sitivity.¹ We present a case of OMM without symptoms of Whipple's disease and with negative peroral jejunoileal biopsies, which indicates the usefulness of laparotomy for jejunoileal biopsies as an alternative to brain biopsy to confirm Whipple's disease.

A 47 year old woman was admitted in May 1988 in a depressed state. In June 1987 she had noted progressive visual disturbance. Rhythmic elevations of her right upper lip appeared, and later, paroxysmal hypersomnia and considerable weight gain (10 kg). A nine month course of treatment for depression was ineffective and her symptoms and signs progressively deteriorated. Examination on admission showed complete vertical and horizontal ophthalmoplegia with sparing of oculocephalic reflexes (which appeared spontaneously, giving the doll's eyes phenomenon with all movements of the head). Her eyes, face, and proximal part of her limbs were affected by myorhythmia, which consisted of masticatory movements with synchronous adduction of her eyes (convergence) and limbs at about 1 cps. Her soft palate was not involved. Movements also occurred during sleep. Gait disturbance and a slight facial akinesia was noted but no neck rigidity. Her mental state was normal. There was a pseudobulbar type dysarthria but no difficulty in swallowing. No other systemic sign or symptom was recorded; there was no diarrhoea. Her CSF was normal with no PAS positive cells present. EEG, CT, and T1-weighted (DTPA-Gadolinium enhanced) and T2-weighted MRI scans yielded normal results, as did endoscopy and 30 peroral distal and proximal jejunal and ileal biopsies. Erythrocyte sedimentation rate was 35 mm per hour. Schilling's test was 5% (normal range 12–30%), suggesting distal ileal involvement.

A laparotomy was performed and surgical biopsy specimens of the jejunum and mesenteric lymph nodes were taken. Pathological examination showed no jejunal abnormality but PAS positive cells with positive Gram stain in the mesenteric lymph nodes were found, confirming Whipple's disease. Treatment with rifampicin and tetracycline for two months stabilised the disease. Trimethoprim-sulfamethoxazole and chloamphenicol were then given for a further two months. The results of Schilling's test returned to normal but signs and symptoms did not improve. Chloramphenicol had to be withdrawn and was replaced by pefloxacin.

Two and a half years after the onset of treatment there was mild improvement of signs. Masticatory movements remained the same, but the adduction of the eyes had disappeared; the eyes could be displaced to the left and right to 50% and slightly downward but not upward. Unsteadiness of gait, probably due to the supranuclear oculomotor palsy, persisted. Her mental state was largely unaffected (minimal status was 30/30). Her full scale intellectual quotient on the WAIS fell slightly from 92 to 86 then increased to 96 in 1990. An uncontrolled new synchronous movement of flexion extension of the right thigh appeared when she relaxed in bed. Worsening of hypersomnia and appearance of cataplexy required high doses of imipramine which gave partial relief.

Progressive supranuclear palsy is a feature of Steele Richardson Olszewski disease, a degenerative disorder of unknown aetiology and with no known treatment. A supranuclear oculomotor paresis for downgaze is one of the main characteristics of this syndrome, together with axial rigidity and

pseudobulbar palsy. The association of supranuclear gaze paresis with oculomasticatory myorhythmia, however, seems to be pathognomonic of the effects of Whipple's disease on the CNS.^{1,2} This led us to perform surgical jejunal and mesenteric lymph node biopsies rather than a brain biopsy despite negative endoscopic and numerous peroral distal jejunal and ileal biopsies. The normality of the CT and MRI scans also supported this decision.

The possibility of brain involvement without systemic manifestation in Whipple's disease should be kept in mind. This necessitates a search for the disease by endoscopic and peroral jejunoileal biopsies in all patients with unexplained supranuclear oculomotor palsy. Despite two single reports of reversible CNS involvement,^{4,5} however, the treatment of CNS Whipple's disease has so far been disappointing.⁶ The mild improvement in neurological states on pefloxacin was important in our patient but needs further confirmation. Pefloxacin is a quinolone which readily diffuses across the blood-brain barrier (BBB) and is effective against intracellular micro-organisms such as those supposed to be the cause of Whipple's disease. Nevertheless, taking into account the specificity of OMM in the diagnosis of Whipple's disease and the poor efficacy of treatment⁶ were we justified in performing a laparotomy to confirm the diagnosis? We think that this condition needs to be formally recognised and confirmed before embarking on such a long and difficult treatment.

