LETTERS TO THE EDITOR

Familial Creutzfeldt-Jakob disease with D178N-129M mutation of PRNP presenting as cerebellar ataxia without insomnia

Fatal familial insomnia (FFI) is a prion disease clinically characterised by progressive insomnia and dysautonomia, and associated with an aspartic acid to asparagine mutation at the codon 178 (D178N) of the prion protein gene (PRNP). This mutation is also associated with familial Creutzfeldt-Jakob disease (CJD). These phenotypes have been held to depend on the polymorphism at the codon 129. FFI and CJD phenotypes are associated with methionine (129M) and valine (129V) polymorphisms, respectively. However, the diverse phenotypes can be associated with D178N-129M genotype. We here report on a Japanese family with D178N-129M genotype presenting cerebellar ataxia without overt insomnia.

The pedigree of this family is depicted in the figure. Patient 1 (I-1), a 50 year old man, a proband, noted an unsteady gait in October 1997 and difficulty in speech in December 1997. These symptoms worsened rapidly. He had no episodes of insomnia, hallucination, or involuntary movement. On admission, he was normal in general condition, well oriented, and cooperative, but slightly restless. The Wechsler adult intelligence scale revised (WAIS-R) score was normal (verbal IQ 108 and performance IQ 95). He showed saccadic ocular movements and nystagmoid movements on lateral gaze. His speech was explosive and scanning. Myoclonus was not evident. The muscle tone and strength were normal. He presented moderate bilateral limb ataxia. He could barely stand and walk on a wide base, and tandem gait was impossible. The deep tendon reflexes were normal in his arms and mildly brisk in his legs without Babinski's sign. Routine examination was normal. Autonomic signs were absent. Routine laboratory and CSF examinations were normal. An EEG showed a background of 9 Hz activities spreading to the anterior regions without periodic synchronous discharges (PSDs). The sleep EEG overnight for 3 days showed a normal sleep pattern in which spindles K complexes, slow activities, and REM sleep were seen. Brain MRI showed mild cerebellar atrophy. Sodium dodecyl sulphate (SDS) polyacrylamide gel electrophoresis (SDS-PAGE) of the whole brain homogenate failed to detect any abnormal bands. The sleep EEG over-427 bp band is too thin to be visible. 427 bp band 129M polymorphism. The 75 bp band is too small to be visible.

The 129V polymorphism was on the same allele in patient 1. The patient's father (II-1), who died of a cerebrovascular disease at 75 years of age, had dementia, and isosthenic myoclonus. Myoclonus developed in patient 1 and three smaller fragments in his child were detected in patient 1 and three smaller fragments in his child, which indicated that patient 1 was heterozygous for 129V and 129M and that his child was homozygous for 129M. The sequencing of PCR products demonstrated that D178N mutation and 129M polymorphism were on the same allele in patient 1.

Pedigree of the family and genotypes. (A) Pedigree of the family. Square, males; circles, females; triangles, either sex; to protect the confidentiality of the family, the sexes of these people are not shown. Filled symbols, affected; shaded symbols, genotype only examined; slashed symbols, deceased; numbers, ages of onset. (B) Tth 111I and Nsp I restriction analyses of the 848 bp open reading frame of PRNP. The Tth 111I non-digested band of 848 bp indicates D178N mutation. The Nsp I 1-nondigested band of 502 bp indicates 129V polymorphism and the 427 bp band 129M polymorphism. The 75 bp band is too thin to be visible.

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Postmalaria neurological syndrome: a case of acute disseminated encephalomyelitis?

We report on a 30 year old woman presenting with neurological dysfunction 8 weeks after complete recovery from Plasmodium falciparum malaria. Magnetic resonance imaging during her illness showed multifocal white matter abnormalities. She made a full recovery.
ery without any specific treatment. Repeat MRI 6 months after her acute illness showed complete resolution of all lesions. Although the term postmalaria neurological syndrome has been used to describe such cases, the clinical and radiological findings are indistinguishable from those seen in acute disseminated encephalomyelitis.

The term postmalaria neurological syndrome (PMNS) was first introduced in 1996. The syndrome has been defined as the acute onset of neurological or neuropsychiatric symptoms in patients recently recovered from *Plasmodium falciparum* malaria who have negative blood films at the time of onset. This therefore distinguishes it from cerebral malaria, which occurs during parasitaemia. The time from eradication of the systemic parasitaemia to the development of this syndrome can be up to 9 weeks (median 4 weeks). The prevalence of PMNS in patients with *Plasmodium falciparum* malaria is 0.12%. PMNS is 300 times more common in patients with severe rather than uncomplicated malaria. The reported clinical features include generalised convulsions, acute confusional state, acute psychosis, and tremor. The range of neurological manifestations of PMNS is probably wider and includes cerebellar ataxia (first reported in 1986), motor aphasia, and generalised myoclonus. Most cases made a complete recovery without specific treatment.

We report a case of PMNS where MRI was performed during and 6 months after the period of acute neurological dysfunction. The similarities between PMNS and acute disseminated encephalomyelitis (ADEM) are discussed.

