PATHOLOGICAL STUDY OF ONCHOCERCIASIS IN THE SUDAN

Thesis Submitted in Partial Fullfilment for Master Degree in Pathology

By

SOAD FADLALLA ALI

M.B.B.CH. Khartoum University

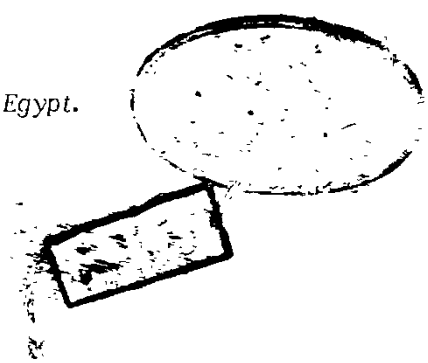
SUPERVISORS

Prof. Dr. ADLY FARID GHALY

Professor of Pathology,
Faculty of Medicine
Ain Shams University, Cairo, Egypt.

Dr. MAHMOUD ABDEL FATAH KHALIFA

Lecturer of Pathology,
Faculty of Medicine
Ain Shams University, Cairo, Egypt.

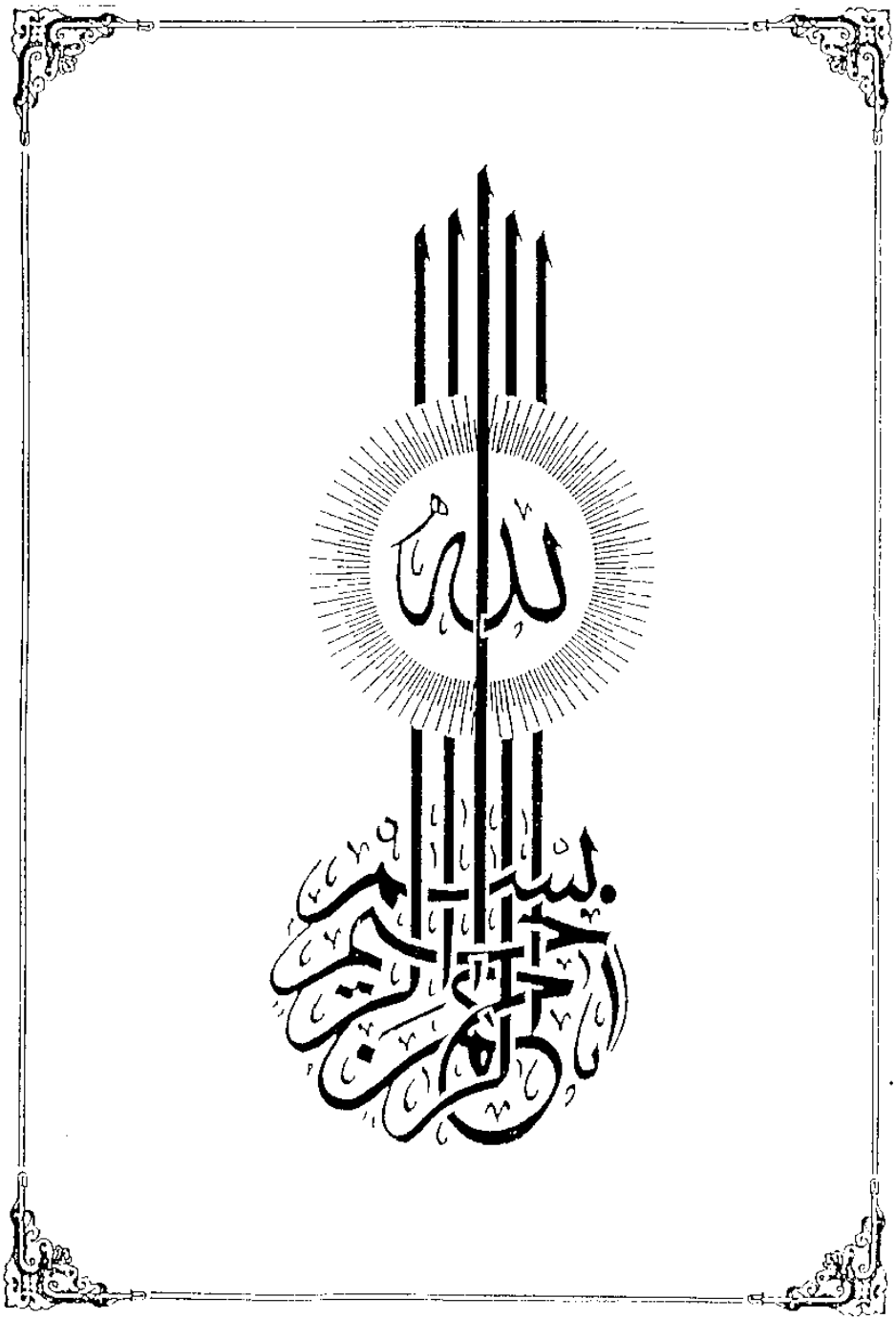


1988

وقل رب زدني علما

صدق الله العظيم

سورة طه آية رقم (١١٤)



ACKNOWLEDGEMENT

I would like to express my deepest gratitude to ***Prof. Dr. Adli Farid Ghali*** *Professor of pathology, Ain Shams University, Faculty of Medicine, for his valuable suggestions and guidance throughout the preparation of this work.*

My thanks are also due to ***Dr. Mahmoud Abd Elfatah Khalifa,*** *Lecturer of Pathology, Ain Shams University, Faculty of Medicine for his support and valuable advices.*

INTRODUCTION AND AIM OF WORK

INTRODUCTION AND AIM OF WORK

Onchocerciasis is a chronic filarial disease caused by a nematode worm Onchocerca volvulus. It is a disease characterized by fibrous nodules in the skin and subcutaneous tissue and also by ocular lesions which may lead to blindness **(Philipp et al., 1984).**

There are four types of filarial parasites infecting humans in Sudan. Onchocerca volvulus is by far the most important because of the serious ocular and skin disease now recognized to result from wide spread infection in Sudan **(Satti, 1985).**

Onchocerca volvulus was first reported in Sudan by **Bryant (1933).** He called it Jur blindness because the disease was prevalent among the Jur tribes near the Jur river **(Satti, 1985).**

The disease is transmitted by the bite of the infected female black fly of the genus Simulium **(Baker et al., 1985).**

The adult worm and microfilariae are found in subcutaneous tissue, usually encapsulated in a fibrous tumour. Each fertilized worm produces a large number of microfilariae which invade the skin causing severe dermatitis with intense itching. Scrotal enlargement, elephantiasis and enlarged testes are seen in Onchocerciasis **(Manson-Bahr and Apted, 1982).**