Riggs has suggested that incidental use of antibiotics may eradicate gastrointestinal involvement in presymptomatic Whipple's disease but not the meningeal involvement because of their poor BBB diffusion.⁷ This may explain the apparently isolated and late CNS involvement. Such a hypothesis considers only the infectious mechanism and does not explain the poor effect of some antibiotics which are well able to cross the BBB. Unlike most infectious diseases, there are no established cases of direct transmission of Whipple's disease from one patient to another, no reproduction of the disease in laboratory animals, and no convincingly specific organisms isolated by culture in

vitro.⁸ Whipple's disease is associated with immunodeficiency.⁸ Thus intestinal wall macrophages are ineffective in phagocytosing intracellular gram positive bacilli, resulting in inability to eliminate chronic infection.⁸ This suggests that Whipple's disease may be considered as a disease of macrophages.⁸ The periventricular and periaqueductal distribution of the CNS involvement in Whipple's disease consists of macrophagic infiltration and subependymal nodules. Such a "tumoural" involvement may explain why antibiotics with good BBB diffusion are not effective in this CNS disease.

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Binswanger's clinical and neuropathological criteria for "Binswanger's disease"

Bennett *et al*¹ have made a timely and critical attempt to standardise the diagnostic criteria for "Binswanger's disease". They have based

their suggestions on current English and French literature. It might be of interest to compare these modern criteria to Binswanger's original description,² which had only been available in English in a grossly truncated form.³

The table shows the clinical hallmarks

Table Binswanger's clinical and neuropathological criteria for the diagnosis of "Encephalitis subcorticalis chronica progressiva"²

Clinical criteria: (verbatim from reference 2, page 1184)

the disease begins at the onset of senility (early in the fifties) or in advanced old age (early in the sixties); slow impairment of intellectual capabilities manifesting primarily by the progressive impairment and ultimate loss of the association between cortical sensory and motor areas; most frequently observed are aphasic disturbances (as in the present case), hemianopia or hemiparesis, hemiparesis with loss of the sense of pressure, position or touch; these circumscribed deficits are of a stable character during the fully developed disease and they are combined with the slow and relentless deterioration of intellectual performance; (... until) the patients resemble decerebrate laboratory animals.

Neuropathological criteria: (from reference 2, page 1137)

we find a pronounced atrophy of the hemispheric white matter, either restricted to one or more gyri in one brain area or of several hemispheric regions affected with variable severity; these changes are most clearly found in the area of the occipital and temporal lobes, so that the temporal and occipital horn are widened into bag-like cavities, while the anterior portion of the lateral ventricle shows relatively little enlargement and the frontal white matter is almost unaffected by the disease process. The cortex does not show any remarkable macroscopic change apart from a slight narrowing. Invariably, these cases show severe atheroma of the cerebral arteries.

and the neuropathological findings which Binswanger considered essential to a disease which he called "encephalitis subcorticalis chronica progressiva". These "reliable criteria" were introduced to differentiate "encephalitis subcorticalis" from "arteriosclerotic brain degeneration" (which also affects the cortex), from the "general paralysis of the insane" and from senile dementia, which he knew could also be accompanied by white matter changes.²

The similarities between Bennett's¹ and Binswanger's own criteria are obvious. Nevertheless, several striking discrepancies appear noteworthy. The white matter atrophy in Binswanger's patients was most pronounced in the occipital and temporal lobes, whereas radiological changes are most commonly found in the frontal lobes. According to Binswanger, "encephalitis subcorticalis" slowly and relentlessly progressed to a state of decerebration, whereas Bennett *et al* excluded patients with severe dementia. Binswanger assumed that arteriosclerosis was the cause of disease and mentioned the invariable presence of cerebral arteriosclerosis (which was, however, very mild in the only case he described extensively). He did not describe hypertension or other evidence of systemic vascular disease.

It has already been pointed out that the relationship between Binswanger's findings and the modern "Binswanger's disease" remains open to question.³ Binswanger did not present a full account of the histopathology in his cases. This was left to Alzheimer, who first used the eponym "Binswanger's disease",⁴ and to Nissl.⁵ Inconsistencies in Binswanger's original description may support the speculation that he eventually regarded the differentiation of such vascular dementias as too difficult or too unrewarding.²

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Pseudotumour cerebri and chronic benzene hexachloride (lindane) exposure

Pseudotumour cerebri, the syndrome of idiopathic intracranial hypertension and papilloedema in the absence of a tumour or obstructive hydrocephalus, may be associated with exposure to drugs or toxins.¹⁻⁴ We report a patient, repeatedly exposed to the pesticide benzene hexachloride (lindane), who developed chronic intracranial hypertension.

