

The Skin and
MUSCULOSKELETAL
System



MICROBIOLOGY

SLIDES

SHEET

LECTURE #1- Handout for lecture 1

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DONE BY:

Onchocerca volvulus :

The cause of river blindness. The adult worm is found in subcutaneous tissues surrounded by a fibrous capsule (nodule).

The liberated microfilariae are present in the nodule (2 cm in diameter) and migrate in subcutaneous tissues but are rarely found in the blood and internal organs. Their migration into the eyes is responsible for the morbidity of this disease.

The vector is the black fly.

The worm becomes an adult in < 1 year and lives for 5 years.

Confined to West Africa and tropical America, on the banks of fast flowing rivers which are breeding grounds for the vector fly (2-3 miles on either side). Humans are the only source of infection.

Symptoms and pathology :

Nodules around the adult worm in the subcutaneous tissues gradually undergoing caseation fibrosis and calcification.

Chronic infection may lead to lizard skin.

The microfilariae may migrate to the eye where pathology occurs probably as an allergic reaction, symptoms in the eye resemble those of a foreign body. NB DEC should not be given to patients with eye involvement as this increases the danger of damage to the eye.

Diagnosis :

Clinical e.g. nodules, eosinophilia and ocular signs.

Demonstration of microfilariae in skin snips from nodules, the snips are kept in saline, the motile microfilariae emerge within minutes to 24 hours and can be visualised.

Treatment :

DEC and ivermectin are effective against microfilariae but not the adult. DEC is contraindicated with eye involvement, but ivermectin can be used as its effect on the microfilariae is slow.

Suramin is effective against the adult worm but is toxic.

Surgical removal of accessible nodules effectively removes the worms.

Ivermectin in single dose at intervals of 6-12 months is effective and practical for the control of microfilariae.

Control of the vector is expensive and hence impractical.

Loa Loa (eye worm, Calabar swelling) :

The adult worm inhabits the S/C tissues, the microfilariae appear in the blood and have a diurnal periodicity (day afternoon).

The life span of the worm is 4-17 years.

The vector is a mango fly. The infective larvae become adult worms in 12 months. It is a disease of Equatorial Africa.

Pathology and symptoms :

The parasite usually does not cause a lot of harm to the host.

The adult worm migrates in the s/c tissues and can be found in any site in the body. Allergic reactive swelling (Calabar swelling) that appear spontaneously and last for about one week, anywhere in the body but especially on the hands and around the orbit.

These may reach the size of a hen egg.
High grade eosinophilia is usually present.
The worms may be found in the eye.
Some patients may experience crawling sensation of the worm.

Diagnosis :

Residence in endemic areas, clinical symptoms e.g. calabar swellings and eosinophilia should suggest the diagnosis, it is confirmed by finding microfilariae in blood samples taken in the afternoon.

Treatment :

DEC is effective against worms and microfilariae NB Mazzotti type reaction. Steroids may be necessary for this.

DEC once weekly is effective in preventing the disease.

Control of the vector fly.

Dracunculus medinensis (guinea worm) :

This is an animal parasite that may infect Humans. The adult worm is 50-120 cm long and 1-1.5 mm thick, it inhabits cutaneous and s/c tissues, it has a life span of 12-18 months.

The gravid female migrates to parts of the body likely come in contact with water. The anterior end of the worm produces a nodule in the skin which eventually ulcerates, when the ulcer comes in contact with water the worm discharges its larvae into the water. Wells where people stand in the water.

The larvae are ingested by cyclops which in turn are ingested in drinking water by humans or animals. The larvae penetrate the wall of the GIT and migrate to loose connective tissue where they develop into the adult worm.

Diagnosis :

Local lesion with demonstration of worm or larvae

Treatment :

Flagyl, mebendazole and surgical removal (care is taken not to break the worm to avoid allergic reactions).

Hygiene is useful for control.

Blood and tissue Nematodes :

Filariae :

These are arthropod transmitted parasites of the circulatory, lymphatic systems, muscles and connective tissues. They affect 5-10% of the Earth population.

The filiform worms range from 2-50 cm in length. A distinctive feature is that the female worm gives birth to prelarval microfilariae whose morphology differs according to the species, a microfilaria is slender and has a row of nuclei and may possess a sheath, they do not appear until a few months after infection, they do not develop further until ingested by an insect vector. Their appearance in the blood tends to be periodic according to the species (day or night).

Microfilariae can last in the host for several months.

When ingested by the insect, it develops into an infective filariform larva which is passed into a new host after biting. They are not injected directly into the bite site but are deposited on the skin and then gain entry, thus the mechanism is not very efficient.

Immunology :

The patient may exhibit lymphangitis and with absence of further infection they do not have microfilaraemia, this indicates that there is an immune response that gets rid of the microfilariae.

With continued exposure to filarial infection, there is a suppression of the immune response, microfilaraemia occurs and there is subsiding of the inflammatory reaction (the patient is asymptomatic), indicating a state of tolerance. The exact mechanisms of immunopathology that lead to lymphatic obstruction (reaction to adult worm) in some patients are not fully understood.