A 30-year-old woman was admitted to hospital after returning from a holiday in Kenya. She complained of rigors, sore throat, and shortness of breath. On the day of admission she had become jaundiced. She had not taken any malaria prophylaxis before or during the holiday. A blood film showed 29% falciparum malaria parasitaemia. She was treated with intravenous quinine, doxycycline, exchange transfusion, and, subsequently, erythrocytopenia. She remained conscious throughout the acute illness and there was no clinical evidence of cerebral malaria. Her illness was complicated by myocardiitis and transient renal impairment. She was discharged 24 days after admission having made a full clinical recovery.

Two months after discharge she was readmitted. Her partner reported that she had apparently been normal since discharge up until 3 weeks previously. She had become increasingly lethargic and was sleeping for up to 18 hours per day. She had also become agitated, exhibited odd behaviour, and at times experienced language difficulties. Twenty four hours before her admission she had woken up with a severe headache associated with nausea, profound confusion, and inability to recognise her long term partner or her parents.

Initial assessment on admission showed the severe confusion to have largely resolved although she still exhibited inappropriate behaviour and was very apprehensive and restless. Neurological examination disclosed brisk reflexes with no focal neurological deficit. Soon after admission she had a tonic-clonic convulsion. She was treated with phenytoin, intravenous acyclovir, and broad spectrum antibiotics.

Full blood count, blood film, urea and electrolytes, and random blood glucose were normal. Liver function tests showed slightly raised transaminases. A cranial CT showed no significant abnormalities. Examination of the CSF showed 200 x 10^6 white cells (all lymphocytes) and no xanthochromia. Protein in CSF was raised at 1.4 g/l (normal <0.4 g/l). Brain MRI was performed on a 1.5 Tesla Siemens magnetic system. T2 weighted images of the brain showed areas of high signal in the subcortical white matter of the right frontal and posterior portion of the right temporal lobes (figure A). There were also increased signal in the white matter of the left cerebellar hemisphere (figure B). After intravenous gadoLINUM (DTPA) there was contrast enhancement of all areas with white matter signal change (figure C). An EEG showed a large excess of background activity with frequent runs of high voltage rhythmic slow/sharp activity, in keeping with an encephalopathy. Bacterial, viral, and mycobacterial cultures of the CSF and polymerase chain reaction for herpes virus were negative. Autoimmune and vascu- litis screens were also negative.

As there was clinical evidence of improvement after the MRI she was not given steroids. She gradually improved over the next week and was discharged home 14 days after admission with no neurological deficit and with complete resolution of her confusional state.

Neurological assessment 6 months after this admission showed her to be normal. Repeat MRI with intravenous contrast on this occasion showed complete resolution of the abnormal findings.

Changes in MRI in PMNS have been reported to date only once, in a case that responded to steroid treatment. The MRI findings in this patient, as in the case previously reported, suggest a multifocal white matter inflammation. This explains the wide range of neurological manifestations reported so far. The aetiology of PMNS is unclear. In cerebral malaria sequestration of leuko bearing parasitised red cells within the cerebral vessels can result in local ischaemic damage. This mechanism however cannot be implicated in PMNS where, by definition, no parasitised red cells are present. Plasma and CSF concentrations of cytokines (tumour necrosis factor and interleukins 2 and 6) are raised in patients with severe malaria. Tumour necrosis factor has been implicated in neurotoxicity. These cytokines may persist within the circulation even after eradication of the parasites but, more importantly, they can be found in higher concentrations in the serum samples of patients with PMNS compared with concentrations present during the recovery period. The observed time to neurological dysfunction after eradication of the parasite and the reported response to steroid treatment are supportive evidence of an immunological mechanism. There are no reports in the literature of acute disseminated encephalomyelitis (ADEM) in association with the use of quinine, doxycycline, or after erythrocytopenia.

There are some similarities between PMNS and ADEM. ADEM is a multifocal, monophasic, demyelinating disease characteristically occurring 1 to 3 weeks after a viral or, occasionally, bacterial infection or vaccination. Most patients with ADEM make a full recovery. In severe cases corticosteroids can be of help. Brain MRI usually shows widespread lesions in the white matter of the
brain or the spinal cord. Distinction from multiple sclerosis can be difficult at the onset but the clinical history, the course of the disease, the lack of relapses, and the resolution of the lesions on repeat MRI are useful distinguishing features. The similarities between PMNS and ADEM are striking: latency from infection to neurological dysfunction, multifocal neurological deficits, response to steroids, good prognosis, identical MRI findings, and now evidence of complete resolution of such lesions on MRI.

This is the first case report of PMNS showing spontaneous and complete resolution of not only the clinical but also the MRI abnormalities. There are no identifiable clinical or radiological features that can distinguish PMNS from ADEM. Plasmodium falciparum malaria should therefore be added to the list of infections able to precipitate ADEM.

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Trigeminal sensory neuropathy: anatomico-physiological correlation

The widespread use of MRI, allowing accurate localisation of brain lesions, particularly within the brainstem, tends to overshadow the usefulness of electrophysiology in evaluating functional loss. This is the case of the trigeminal sensory neuropathy. The usefulness of electrophysiology in evaluating reversible dysfunction of the trigeminal nerve.

(1) Brain MRI shows hyperintensive lesion (arrow).