A 45 year old man (weighing 80 kg) who kept hounds noted fleeting episodes of blurred vision in his right eye usually related

to changes in posture. The blurring became persistent after three months and then he developed intermittent blurring in his left eye. Shortly after he noticed early morning occipital headaches and tinnitus. He had used benzene hexachloride at least twice a month for about 30 years to rid his beagle hounds of fleas and ticks. He said he used a 20% concentrate to make dip and spraying applications but wore a mask and appropriate protective clothing. He was well built but not obese. His neurological examination yielded normal results except for visual findings: his best corrected visual acuity was 6/36 OD and 6/9 OS. He had a right relative afferent pupillary defect. Ocular motility and slit lamp examinations were normal. Intraocular pressures were 21 and 23 mm Hg respectively. Ophthalmoscopic examination showed distinct swollen optic discs with small cups, loss of the nerve fibre layer in the right eye, and a small pseudodrusen in the left eye, typical of chronic papilloedema. Goldmann perimetry showed visual field loss characteristic of chronic papilloedema.

MRI of the head was normal except for a few small periventricular white matter lesions; venous sinus thrombosis was not seen. A spinal tap showed an opening pressure of 400 mm CSF with one monocyte per cu mm, protein 0.34 Gm/l, glucose 2 mmol/l, and no evidence of infection. Other laboratory values were notable only for elevated cholesterol and triglyceride concentrations and mildly abnormal results of liver function tests. Thyroid function tests were normal; rheumatoid factor and antinuclear antibodies were negative. Toxic screens for lead, mercury, and arsenic were negative. Management included dietary advice (weight loss), diuretics, and prednisone, but he subsequently had bilateral optic nerve sheath fenestration because of progressive visual field loss. Ten months after diagnosis his field defects were stable, but his visual acuity remained impaired.

Lindane, a gamma isomer of hexachlorocyclohexane used as a pesticide and an ectoparasiticide, is metabolised by the liver and distributed and stored in depot fat and other lipophilic tissues. It is commonly prescribed topically as a 1% solution for scabies but is available in concentrations of 0.5%-99%; our patient used a 20% veterinary concentration for his dogs. Lindane is a powerful CNS stimulant known to cause headache, nausea, vomiting, diarrhoea, convulsions, muscle spasms, respiratory failure with cyanosis, coma, and death.⁵⁻⁸ "Optic neuritis" after "improper use" of lindane powder has also been reported.⁶ Heuser and Heuser briefly described "pseudotumour cerebri" in a farmer with localised brain oedema, after "prolonged professional inhalation" of lindane,⁹ but the appearance of the optic discs and the spinal fluid pressure were not reported. The mechanism of lindane toxicity is unknown, although it is highly lipid soluble and may act as a gamma-aminobutyric acid-A (GABA-A) receptor antagonist to produce convulsive effects and interference with the production and utilisation of free ammonia in the brain.^{8,9} Chlordecone, a cyclodiene insecticide which also induces seizures, has been implicated in causing pseudotumour cerebri by inhibition of ATPase activity, resulting in impaired resorption of cerebrospinal fluid across the arachnoid villi.² Lindane and chlordecone may have similar effects on the arachnoid villi as they are both lipid soluble, neurotoxic chlorinated hydrocarbons.

Our patient stopped using lindane when the association of pseudotumour cerebri and lindane was brought to his attention; this was coincidentally reinforced when a neighbour's puppies convulsed and died after exposure to a 20% solution. Despite discontinuation of the pesticide the patient's intracranial pressure remained elevated (440 mm CSF) and headaches continued 11 months later when a lumbo-peritoneal shunt was inserted. Removal of the toxin should result in alleviation of increased intracranial pressure. Perhaps the lindane caused permanent or prolonged alteration of the arachnoid villi. Alternatively, lindane may be present in fat cells for an extended period and have a long lasting effect on CSF absorption. Whether the patient's liver damage was caused by previous chronic alcohol consumption or exposure to lindane is unclear. The relation with lindane exposure may not be coincidental because other pesticides have been linked to pseudotumour cerebri in the past.² The use of lindane should be discontinued when patients have unexplained raised intracranial pressure.

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Motor neuron syndrome in the arms after radiation treatment

Radiation myelopathy is a rare but well established complication of radiotherapy leading to diagnostic difficulties with neurological complications of the primary neoplasm, like epididitis or spinal metastasis.¹ We report a rare case of radiation myelopathy presenting as a cervical motor neuron syndrome that developed three years after local radiotherapy in which spinal cord magnetic resonance imaging (MRI) showed a centropinal cystic lesion.

A 44 year old man without relevant history presented with dyspnoea and a rapidly growing cervical anterior mass. We found a mal-