Microfilariae frequently reach the eye causing ocular disturbances. These ocular disturbances are very serious which finally end by blindness **(El Sheikh et al., 1985).**

The pathology and symptomatology of onchocerciasis are considered to be caused largely by dying or dead microfilariae. Dead parasites provoke intense inflammatory reactions which may be immunologically mediated **(Bartlett et al., 1978).**

Infection is detected by finding the microfilariae in small pieces of skin snipped from the infected individual or by palpating the subcutaneous nodules that develop around the adult worm **(Philipp et al., 1984).**

The prevention of this disease is by combined methods of chemotherapy and control of both vector and parasite in the human host **(Baker and Abd Elnur, 1985).**

The aim of this work is the histopathological study of the different lesions produced by Onchocerca volvulus infestation, trying to throw light on its pathological magnitude. The study includes skin biopsy specimens collected from patients infected with Onchocerca volvulus in Sudan to varify the histopathological changes in the skin.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Aetiology:

Human onchocerciasis is caused by Onchocerca volvulus - a nematode worm which is transmitted by a female black flies of the genus Simulium. The vector in Africa is Simulium damnosum and Simulium naevii groups. Simulium damnosum is associated with Onchocerca volvulus in the Sudan savannah type of onchocerciasis. The transmission is seasonal and there is a high incidence of blindness **(Baker et al., 1985).**

Human is the only definitive host, although closely allied species occur in other mammals. The adult worms are found in the subcutaneous tissues, usually encapsulated in fibrous tumours within which the worms are coiled. The liberated microfilariae are present in the nodules, subcutaneous tissues and skin, rarely in the blood or internal organs **(Manson-Bahr and Apted, 1982).**

