Escherichia coli meningitis and disseminated strongyloides

Sir: Escherichia coli is a rare cause of meningitis in adults, and has a high mortality rate.1-3 It is particularly associated with cranial trauma and neurosurgical procedures,4 but spontaneous cases have been reported in an older age group often with a background of diabetes or alcohol abuse.4 We describe a patient in whom E coli meningitis occurred as a manifestation of disseminated strongyloides.

The patient, a 65 year old Indian man, was transferred to the Neurological Unit for investigation of neck stiffness, pyrexia and drowsiness. Ten days previously he had presented to the referring hospital with a 4 week history of abdominal pain and diarrhoea. No cause for the abdominal symptoms was found despite extensive investigations including sigmoidoscopy and examination of stool for ova and parasites. Two months previously he had complained of severe left temporal headache and had an ESR of 120 mm/1h. Giant cell arteritis was diagnosed on temporal artery biopsy and the patient was commenced on prednisolone, 80 mg daily, to good effect. At the time of his current admission he was taking 30 mg daily. There was no other past history of relevance and he was not on any other medication. The patient had lived in England since 1976, returning briefly to India for a visit in 1983.

On examination the patient was cachectic and had a temperature of 38-5°C. He was unconscious but localised to painful stimuli.

He had marked neck stiffness and positive Kernig’s sign. Cranial nerve examination was normal and pupils reacted equally to light. Tendon reflexes were symmetrical throughout and both plantar responses were flexor. On general examination the pulse rate was 100/minute, he was tachypnoeic with a respiratory rate of 32/minute, and had fine crepitations throughout both lung fields; the abdomen was diffusely tender but there were no palpable masses. Investigations revealed an ESR of 52 and a haemoglobin of 11.3 g/dl with normal indices. The white cell count was 8.9 x 10³/l (90% neutrophils, 7% lymphocytes, 2% monocytes and 1% eosinophils). Blood biochemistry was normal and serum electrolytes were within normal limits. Serum glucose was 4.5 mmol/l. CSF showed 10 cells/mm³, 70% mononuclears, 30% polymorphs, protein 0.4 g/l, sugar 4.1 mmol/l and a normal CSF pressure. CSF cultures were negative. CT scan of the brain and chest were normal.

On admission the patient was treated with chloramphenicol 1g four times daily and cephalexine 2g three times daily. Twenty four hours later when the systemic strongyloides infestation was diagnosed he was started on thiabendazole 1g twice daily. He required oxygen and nasogastric feeding and showed little sign of improvement. Eight days later his level of consciousness deteriorated further and the following day he died. Permission for postmortem examination was refused.

This patient presented with E coli meningitis preceded by a 4 week history of abdominal pain. In retrospect, both these symptoms were attributable to disseminated strongyloides infection which had been activated by steroid therapy. However, this diagnosis was not considered until larvae were found in the sputum, by which time the patient was extremely debilitated and died despite appropriate therapy.

Gram negative meningitis is an unusual infection in adults.1-3 Spontaneous cases present acutely and run an aggressive course.4 E coli meningitis has a high mortality rate ranging from 50% to 90%6-4 particularly in the presence of bacteraemia or coma.4 An association between E coli meningitis and predisposing factors such as diabetes and alcohol abuse is well recognised but the association with strongyloides is emphasised only in parasitology literature.6-10

Strongyloides is one of the major human intestinal nematode infections and is usually caused by Strongyloides stercoralis11 which is endemic in the tropics, sub-tropics and south eastern part of the United States. Humans are the main host and infection is usually acquired from soil contaminated by filariform larvae which penetrate intact skin, enter the blood stream and pass into the lungs. They then ascend to the mouth, are swallowed and reach the small intestine where some larvae burrow into the mucosa.