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Unilateral eyelid retraction

Two muscles are involved in upper eyelid elevation: the tarsal smooth muscle of Müller that has an accessory role limited to the tonic control of eyelid position, and the levator palpebrae, a skeletal muscle innervated by a subdivision of the oculomotor nerve. The levator palpebrae shares several features with the superior rectus. Both muscles are often activated in conjunction, allowing for eyelid coordination during vertical eye movements, they have common embryological stages, and their motor neurons remain close to each other from the orbit to the mesencephalon. This anatomical parallelism persists at the nuclear level, at least in lateral eyed mammals. In these species, both levator palpebrae and superior rectus nuclei are paired and have crossing axons. However, in higher frontal eyed mammals, levator palpebrae innervation is provided by a single medial
nucleus, the central caudal nucleus, although the crossed pattern of innervation of the superior rectus remains. Anatomical studies have shown that, in most frontal eyed mammals including primates, cell bodies of both levator palpebrae are bilaterally distributed and totally intermixed within the central caudal nucleus. Furthermore, branching axons—that is, levator motor neurons connected with both levator palpebrae, are absent, or extremely rare (2%). Very little is known about the premotor network that controls the central caudal nucleus. A recently identified region in the rostral mesencephalon, medial to the rostral interstitial nucleus of medial longitudinal fasciculus, sends pathways to the central caudal nucleus, and could provide an excitatory signal for the upper eyelid, involved in eyelid coordination. Another structure, the nucleus of the posterior commissure probably provides inhibitory inputs to the central caudal nucleus, as a lesion of this region results in upper eyelid retraction. Each nucleus of the posterior commissure is connected with its contralateral counterpart through the posterior commissure, but does not project directly to the central caudal nucleus. Linkage between the nucleus of the posterior commissure and levator palpebrae motor neurons could be realised in the so called supraculomotor area. This region, located dorsolaterally to the oculomotor nucleus, within the periaqueductal grey, receives nucleus of the posterior commissure afferents and contains dendrites coming from central caudal nucleus cell bodies. However, the exact pattern of connectivity between the nucleus of the posterior commissure and levator palpebrae neurons within the supraculomotor area is unknown.

We here report on a patient with a circumscribed brainstem infarction and a consecutive nuclear oculomotor nerve syndrome with normal ipsilateral eyelid position and motility and contralateral eyelid retraction. This unusual pattern of eyelid dysfunction allows for deductions on supranuclear central caudal nucleus pathways involved in levator palpebrae inhibition.

A 44 year old man was admitted after sudden onset of a left hemiplegia. A cerebral CT showed a right thalamic subcortical haematoma. Neuro-ophthalmological examination showed a right sided oculomotor palsy, with a large 5 mm non-reactive pupil, and a vertical gaze and adduction palsy. However, there was no ptosis: the right eyelid had a normal position in resting condition, and showed upward and downward displacements during attempted vertical eye movements. Abduction was normal. On the left side, there was a tonic downward deviation of the eye that could not be elevated above the horizontal plane, even during vertical oculoccephalic manoeuvres. Downward movements, abduction, and adduction were normal. The pupil was of normal size (2.5 mm) and reactive to light. The eyelid was markedly retracted, a 4 mm band of upper sclera being uncovered in resting conditions (figure A). Manual opening or closure of the right eyelid did not influence lid retraction on the left side.

When the patient was seen on follow up 2 months later, the ocular motor syndrome was unchanged. Written consent was obtained from the patient for photographs. Brain MRI was performed and showed a lesion in the right thalamus and in the right paramedian mesencephalon. At this level, the lesion involved the region of the red nucleus and extended posteriorly towards the sylvian aqueduct but remained anterior to the posterior commissure (figure B).

The clinical features of this patient are consistent with a lesion of the right oculomotor nucleus. Complete elevation palsy on the side contralateral to the lesion is explained by the crossed innervation of the superior rectus. The downward deviation of the eye on the normal side has been previously reported and results from the unopposed action of the intact left inferior rectus muscle. Normal reactivity of the left pupil indicates that the lesion did not reach the unpaired Edinger-Westphal nucleus, located at the rostral pole of the oculomotor nucleus. Therefore, right-sided mydriasis resulted from an involvement of ipsilateral Edinger-Westphal nucleus efferent fibres. Conversely, absence of ptosis on the right side indicates that the central caudal nucleus and its efferent fibres (in the right oculomotor nerve) were intact. Such levator sparing in patients with an oculomotor nucleus lesion has already been reported, and is probably related to the medio-caudal location of the central caudal nucleus. The striking clinical feature of this patient was the existence of a contralateral eyelid retraction without ipsilateral ptosis, a condition that has...
not been previously reported in the context of a stroke. This retraction was unlikely to result from a levator palpebrae overactivation (as it would be expected according to Hering’s law) as it was not influenced by manual elevation of the contralateral lid.1

Various patterns of eyelid disorders may be encountered in patients with focal meningeal lesions. Ptosis may be unilateral when central caudal nucleus efferent fibres are damaged, or bilateral, if the central caudal nucleus itself is involved.1 A bilateral eyelid retraction results from a lesion that involves either the posterior commissure or the nucleus of the posterior commissure itself.1 Lastly, a mixed pattern, the plus-minus lid syndrome, consists in ipsilateral ptosis and contralateral eyelid retraction.1 It is ascribed to a lesion involving both central caudal nucleus efferent (ipsilateral ptosis) and afferent (contralateral eyelid retraction) fibres.2 However, in this latter case, the ipsilateral ptosis could mask an eyelid-retraction.

In summary, it may be inferred from this finding and from anatomical data that the central caudal nucleus receives inhibitory inputs from the contralateral nucleus of the posterior commissure, and that lesion of these pathways leads to contralateral eyelid retraction.

