Human infection with rat lungworm Angiostrongylus cantonensis (Chen, 1935) in West Malaysia

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EOSINOPHILIC MENINGOENCEPHALITIS due to *A. cantonensis* is the result of invasion of the central nervous system in man by the developmental stages of the nematode. The condition has not previously been reported from West Malaysia (Malaya). Watts (1969) reported five cases of eosinophilic meningitis from Sarawak, East Malaysia and suggested the rat lungworm *A. cantonensis* as the cause.

Although suspected by physicians aware of the condition, eosinophilic meningoencephalitis has not so far been reported in West Malaysia. The following case is the first in which eosinophilic meningoencephalitis due to *A. cantonensis* in West Malaysia has been found in man.

Case Report

A 27-year-old Chinese male, a sales representative from Kuala Lumpur, was admitted to hospital on the 7th June, 1971, with a 12-day history of severe headache, fever, backache, generalised muscle pains, weakness of legs (severe enough to prevent walking or standing even for micturition for any length of time) and disturbance of vision. He was seen at one hospital six days earlier and given analgesics for his headache and body pains and discharged after three days without a diagnosis having been made.

On the 22nd May, the patient had a meal of prawns and other shellfish which were lightly scalded together with raw lettuce, tomatoes and other salad greens. Two days later, he developed stomach cramps with pain in the right hypochondrium. Headache and disturbance of vision developed six days later (28th May) with headache, weakness of body and pain in the lower legs. Abdominal cramps and pain in the right hypochondrium persisted.

After consulting a private practitioner, who prescribed analgesics and a sedative, the patient left Kuala Lumpur on the 29th May for Ipoh, about 140 miles away where, on the advice of relatives, he consulted a "Chinese medicine man", who prescribed a mixture of Chinese herbs. On his return to Kuala Lumpur two days later, he again consulted a private practitioner who, suspecting a "virus" condition, advised admission to hospital in view of the persistence of symptoms.

The patient when seen on the 7th June was pyrexial (99.8°F) being able to walk only with the aid of a stick. The chest was clear and he was tender in both loins. Photophobia and marked neck

Kernig's and Brudzinski's signs were positive, the knee and ankle jerks brisk, and the plantar responses were extensor suggesting meningitis. A right facial weakness was noted soon after admission.

Lumbar puncture revealed an opalescent fluid under increased pressure (300 mm. CSF). The cells in the CSF numbered 610/c.mm. (P. 44%, L.25%, E. 31% the sugar was 58 mg.%, chloride (NaCl) 680 mg.%.) Total protein was 145 mg.% with globulin positive. Two larval nematodes, each measuring 517 u long by 10.4 u wide and 713 u long by 10.4 u wide respectively, were recovered in the CSF and seen alive by one of us (J.K.L.). It was identified as the late third stage larvae of *Angiostrongylus cantonensis*. These larval worms corresponded in all respects to the larval stage of *A. cantonensis* at about the fifth post-infective day from the cerebrum of laboratory-bred white rats infected with the third stage infective larvae of the parasite, obtained from land slugs and snails from an oil-palm estate on the outskirts of Kuala Lumpur.

The haemoglobin was 16 gm.%; the ESR was 7mm/hr. The white blood cells numbered 10,200/c.mm. (P.48%, L.19%, M.3%, E.30%). No malaria parasites were found in the blood. The Widal and Weil-Felix reactions were negative. The liver function tests were within normal limits. A rise of gammaglobulins was noted a week after admission. The urine was clear. Three stool examinations by centrifugal concentration using the formalin-ether method were negative for ova or protozoan cysts.

Repeat L.P. on the third day of admission showed an opalescent fluid with a pressure of 250 mm. CSF with total cells numbering 378/c. mm. (L.42%, E.45%). Many Charcot-Leyden crystals were identified in the CSF. No TB organisms were isolated and culture and animal inoculation were negative.

The patient was treated with thiabendazole 1.2 G t.d.s. for a week with a rest for two days followed by another week of the drug at the same dosage. He gradually recovered and was discharged symptom free, two-and-a-half weeks after admission.

On subsequent follow-up about one-and-a-half weeks later (7.7.71) the patient was readmitted as he complained of fever with chills, headache, body aches and numbness of his limbs for one day. On examination, his temperature was 100°F and there was no neck stiffness. Lumbar puncture on the 9.7.71 was as follows:— pressure 170 mm. CSF, fluid slightly cloudy, red blood cells 50, white blood cells 720 (E.> 80%), sugar 67 mg.%, total protein 120 mg.%, globulin positive. His total white blood count was 8,500 (P.61%, L.28%, M.1%, E.10%). The ESR was 6mm./hr.

As his fever and very high CSF eosinophilia was regarded as a reaction to dead or dying larval *A. cantonensis*, the patient was treated symptomatically with analgesics and anti-pyretics. His symptoms cleared quite rapidly, his temperature coming down to normal the day following admission, with discharge five days after admission.