The principal intermediate hosts are the black flies of the genus Simulium. Microfilariae are ingested by the fly when it bites an infected man. They develop into third stage larvae in the thoracic muscles of the black fly. This third stage larva is an infective form which migrate to the probosis of the insect. When the infective black fly bites, larvae escape to the skin

of a new host and penetrate the bite wound. The third stage larva (3L) travelsup the lymphatics and moults to reach a fifth stage larva (5L) then becomes an adult worm in less than a year, Fig. (1). The adult worm subsequently produces microfilariae and can live for up to 15 years. The life span of microfilariae in the skin may be as long as 30 months **(Baker and Abd Elnur, 1985).**

Congenital transmission can occur by transplacental passage of microfilariae from the mother to the infant **(Nelson, 1970).**

The main single factor influencing the extent of human exposure to infection is infective density of the Simulium vectors. This depends upon the size of the Simulium population. number of infective flies, concentration of infective larvae in these flies, seasonal variation in number of these flies and the distance of human dwellings from the breeding grounds. The human host factors which must be considered are occupation. seasonal migration, changes in habits and social and economic changes in human population **(Manson-Bahr and Apted, 1982).**

Onchocerca species of animals are closely related to Onchocerca volvulus of man and are common throughout most parts of the world **(Mustafa et al., 1985).**

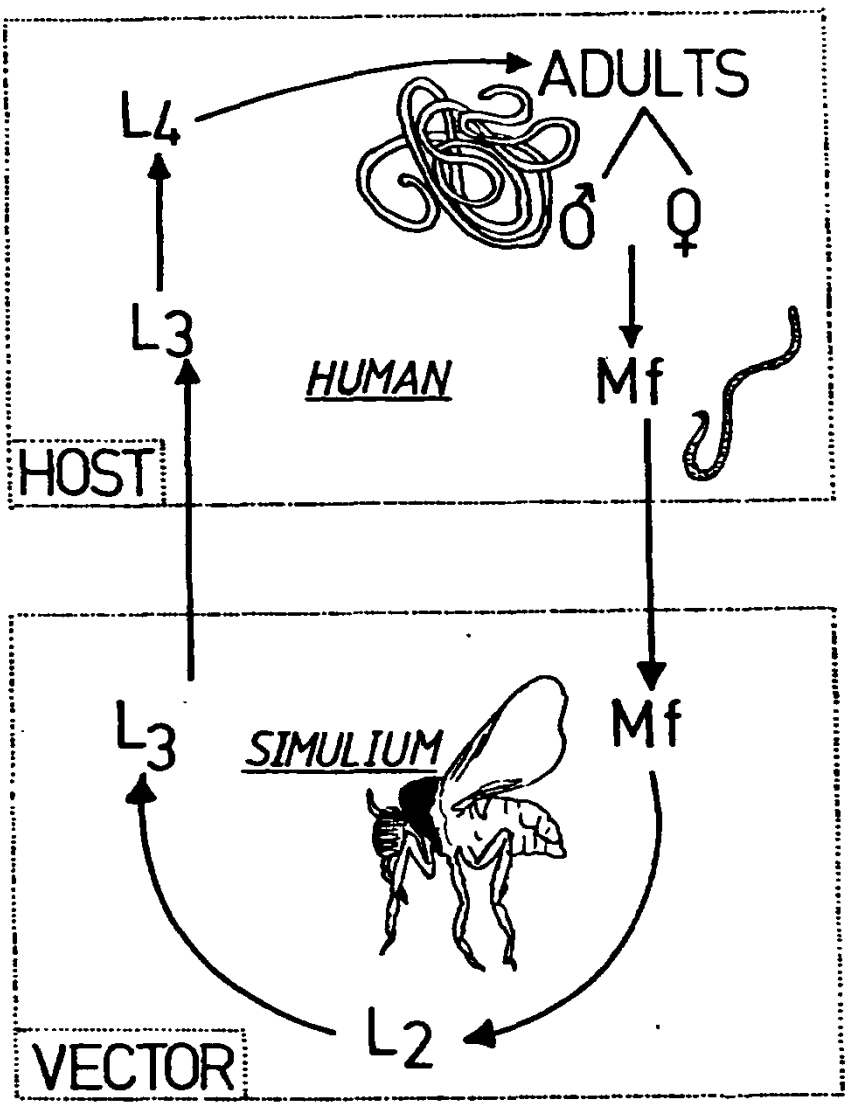


Fig. (1): Shows the life cycle of Onchocerca volvulus.