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References


Behçet’s syndrome may present with partial seizures

A 25 year old right handed male shop assistant presented with seizures, visual problems, and malaise. The first symptoms were arthralgia and fatigue shortly followed by a bifrontal headache. A few days later he developed a visual disturbance that he described as peripheral blurred patches in both visual fields similar to the effect of staring into a bright light. About 2 weeks from the onset of symptoms he was driving when he had numerous episodes of deja vu and three episodes of a pungent sickly smell. He then lost consciousness and crashed his car into a public house without serious injury. An off duty nurse witnessed a generalised tonic-clonic seizure at the time. He was admitted to hospital and investigated but no diagnosis was made. The headache stopped completely in a month; the visual defects improved slightly but persisted. Six months later he had a relapse with recurrent headaches, pyrexia, and enlargement of the scotoma in the right eye and he was readmitted. He had had recurrent oral ulceration for 3 years and psoriasis since childhood, but no genital ulceration, red eyes, or venous thrombosis.

On examination he had a low grade pyrexia. General health was otherwise normal with no evidence of pathology at sites of needle pricks, genital ulceration, arthritis, or venous thrombosis. He was oriented with no meningism. Acuity was 6/5, N4.5 bilaterally. Colour vision was normal. In the left eye there was a partial superior scotoma, in the right eye a suprachiasmatic scotoma. Fundoscopy showed specific features of the uveitis of Behçet’s syndrome. This consisted of multiple pale yellow patches of retinal infiltration lying deep to retinal vessels. Eye movements were normal. Pupils were equal and reactive with no afferent pupillary defect. The rest of the cranial nerve examination, gait, and limb examination was normal.

Biochemistry, liver function, thyroid function, coagulation studies, serum electrolytes, serum ACE, B,, folate, and plasma amino acids were all normal. Haematology showed a slight lymphopenia of 1.0 (1.5–4.0) and slightly increased erythrocyte sedimentation rate at 19. Autoantibody profile, RF titre, and syphilis serology were negative; CSF pressure was normal, but analysis was abnormal with 20 white cells (93% lymphocytes, not reactive) and a slightly increased protein of 0.88 g/l, glucose was 3.0 mmol/l (serum 4.2 mmol/l). The CSF had no oligoclonal bands, CSF ACE and cytology were normal. Chest radiography, EEG, transthoracic ECHO, and extracranial magnetic resonance angiography (MRA) were normal. An EEG at presentation showed two small focal T2 hyperintense lesions in the head of the right caudate nucleus and more diffuse signal change in the right mesial temporal lobe, confined within the head and body of the right hippocampus (figure). There was no evidence of venous sinus thrombosis.

A diagnosis of Behçet’s syndrome with neurological complications was made on the basis of typical retinal lesions, multiple focal CNS lesions, recurrent mouth ulceration and a constitutional disturbance. Prednisolone was started at a dose of 40 mg daily, his symptoms rapidly improved and so combination immunosuppression was not used. A second MRI, a year later, showed that the lesions previously seen in the caudate had disappeared and that in the mesial temporal region had undergone a marked reduction in size (figure). There have been no more seizures and he has remained off antiepileptic medication.
Behçet’s syndrome is a multisystem inflammatory disorder of unknown aetiology. It is a disorder of young adults with a male preponderance. There is a striking geographical variation in prevalence. The triad of oral and genital ulceration with hypopyon iritis is classically neurologically involved. The most serious manifestation is the spinal cord lesion. There is no specific laboratory test and so diagnosis is made on clinical features. The International Study Group for Behçet’s syndrome diagnostic criteria are recurrent oral ulceration plus two from recurrent genital ulceration, eye lesions, skin lesions, or positive pathergy test. Strict use of these criteria leads to under-diagnosis and it is accepted, as in this case, that experienced clinicians may make the diagnosis on the more unusual features of the syndrome.

In the British series neuroBehçet’s syndrome usually manifested as a subacute brainstem meningoencephalitis, occasionally with involvement of hemispheres or spinal cord. Brain MRI demonstrates lesions in about three quarters of patients with neuroBehçet’s syndrome.

To our knowledge this is the first report of Behçet’s syndrome presenting with seizures. The phenomenology of the seizure cluster at presentation suggests that the focus was the lesion in the medial temporal lobe identified on the first MRI. As this lesion has regressed by the time of presentation, no recurrence has occurred.

In summary, this case illustrates an unusual neurological complication of Behçet’s syndrome. Diagnosis was made on the basis of a typical posterior uveitis, recurrent mouth ulceration, multiple focal CNS lesions on MRI, and constitutional upset. He presented with complex partial and secondary generalised seizures with a medial temporal lobe lesion on MRI that disappeared 6 months later.

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Morphological abnormalities of hepatic mitochondria in two patients with spinocerebellar ataxia type 7

The dominantly inherited spinocerebellar ataxias (ADCA) are a clinically and genetically heterogeneous group of neurodegenerative disorders characterised by premature neuronal loss in the cerebellum. The cardinal manifestations are ataxia, dysarthria, dysmetria, and intention tremor. These clinical findings are associated with varying degrees of other neurological symptoms due to degeneration of other components of the nervous system. The similarity in the clinical presentation of the ADCA to the mitochondrial cytopathies is widely recognised. Potosis, ophthalmoplegia, pyramidal and extrapyramidal symptoms, optic atrophy, retinopathy, dementia, and peripheral neuropathy may variably occur in both disorders. Patients with an ADCA are therefore often investigated to exclude a mitochondrial disease.