Discussion

A. cantonensis is normally a parasite of rats and has been found in rats in all the Pacific Islands and parts of Southeast Asia and the Far East from which eosinophilic meningoencephalitis has been reported. This lungworm is a common parasite of Malaysian field rats (*Rattus jalorensis* and *R. argentiventer*). Other rats (*R. bowersi, R.r. diardi, R. exulans, R. mulleri*) were also found infected (Lim et al., 1965; Lim and Heyneman, 1965).

The giant African snail *A. fulica* is very susceptible to infection with larvae of *A. cantonensis* (Alicata, 1969; Bisseru and Verghese, 1970). Many species of molluscs, both land and fresh water species, are naturally and can also be experimentally infected with this nematode (Bisseru and Perianan, 1968). Species such as *Pila scututa, Brotia costula* and *Indoplanorbis exustus* which are common in rice fields, streams and lakes in the country have been found to be eaten and are also taken orally for medicinal purposes by certain communities (Lim and Krishnansamy, 1970).

Infection in man with *A. cantonensis* has been reported from Thailand (Punyagupta, 1965; Tangchai et al., 1967), Vietnam (Jindrak and Alicata, 1965), Sumatra, Indonesia (Smit, 1962; 1963) and clinically suspected in the Philippines (Latonio, 1971).

Angiostrongyliasis in man reported from Tahiti has resulted largely from the eating of certain freshwater crustaceans (prawns) which carry the infective larvae of the parasite (Alicata and Brown, 1962). In Saipan, infective larvae of *A. cantonensis* have been found under natural conditions in land crabs and when eaten raw, these crustaceans have caused human infection (Alicata, 1964).

Strong evidence for the aetiological role of *A. cantonensis* causing eosinophilic meningoencephalitis in this case was the finding of larvae in the cerebrospinal fluid. Bisseru (1971) has shown that the same strain of *A. cantonensis* exists throughout West Malaysia and the parasite is very likely the same throughout Southeast Asia.

On epidemiological grounds the incidence of *A. cantonensis* in rats and the consumption of raw

freshwater prawns are significant in human infection, as discussed above. Heyneman and Lim (1967) found that the land slug *Microparmarion malayanus* discharged living third stage larvae on the surface of lettuce leaves which remained alive and infective in slime for as long as 72 hours. Moreover, lettuces in Kuala Lumpur markets were found to be contaminated with *A. cantonensis* larvae at the rate of 2-3 larvae per 50 grams of leaf.

The patient gave a clear history of the consumption of "raw" prawns, other shellfish, raw lettuce, tomatoes and other salad greens, and he was infected by the consumption of the raw vegetables contaminated by larvae and slugs and possibly the "raw" prawns also played a part. Thiabendazole was effective in treatment.

An eosinophilia of the cerebrospinal fluid may be due to parasitic and non-parasitic causes. Meningitis (tuberculosis and other bacteria) and encephalitis are commonly encountered in Malaysia and Southeast Asia. Migrating larvae of *Gnathostoma spinigerum* may invade the central nervous system causing an eosinophilic myelo-encephalitis with widespread paralysis, marked disturbance in consciousness and a high mortality as seen in Thailand (Punyagupta et al., 1968).

In cases of meningitis or meningoencephalitis, eosinophilia of the cerebrospinal fluid is not usually specifically sought for and in consequence, eosinophilic meningoencephalitis or mild cases of the disease can escape detection. The sporadic cases of eosinophilic meningitis at first of unknown aetiology in various Pacific islands drew attention to cerebral angiostrongyliasis in Ponape, Tahiti and New Caledonia (Rosen et al., 1961.).

The use of Leishman stain as a method of carrying out a differential count on the cerebrospinal fluid (Lucas, J.K. and Anniah, J., unpublished) is given as a step towards elucidating cerebrospinal eosinophilia when present. The method is as follows:

(1) The sample of CSF is centrifuged.

(2) Pipette almost the entire supernatant fluid, mixing the deposit with the remaining fluid in the tube.

(3) Place about 3-4 drops of the mixture on a slide and gently spread with a glass rod (or small test tube) to avoid crushing the cells.

(4) The smear is dried slowly, using warm and cold air alternatively from a hair-dryer.

(5) Four drops of Leishman's stain and four drops of distilled water are mixed in a small test tube and gently poured on to the dried smear.

(6) Spread the stain mixture over the smear by either gently tilting the slide or by gentle blowing to prevent the danger of washing away the smear.

(7) After 1 to 2 minutes (particularly, if eosinophils are to be seen clearly and after 3 minutes if all leucocytes are to be identified) rinse the stain away with distilled water using a pipette.

(8) While the smear is still wet apply cover slip; or, gently dry and mount using DePex mounting fluid and coverslip.

Summary

The first case of eosinophilic meningoencephalitis due to *A. cantonensis* is reported in a 27-year-old Chinese from West Malaysia. A history of a diet of "raw" prawns and other shellfish, raw lettuce and other salad greens with symptoms of headache, fever, stiffness of neck and back (meningoencephalitis) and generalised body pains and weakness is considered of importance. The presence of larval stages of the parasite, Charcot-Leyden crystals and high eosinophilia in the CSF was of value in the diagnosis of parasitic eosinophilic meningoencephalitis.

Physicians should consider the infection in the differential diagnosis in suspected cases with eosinophils in the CSF and the dietary history may be of importance.

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