Transmission of Onchocerca larvae of animals to man by a zoophilic vector may occur. Onchocerca gutturosa of bovines closely resemble Onchocerca volvulus and infection of man have been described. All cases presented as fibrous nodules in the wrist containing adult worm but no microfilariae were demonstrated (**Mustafa et al., 1985**).

Geographical Distribution:

Human onchocerciasis is found in many areas in the world. In Africa onchocerciasis occurs on the west coast from Sierraleone to the Congo basin, extending eastward through Zaire, Angola and Sudan to east Africa. In the Americas it is found in the highlands of Guatemala, Mexico, Colombia, Brazil and Venzuela. Endemic areas in Central America are confined to the highlands along streams and rivers where black flies are abundant. In Africa the disease is confined to the neighbourhood of rapidly flowing small streams where the insect breed (**Rassi et al., 1977**). A small new focus has recently been reported in the Yemen (**Duke, 1972**).

Distribution of Onchocerciasis in Sudan:

Onchocerca volvulus was first reported in Sudan in the south-western province of Bahr El Ghazal and it was called Jur blindness. The disease occur in at least six provinces. The two

major areas are Bahr El Ghazal in south and Abu Hamed in the north. Other focus of onchocerciasis is found in Kassala province in the east. The ecological characteristics of these endemic areas range from Nubian desert in the north through woodland Savannah to more humid forested area of equatoria in the south. Simulium damnosum is able to exist in large rivers and small streams provided that an adequate velocity of water and adequate food supplies are found. In the rainy seasons Simulium damnosum is known to be able to fly up to 300 kilometers for breeding purposes to invade new areas. In the dry seasons it is found near streams where the humidity is maintained **(Manson-Bahr and Apted, 1982).**

Presentation of the disease:

The disease is manifested by the following presentations **(Salih, 1985).**

1. Onchodermatitis.
2. Onchocercal nodules (Onchocercomas)
3. Sowda (localized onchocerciasis)
4. Eye lesions
5. Elephantiasis
6. Hanging groin
7. Onchocercal lymphadenitis
8. Arthropathy
9. Other manifestations

Variation in clinical presentations have been attributed to a number of factors. These include the vector and its biting habits, the intensity of the parasite loads in the skin and the degree of microfilarial destruction (Mackenzie and Williams, 1985).

More recently immunological factors have a certain role in the clinical outcome of the disease. These include immediate and delayed hypersensitivity, immune complexes (Greene et al., 1980) and antibodies (Mackenzie, 1980).

The incubation period of onchocerciasis is not known with any certainty, but microfilariae appear 6-18 months after infection. Nodules are not usually found in children below the age of two, though they have been identified in tissue of neonates (Salih, 1985).

Many individuals are asymptomatic and are only discovered to harbour the infection when they undergo thorough clinical examination. such patients are important as reservoirs for infection (Salih, 1985).

1. Onchodermatitis:

The main symptom is pruritis with a rash composed of numerous, red, small circular and discrete papules 1-3 centimeters in diameter. The pruritic papular skin rashes can be very severe

and confined to one anatomical quarter of the body or in the back in a butterfly distribution. In many patients pruritis persists throughout the whole course of the disease. In the early stage (Fig. 2), there is macular dyspigmentation consisting of hyper-pigmented spots with depigmented centres **(Duke, 1972).**

Depigmentation is often a feature of onchodermatitis. It is usually most pronounced over the legs. The evidence is rather in favour of a toxin derived from microfilariae or adults with a selective action on melanoblasts in areas of predilection **(Browne, 1960).**

In Africa the skin lesions are commonest over the lower limbs but may cover the whole body. In the late stage of the disease, there is thickening of the skin due to subcutaneous oedema and this produces the characteristic peu d'orange effect. It is often associated with lymph gland enlargement, especially in the groins. Later there is a heavy lichenification and thickening of the skin and finally atrophy with loss of elasticity (presbyderma). In these cases microfilariae can readily be demonstrated in the skin, often in enormous number. In Central America gross skin changes are less marked. some patients may show thickened smooth white face giving a leonine appearance **(Manson-Bahr and Apted, 1982).**