The ADCA are divided into three groups (ADCA I, II, III) on the basis of associated findings. ADCA II is characterised by the presence of a retinopathy. It is caused by mutations (unstable trinucleotide expansion) in the coding region in a single gene, SCA7, on the short arm of chromosome 3. The protein product, ataxin-7, has a nuclear localisation. Clinically, patients with this rare condition present with visual impairment and ataxia, which may be associated with dementia, ophthalmoplegia, spasticity, and extrapyramidal symptoms. We have identified two SCA7 families and report here on the finding of abnormal hepatic mitochondria in the index cases of the two families. This is a hitherto undescribed finding. Patient 1 was a 20 year old black woman who presented with progressive ataxia and visual loss beginning at the age of 16 years. She had severely impaired mental functions, bilateral ptosis with external ophthalmoplegia, bilateral papilloperipapillary and macular degeneration, distal weakness (bilateral foot drop) with depressed reflexes but intact sensation (nerve conductions studies were not done), and abnormal movements including a fixed torticollis to the right with ocular and palatal myoclonus. Brain CT and MRI showed marked cortical, cerebellar, and brainstem atrophy. Routine screens to exclude acquired causes of ataxia and retinal degeneration were carried out. Serum concentrations of pyruvate, lactate, vitamin E, and a fasting lipogram, liver function tests, assays for β-galactosidase, α-galactosidase, sphingomyelinase, β-glucosidase hexosaminidase, long chain fatty acids, copper, and ceruloplasmin were normal. Urine screened for organic amino acids, copper and heavy metals was normal or negative. There were no acanthocytes. Her CSF was normal. Histological examination of skeletal muscle showed no ragged red fibres (with Gomori trichrome stain) and no morphologically abnormal mitochondria on electron microscopy. Results from cytochrome oxidase, NADH-TR, succinic dehydrogenase, oil red O, and PAS stains were normal. Skin, conjunctival, and rectal biopsies were histologically normal and normal on electron microscopy. A liver biopsy was histologically normal. There was no fatty steatosis. On electron microscopy morphological abnormalities of the mitochondria were present. The figure shows the abnormalities of the mitochondria in shape and size. Paracrystalline inclusions, forming so-called parking lot bodies were demonstrated. At least 50% of the mitochondria showed these abnormalities.

Blood samples were screened for the SCA 1, SCA 3/MJD (Machado-Joseph disease), and SCA 7 trinucleotide expansions. Polymerase chain reaction analysis of her DNA showed a SCA 7 CAG repeat length of 81 (normal 7 to 17 repeats). Her mother and two other siblings are affected. They did not have biochemical, histological, or genetic investigations.

Patient 2 was a 23 year old black woman who presented with progressive visual failure. She was ataxic and had bilateral papilloperipapillary and macular degeneration with spasticity and...
bilateral ptosis without ophthalmoplegia. She had clinical depression but had no evidence of a dementia. Brain CT showed marked brainstem and cerebellar atrophy. Investigations were carried out as described in patient 1. All tests, including histological analyses were normal or negative, apart from the hepatic electron microscopy. This showed identical mitochondrial abnormalities. Polymerase chain reaction analysis of her DNA showed a SCA 7 CAG repeat length of 53. Her mother is clinically affected but declined investigations.

The electron microscopical changes identified in the two index cases are widely recognised as indicative of mitochondrial disease. The same abnormalities were identified in skeletal muscle as the prototype tissue involved in the mitochondrial encephalopathies. The failure to identify the abnormalities in the other tissues sampled, especially skeletal muscle, may reflect selection bias. Biochemical and molecular studies have not yet been undertaken.

Abnormal mitochondria (with paracrystalline inclusions) are not present in normal liver tissue but can be seen in various conditions, including alcoholic liver disease, diabetes mellitus, hepatocellular carcinoma, hepatocellular adenoma, Wilson’s disease, and drugs including the oral contraceptive rifampicin, phenobarbital, and steroids. These were all excluded in the two index cases. In terms of neurological diseases, Okamura et al described a patient with congenital oculocerebrorenal myopathy, diarrhoea, deafness, and cardiac abnormalities in whom abnormal mitochondria were found in skeletal muscle as well as in liver cells.

In SCA7, Coeles et al described a family in whom abnormally large mitochondria with intracellular cristae were identified in the skeletal muscle of three affected members. Intramitochondrial inclusion bodies as seen in our patients were not present. Forsgren et al described a large SCA7 pedigree in whom electron microscopy of skeletal muscle in affected people showed uneven distribution of mitochondria, subsarcolemmal accumulations of small rounded mitochondria, areas devoid of mitochondria, and frequent autophagic vacuoles. In a severely affected child in this family, reduced activities of complex IV and to a lesser extent of complex I were to a greater extent of complex I were found. In the above reports, hepatic tissue was not examined.