There may be high levels of IgE and eosinophilia.

Wuchereria bancrofti (Elephantiasis) :

Adult worm is 8-10 cm long, found in lymphatics. Microfilariae are laid by the worm and are found in the lymph and in the blood especially at night.

The adult worm may live up to 5 years.

Life cycle :

The microfilariae are ingested by the feeding mosquito, develop into infective larvae in muscle and migrate to the proboscis. On a subsequent feed the larvae leave the proboscis and settle on the skin, then they enter through the bite wound i.e. they are not injected directly, they pass to lymphatics and lymph nodes where they mature in about 6 months to produce microfilariae that pass in the blood.

The disease occurs in tropical and subtropical regions, many species of mosquitoes act as vector.

Symptoms and pathology :

Symptoms are caused by the adult worm dead or alive. Granulomatous reaction around the worm in the lymphatics leading to occlusion and narrowing with dilatation of lymphatics :

- 1)- Asymptomatic filariasis : in endemic areas where children are infected at an early age, there is microfilaraemia but little symptoms due to the adult worm. Eventually the adult dies and the infection subsides.
- 2)- Inflammatory disease : there is sensitisation to the adult worm either dead or live with resulting lymphangitis of the extremities mainly the legs, epididymitis and

orchitis. Eosinophilia may be prominent. Yet most of the patients do not have microfilaraemia.

3)- Obstructive disease : this is the exception rather than the rule, < 10% of affected patients progress to elephantiasis, it is due to the fibrosis that follows the inflammatory process.

Diagnosis :

History and clinical findings.

Blood smear obtained at night, visualize actively motile microfilariae. They can be stained with Giemsa stain.

Microfilariae are not found early and in late stages of disease.

Treatment :

Diethylcarbamazine DEC kills microfilariae, but they return albeit to lower levels after 3-6 months. Ivermectin is also effective against microfilariae. No side effects because of slower killing.

NB Mazzotti reaction : fever, arthralgia, adenopathy, headache.

DEC may have an effect on adult worms as well but has to be prolonged.

Surgical intervention may be useful in elephantiasis.

Control of mosquitoes and mass administration of DEC.

Trichinella spiralis :

Small worm 1.5 - 3.5 mm, adult rarely seen, larva has spear-shaped anterior end, there are no eggs laid.

Same animal for intermediate and definite host. Carnivores and omnivores e.g. human, pig, cat, rat, dog and foxes.

Transmitted by eating flesh containing viable encysted larvae.

Life cycle :

Encysted larva are eaten in raw meat, the larva is released in small intestine, burrows into mucosa, matures to adult male or female worms in 24 hours, female ready to lay larvae in 5 days, the male is expelled after fertilization into the lumen and passed out in the faeces.

The laid larvae (no eggs) reach lymphatics and then the blood stream (passes through the hepatic and pulmonary capillaries), and become disseminated to all parts of the body, but they can only develop further in striated muscle, in other tissues they soon disintegrate. They encyst in the muscles (in about 3 weeks) and eventually become calcified in 1/2 to 2 years (larvae remaining viable for years).

They may deposit in lungs, CNS, myocardium, where they may cause symptoms and then disintegrate.

Common in Europe and USA, from eating pig or exotic meat like bear meat. It is becoming less prevalent, due to better control over garbage fed to pigs, but occasionally a pig may eat an infected dead rat (cannibalistic rats perpetuate the infection). Hamburgers adulterated with pork may also cause infection. Absent in Moslems and Jews.

Symptoms :

G.I. diarrhoea, nausea, vomiting (due to adult worms).

Spread through blood may cause malaise, headache and fever (only Helminth to produce fever). There may be allergic manifestations e.g. skin rashes and periorbital oedema.

Myocarditis, pneumonia, meningism and encephalitis. Muscle aches and tenderness, symptoms are usually mild unless there is heavy infestation.

If the dose is massive death can ensue in 2-3 weeks.

Diagnosis:

Eosinophilia may be 40-80%, maximal at 4 weeks then declines. Eosinophils are important in immunity as they kill the larvae with the help of specific antibody IgE and IgG.

Specific IgE develops and useful in diagnosis (agglutination), seroconversion, or increase in titre, the IgE does not last more than one year (i.e. test is not +ve after 1 year) a strong +ve test indicates recent infection. Antibodies may give resistance against re-infection.

Muscle enzymes may be raised CPK, LDH.

The most definite diagnosis is muscle biopsy (in the 3rd to 4th week of infection), N.B. calcified cysts with no surrounding reaction may be old lesions not related to the present condition.

Treatment :

Mebendazole, thiabendazole. Steroids for myocarditis and CNS involvement. Bed rest and symptomatic therapy.

Avoid raw pork, sterilize hog feed, cannibalistic rats may perpetuate transmission (pigs eating dead rats).

Freezing meat to -21 degrees C. for 2-3 weeks kills the larvae.