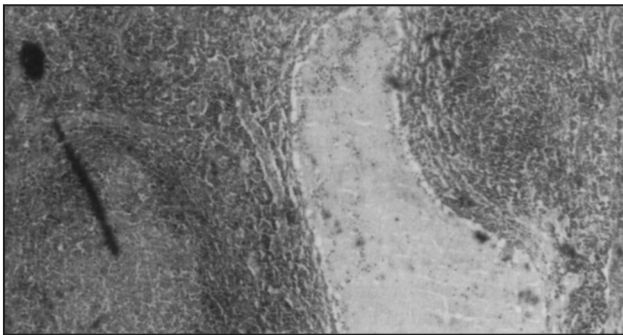


Fig 7. Microphotograph showing degenerated worm surrounded by heavy infiltration with neutrophils (HEx500)

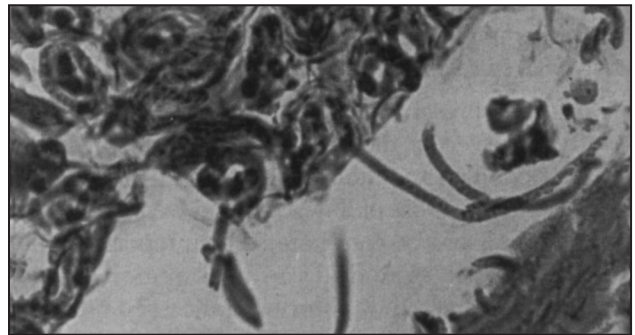


Fig 8. Microphotograph showing microfilariae parallel to the location of nodule (HEx500)

fibrosed and calcified. In a few cases, caseation of the whole nodular mass was observed.

Microfilariae were observed in the subcutaneous tissue adjacent to the lesions usually parallel to the location of nodules containing adult worms (Fig 8). No microfilaria was observed in the blood of camels examined.

Discussion

High incidence of *O.fasciata* in camels i.e. overall 26.0% of which 34% in indigenous camels (El-Bihari, 1985), 15.5% (Cheema *et al*, 1984) and 59.0% (Nasher, 1986) were reported from Saudi Arabia and other countries. In the present study, 48.0% camels of Iran showed this infection which was higher than the observations of Cheema *et al* (1984) but lower than the reports of Nasher (1986). Contrary to these observations, El-Massry and Derbala (2000) observed much lower (2.75%) infection rate in camels from Sudan and Somalia. The great variation in the prevalence rate of this infection in different countries might be due to the variation in the population of insect vectors and also due to the chances of exposure of camels to these vectors. The frequent exposure of camels to the insect vectors in Iran might be the main reason as there is no proper and scientific husbandry practice for maintaining these animals reared for slaughter in villages. In our study, the aged animals above six years, showed quite high infection rate (26%) whereas the young animals below three years had only 6% infection. El-Massry and Derbala (2000) also could not observe this infection in young animals. The present observations on the prevalence of *O.fasciata* according to the sex of the animals, revealed higher infection rate (54.45%) in males as compared to females (28.57%). Beveridge *et al* (1979) and Ferenc *et al* (1986) also observed higher infection rate of *O.lienalis* in bulls than cows. However, El-Massry and Derbala (2000) reported higher infection rate of *O.fasciata* in female camels. No proper explanation is yet available for these differences, the only reason for the sex related variation might be the climatic differences in different zones as was earlier mentioned by Ladds *et al* (1979) and Ferenc *et al* (1986) in relation to *O.lienalis* infection.