Ptosis and ophthalmoplegia were present in both our index cases and were also prominent in the affected family members (not described here). These are frequent in the mitochondrial encephalopahties but occur variably in SCA7. Enevoldson et al, in their extensive review of the clinical features of patients with SCA7, describe ptosis as being “quite common”. In the family of Coeles et al, ptosis was a feature of the disease. The external ophthalmoplegia is more uniformly present in cases described in the literature. The patients described here and those described in the literature suggest mitochondrial dysfunction is a feature of SCA7. The protein ataxin-7, however, has a nuclear localisation. In Friedreich’s ataxia, an autosomal recessive triplet repeat disorder with an unstable expansion of the X25 gene on chromosome 9q13-q21.1, the protein product frataxin is a nuclear encoded mitochondrial protein. Mitochondrial dysfunction is therefore implicated in its pathogenesis. Oculopharyngeal muscular dystrophy (OPMD) is an autosomal dominant trinucleotide expansion disorder. Mitochondrial abnormalities have been found in the skeletal muscle of patients with OPMD. The relevance of mitochondrial abnormality, in patients with SCA7 as well as other triplet disorders, is therefore intriguing and requires further investigation.

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Cervical syringomyelia at the C7-C8 level presenting with bilateral scapular winging

Scapular winging is a neurological sign specifically caused by weakness of the serratus anterior, trapezius, or rhomboid muscles.1,2 Trauma, complications of surgery, myopathies, or peripheral nerve diseases are the major causes. We report on a patient with bilateral scapular winging as the presenting symptom of cervical syringomyelia at the C7-C8 spinal cord segments.

This 38 year old carpenter complained of progressive involuntary movements of the right arm associated with arm and shoulder pain for the past 3 years. Involuntary movements were provoked by writing and similar activities. The patient was suspected of having a psychogenic movement disorder. Examination disclosed normal cranial nerve functions, mild hypotrophy of the right arm muscles, bilateral scapular winging of the serratus anterior type, and mild paresis of the left and right serratus anterior and triceps muscles. The left triceps tendon jerk was attenuated, but the remaining deep tendon reflexes of the arms were normal. The knee and ankle jerks were brisk and symmetric. Examination of sensation, including thermesthesia, was normal.

Skilled manual activities involving the right hand such as picking up a pen or holding a cup of coffee stereotypically induced brisk adduction of the right arm combined with pronation of the hand. Rhythmic alternating movements of the normal left hand were regularly interrupted when action dystonia of the right hand began; indeed this suggested psychogenic dystonia.

Electromyographic examinations showed chronic neurogenic changes of both serratus anterior and triceps muscles. Nerve conduction and transcranial magnetic stimulation studies were normal. Median and ulnar nerve somatosensory evoked potentials showed significant attenuation on the left. Laboratory tests and cranial MRI were normal. Cervical MRI showed a small central cord lesion at the level of vertebral body C7, probably cervical syringomyelia (figure), as well as a hindbrain hernia. The patient was followed up for 2 years, and his condition remained stable.

It is generally thought that three spinal roots, C5, C6, and C7, contribute to the long thoracic nerve which supplies the serratus anterior muscle.1,3 Isolated root lesions of C7-Th1 are not a generally accepted reason for prominent weakness of the serratus anterior muscle, but several cases with unilateral scapular winging as the presenting sign for C7 radiculopathy have been published.4 Clinical presentation of this patient was atypical for C7 radiculopathy. With the exception of the triceps muscles, he had no...
clinical involvement of other muscles supplied by the C7 or C8 segments. Lesions of the spinal anterior horns in syringomyelia usually cause amyotrophy that begins in the small muscles of the hands, ascends to the forearms, and ultimately affects muscles of the shoulder girdle. The clinical presentation of our patient with isolated paresis of the serratus anterior and triceps muscles is therefore very unusual. Apart from the intramedullary syrinx at C7/T1, cervical MRI also demonstrated a small hindbrain hernia. Syringomyelia usually arises as a result of an associated anomaly, for example, the Arnold-Chiari malformation; the demonstrated hernia thus may be the aetiology of the syrinx.

Another interesting finding in this patient is the combination of syringomyelia with movement disturbances. Dystonia and other movement disorders in syringomyelia are rare, but have been recorded. Nevertheless, careful clinical examination suggested psychogenic dystonia in this patient.

The present case illustrates that a central lesion such as that of the C7 and C8 spinal cord segments may damage the serratus anterior motor nucleus on both sides and thus may cause bilateral scapular winging thereby mimicking a neuromuscular disorder.

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Focal neuropathy associated with cutaneous necrosis at the site of interferon-β injection for multiple sclerosis

Interferon-β is the first approved treatment for relapsing multiple sclerosis. Although generally well tolerated, it is sometimes associated with cutaneous reactions at the injection site. To decrease local side effects, it has been suggested that injection sites in the belly, the thigh, and the arms are regularly changed. These cutaneous reactions range from slight erythema to necrosis. We report the first monoparesis neuropathy associated with local adverse reaction after interferon-β injection.

A 39 year old woman had a 15 year history of multiple sclerosis, and a 3 year history of secondary progressive phase (EDSS=6). She had been treated for 3 years with subcutane- ous interferon-β 1b (Betaseron®) every other day, when a painful violaceous, livedoid pattern on the skin of the posterior aspect of the right upper arm appeared, at a site of injection at the mid-portion of the humerus. Two days later, a necrotic ulcer (diameter 10 mm, depth 2 mm) occurred. Concomitantly, she experienced tingling on the dorsal aspect of the thumb without motor or reflex abnor- malities. The lesion lasted a month, and the spontaneous ulcer healed in the same time. The sensory dysfunction recovered 10 months after onset. The following laboratory tests were negative or normal: glycaemic tests, antinuclear antibodies, rheumatoid fac- tor, complement fractions, cryoglobulin, thyroid tests, and anticoagulant antibodies.