After moultiing twice they become female and hermaphroditic worms. Eggs are produced by parthenogenesis and transform into larvae which are either excreted or become infective, penetrating the mucous membrane of the bowel or perianal skin and re-entering the same cycle. This primary infection may be asymptomatic or may cause abdominal pain, diarrhoea and occasionally malabsorption.11

The capacity of strongyloides to replicate within the host is extremely rare among helminth infections and is the explanation for two of its most significant characteristics. Firstly, the ability for this infection to persist for many years after the carrier has left the endemic area and secondly, the phenomenon of dissemination (hyperinfection). In chronic strongyloides a balance is reached between the parasite and host whereby worms are restricted in number and confined principally to skin and gut but cannot be eradicated. However, if host defences break down the larvae multiply rapidly, penetrate the intestinal serosa and spread via the blood stream throughout the body. Immunosuppression is well recognised as a cause of disseminated strongyloides.12-14 In a review of 103 patients by Igra Siegman,8 89 were immunocompromised, 67 by therapy and 22 by disease, particularly lymphatic malignancy. Any organ may be attacked by the invading larvae particularly, as in our case, the lungs, causing pulmonary cavitation, consolidation or diffuse infiltration. The presence of blood eosinophilia, often a clue to parasitosis, is frequently absent in disseminated disease15-17 and a low eosinophil count is regarded as an ominous prognostic sign.14 17 18 Invasion of the meninges and brain, sometimes with cerebral abscess formation also occurs.14-19-21 Strongyloides larvae have been isolated from the CSF of two patients with hyperinfection22 and in both of these cases gram negative bacilli were also detected in the CSF. Secondary bacterial infection, par...
particularly with gram negative organisms is a well recognised complication of strongyloidiasis hyperinfection. In the review by Igra-Siegman et al., 4% of cases developed secondary bacterial infection. Eleven percent had gram negative meningitis mainly from *E coli* infection, and all died. This secondary infection appeared to be the result of strongyloidiasis hyperinfection rather than a coincidence of two infections precipitated by immunosuppression, as there was no difference in the incidence of secondary infection between those who were immunocompromised and those who were not. Enteric bacteria are thought to gain access to the subarachnoid space from the blood streams following ulceration of the bowel or they may actually be carried into the meninges by larvae that enter the blood.

Hyperinfection of immunocompromised patients with strongyloides has an 86% mortality rate. The development of secondary bacterial meningitis is almost universally fatal with only two documented survivors. Since the hyperinfection syndrome may be precipitated by immunosuppression, it is imperative that strongyloidiasis be sought by stool examination in anyone with a history of previous residence or travel in an endemic area. Initial stool examination may be negative, as in our patient, and should be repeated periodically during immunosuppressive therapy. Disseminated strongyloidiasis infection should also be considered in all patients presenting with *E coli* meningitis who have been resident or travelled at any time in an endemic area. In our patient, a fatal sequal to steroid therapy might have been prevented by regular stool examination. Increased awareness of this hyperinfection syndrome is necessary if future deaths are to be prevented.

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Extensor tone disinihibition from an infarction within the midline anterior cerebellar lobe

Sir: The regional physiology of the anterior cerebellar lobe (ACL) is unclear in man; small cortical lesions are rare, and precise clinical-anatomical correlations in lower primates are not available for comparison. In classic experiments on whole cats, unilateral vermal cortical lesions produce marked ipsilateral limb, back, and neck extension in association with contralateral limb flexion. Bilateral vermal cortical lesions produce marked extension of all four limbs, extremitopontodiphenia, and a posterior supporting reaction. Midline ACL lesions have ipsilateral cerebellar cortico-vestibular inhibitory efferents to the lateral vestibular nucleus of Deiters, and appear to inhibit ipsilateral muscle tone. The net effects of midline ACL injury in cats sparing deep nuclei are the loss of inhibitory tone upon the ipsilateral vestibulospinal tract neurons within the lateral vestibular nucleus of Deiters, and subsequent disinhibition of extensor muscle tone. Although similar cerebellar cortico-vestibular projections are present in lower primates, precise clinical-anatomical correlations have not been made with small cortical lesions. To our knowledge the following case represents the first reported patient with marked extensor rigidity from an infarction within the vermal and paravermal cortex of the ACL, and suggests that vermal and paravermal cortical neurons also inhibit extensor tone in humans.

A 47 year old woman, in good health, suddenly developed ataxia and headache while doing household chores. Initial examination revealed a pulse of 80 beats per minute, blood pressure 150/80 mm Hg, normal fundi, absence of vascular bruits,