In the present study, *O.fasciata* nodules were mostly observed in the neck region and also on the sides of abdomen and thorax. These findings are more or less similar to those of El-Massry and Derbala (2000). Our observations also corroborated their reports on rare occurrence of nodules in back

region of the animals. However, they observed quite good number of nodules on the lateral sides of fore and hind limbs, which was contrary to our findings as only a few nodules were observed on limbs in the course of the present study. The size of nodules recorded in our study was smaller (3-15 mm length) as compared to those reported earlier (9-23 mm length) by El-Massry and Derbala (2000). The nodules contained coiled-up worms surrounded by fibrous connective tissue similar to those nodules or 'worm-nests' described by Soulsby (1982) in *O.gibsoni* infection in cattle. The histopathological lesions due to *O.fasciata* infection in camels observed in our study, mainly comprised of inflammatory reactions including infiltration with lymphocytes, eosinophils and giant cells. In later stage of infection, the nodules showed excessive degeneration, fibrosis, calcification and caseation alongwith neutrophilic infiltration. However, the intensity of various lesions was variable in different nodules. Microfilariae of *O.fasciata* were frequently observed around the nodules containing adult worms. The present results agreed with those obtained by Cheema *et al* (1984) and El-Massry and Derbala (2000). Similar to El-Massry and Derbala (2000, no microfilaria was observed in the blood smears of the camel examined in our study. However, contrary to this, Abdul Salam and Al-Taqui (1995) reported 11.0% *Onchocerca* like microfilariae in the blood of camels in Kuwait.

Considering the heavy infection rate with *O.fasciata* in camels in Iran and the consequent effect on sale value of these animals and even sometimes condemnation of infected carcasses due to the resemblance of nodules with tuberculous infection of lymph nodes, adequate measures may be taken to control the insect vector(s) responsible for transmission of this nematode in camels.

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References

- Abdul-Salam J and Al-Taqui M (1995). Seasonal prevalence of *Onchocerca* - like microfilaria in camels in Kuwait. *Journal of Egyptian Society of Parasitology* 25(1):19-24.
- Bain O and Nasher K (1981). Redescription of *Onchocerca fasciata* R. and H., 1910, a parasite of the dromedary. *Annals of Parasitology Hum. Comp.* 56(4):401-6.
- Beveridge I, Kummerow E and Wilkinson P (1979). The prevalence of *Onchocerca lienalis* in the gastro-splenic ligament of cattle in north Queensland. *Australian Veterinary Journal* 55:204-205.

- Cheema AH, El-Bihari S, Ashour NA and Ali AS (1984). Onchocercosis in camels (*Camelus dromedarius*) in Saudi Arabia. *Journal of Helminthology* 58:279-285.
- El Bihari S (1985). Helminths of the camel: A review. In : AJ Higgins (ed). *The camel in health and disease*. British Veterinary Journal 141:315-326.
- El-Massry AA and Derbala AA (2000). Evidence of *Onchocerca fasciata* (Filaroidea: Onchocercidae) in camels (*Camelus dromedarius*): 1, Prevalence, Nodular lesions appearance and parasite morphology. *Veterinary Parasitology* 88:305-312.
- Ferenc SA, Copeman DB, Turk SR and Courtney CH (1986). *Onchocerca gutturosa* and *Onchocerca lienalis* in cattle: effect of age, sex and origin in prevalence of onchocerciasis in subtropical and temperate regions of Florida and Georgia. *American Journal of Veterinary Research* 47:2266-8.
- Ghandour AM, Al-Amoudi AA and Banaja AA (1991). *Onchocerca fasciata* (Railliet and Henry, 1910) and its nodule development in camels in Saudi Arabia, *Veterinary Parasitology* 39:67-77.
- Ladds PW, Copeman DB and Goddard M (1979). The occurrence of *Onchocerca gutturosa* infection in the nuchal ligament in relation to breed, sex and age of slaughtered cattle. *Australian Veterinary Journal* 56:445-446.
- Nasher AK (1986). Incidence and intensity of *Onchocerca fasciata* Railliet and Henry, 1910 in local camels in Saudi Arabia. *Annals of Parasitology Hum. Comp.* 61:77-80
- Omar MS and Raoof AM (1996). *Onchocerca fasciata* : histochemical demonstration of succinate an NADH dehydrogenase. *Journal of Helminthology* 70:47-51
- Soulsby EJJ (1982). *Helminths, Arthropods and Protozoa of domesticated animals* 7th ed. The English Language Book Society and Bailliere Tindall. London.