Radial neuropathy was confirmed by neu- rophysiological testing performed 5 months after the onset. A motor conduction block (>80% reduction of the compound muscle action potential amplitude) was found on the right radial nerve at the level of the injection site related necrosis. In addition, cutaneous thermal thresholds (TSA-2001, Merz, Ramat, Israel) in the right radial nerve territory were significantly higher than the contralateral ones, whereas radial sensory nerve action potential amplitudes were normal and symmetrical (right hand, left 92 µV). Ten months after onset, the conduction block had disappeared and thermal thresholds were normal.

C utaneous necrosis occurred in 1% to 3% of patients treated by interferon-β1b. Necro- sis may be favoured by an inadequate injection technique, not rotating the injection sites, or absence of heating of the diluent before the injection. The cutaneous necrosis associated with interferon-β injection is thought to potentially combine inflammatory and ischaemic local damage. The patho- physiological mechanism of the focal neuropathies can only be hypothetical, but several features of our case suggest an ischaemic mecha- nism. Conduction block in motor nerve fibres is a feature of ischaemic nerve injury. The discrepancy between thermal sensory impairment and normal sensory nerve action potential amplitude is consistent with the higher susceptibility to ischaemia of smaller nerve fibres. Raynaud’s phenomenon has been reported as recenton event as the first evidence of ischaemic lesion induced by interferon-β injection for multiple sclerosis. This led us to avoid recommending some sites of injection, which correspond to the anatomical course of peripheral nerves. These include the posterior aspect of the arm to preserve the radial nerve, the lateral abdominal wall, and close to the anterior superior iliac spine, to preserve the lateral femoral cutaneous nerve, and the posterior aspect of the buttock to preserve the sciatic nerve.

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Treatment with intravenous prednisone and immunoglobulin in a case of progressive encephalomyelitis with rigidity

The progressive encephalomyelitis with rigidity syndrome (PEMRS) is a rare neurological disorder that can be considered as the most severe form of the “stiff person” syndrome although other authors suggest that it may be a distinct entity altogether. Still being clearly defined, but some studies point to humoral immunity as having an important role. Antigliutamic acid decarboxylase (anti-GAD) antibodies have been found to be present in about 40% of cases of the stiff person syndrome. Treatment is very difficult and in the only case reported so far in which intravenous immunoglobulin has been used the response was poor. We report a case of PEMRS with anti-GAD antibodies that had an excellent response to intravenous immuno- globulin.

A 67 year old woman was admitted to our hospital with a 9 month history of progressive gait disturbance and painful back contractions. Family history was negative for neurological disorders. General examination was unre- markable. On neurological examination she showed marked stiffness in her legs and pain- ful spasms; these appeared spontaneously but could also be elicited by external events such as touch, noise, and frightening. The exam- ination was otherwise normal.

Brain and spinal MRI did not show any abnormality. Both needle EMG and nerve conduction were normal except for spontane- ous firing of motor units. Blood tests including vitamin B12 and folie acid, C3, C4, thyroid hormones, antithyrosi- nus antibodies, anti-GAD, and anti-MOP, anti-syphilis serology, and CSF examination were all within normal limits. Anti-GAD autoanti- bodies were positive, both in serum (1/16000 IU) and with histochemistry and 1/16 IU/ml with radioimmunoassay (RIA) and in the CSF (1/40 IU with histochemistry).

For unknown reasons, a week after admis- sion the clinical course changed: the patient seemed to be confused, became disoriented, and her consciousness was clearly impaired. The spasms were more severe and neurologi- cally examination showed bilateral pyramidalism with Babinski’s sign. The clinical picture corresponded to a progressive encephalomyeli- thy. This was confirmed by EEG (generalised slow waves). We started treatment with valproate, gabapentin, and diazepam but lack of improvement led us to try intravenous immunoglobulin (0.5 g/kg twice a day for 3 days and then the same dosage every 2 days) together with intravenous methylprednisolone (80 mg/24 hours). A positive response appeared at the 5th day. After 7 days of treatment she regained normal conscious- ness and did not show any spasms.

However, 6 weeks later the patient pre- sented with gait disturbances again. Anti-GAD autoantibodies were again positive in serum (1/8000 IU) with histochemistry and
We thank Dr F Graus (Hospital Clinic i Provincial, 3º C, 28045 Madrid, Spain) for referring us to this case.}

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The overfitting could have been corrected by multiplying each regression coefficient in the model with a shrinkage factor. This factor can be estimated by a heuristic formula,1 by cross validation, or by a bootstrap resampling procedure. This can be done with the Design library,2 which was already used by the authors. The shrinkage factor is close to unity when there is no overfitting. When the selection of predictors is unstable or predictors have small effects, a lower shrinkage factor might be found—for example, 0.8.

We regret that the model is presented as giving “reasonable accurate predictions of long term survival”, especially because the external validation showed a significant lack of calibration. Correction with a shrinkage factor would have resulted in a recalibration of the probability of survival in the nomogram presented in the paper (fig 3) and in the formula used in a subsequent paper.1

We hope that modern modelling techniques will increasingly be applied in clinical prediction problems such as traumatic brain injury, such that prognostic models are developed that can support the physician in clinical decision making.

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Signorini et al reply: Hukkelhoven et al give a thorough and constructive criticism of the statistical procedures used to construct the model presented in the paper. Their main points of concern regard the effective number of degrees of freedom (df), possible corrections to the apparent overfitting, and the usefulness of the model for individual patients and specific patient subgroups.

It is true that the 6 df present in the final model do not reflect the total uncertainty present in the model, and that some preprocessing of individual predictors was performed to determine appropriate functional forms. The rule of thumb regarding the number of predictor variables which can be assessed in a multivariate model is a guideline, and it should always be remembered that the reason behind it is based on positive findings and hence spurious associations between predictors and outcomes. It is directly analogous to the 5% significance level for hypothesis testing, and we worry that in its increasing prevalence in the literature it is becoming similarly dogmatic. We do not think that we have indulged in any data-dredging to construct these models, and are confident that the false association rate is small. To fully incorporate the overall uncertainty in the final model would perhaps involve methods discussed by Draper,1 with a corresponding increase in the complexity of the modelling process.

The use of shrinkage estimators to prevent overfitting is of course a valuable tool, yet as Hukkelhoven pointed out, there are several options for their calculation and little guidance as to which should be used in a particular circumstance. They are available within the design library used to build our model, but the model validation, as described in the original paper, is achievable using any standard statistical software package. The purpose of the paper was to demonstrate what we think of as a sensible approach, and to go beyond what is possible in standard software would be to dilute that message.

Finally, the model perhaps should not be described as providing “accurate” predictions of long term survival, as the out of sample calibration was not significant at the discrimination point of view, however, the out of sample performance was adequate, and this serves to illustrate that the uses to which a model will be put should play a part in the model building process. Whilst “calibration” (individual predictions) or discrimination (case mix adjustment) is more important can result in different models from the same training set.

One of the most important points of the paper was to stress that there is a lot more to proper statistical model building than clicking the correct menu option in a statistical package. We would hope that this correspondence has emphasised the need for a certain level of statistical knowledge and experience in the analysis of any research data. We agree wholeheartedly with the views expressed in the correspondents’ final paragraph.

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Distinctions between critical illness polyneuropathy and axonal Guillain-Barré syndrome

In this letter we comment on the publication of Yuki and Hirata who postulate a possible relation between critical illness polyneuropathy and axonal Guillain-Barré syndrome.1 The authors mentioned a nosological relation, which at that time still had to be demonstrated by the presence of antineuropathic or antidG1a antibodies in the serum of patients with critical illness polyneuropathy. Critical illness polyneuropathy is a neuromuscular disorder that has been recognised in critically ill patients.2 The clinical picture consists of difficulty in weaning from the artificial respirator, tetraparesis, and muscle wasting of the limbs. The tendon reflexes are mostly decreased or absent. An electrophysiological examination shows an axonal polyneuropathy and sometimes myopathic altered motor unit potentials. The morphological features in the nerve point to a primarily distal axonal degeneration of motor and sensory fibres. Muscle biopsy shows scattered atrophic fibres in acute denervation and grouped atrophy in chronic denervation. Also, necrotic muscle fibres can be found suggesting the contribution of a myopathy or a primary myopathy.

On clinical and electrodiagnostic grounds neuromuscular complications in the critically ill patients may be due to a polyneuropathy or myopathy. Because it is not always possible to differentiate between an axonal motor neuropathy and myopathy, we prefer to use the descriptive term critical illness polyneuropathy and myopathy (CIPNM).

To test the hypothesis of Yuki and Hirata we studied the serum of eight patients obtained during the acute phase of CIPNM and from two controls, who were tested for GM1 and IgG reactivity against gangliosides GM1 and GD1a. In none of these samples could any reactivity be detected. Therefore, it is unlikely that in these Dutch patients with CIPNM, axonal damage is mediated through anti-GM1 or anti-GD1a antibodies as was suggested by the authors.

To distinguish CIPNM from the acute motor axonal variant of Guillain-Barré syndrome the following characteristics may be useful: Guillain-Barré syndrome is the primary neurological reason of admission on the intensive care unit; CIPNM on the other hand develops during a patient’s stay on the intensive care unit for another reason.

Infectious symptoms such as fever and diarrhoea have usually subsided before the clinical features of Guillain-Barré syndrome appear.

The characteristic alterations in the CSF of patients with Guillain-Barré syndrome, with a raised protein and normal to slightly increased cell count.

The possibility of detecting IgG antibodies against GM1, GM1b, GD1a, and Ga1Nac-GD1a as immunological markers in the serum of patients with axonal Guillain-Barré syndrome.

Electrodiagnostic changes in Guillain-Barré syndrome occur in both sensory and motor nerves in about 80% of the patients in the western world. In CIPNM there is a predominantly motor dysfunction in both the clinical and electrodiagnostic evaluations.

During the progression of Guillain-Barré syndrome the demyelinating features of the nerve conduction study may change into a secondary axonal pattern. In axonal Guillain-Barré syndrome slow nerve conduction velocity remains in some patients and the initial needle EMG study lacks spontaneous activity.1 In CIPNM phrenic nerve conduction studies usually show no significantly prolonged latencies.3

Severe autonomic disturbances are more common in patients with Guillain-Barré syndrome after the polyneuropathy has developed than in patients with CIPNM.1

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New hope for patients with pure lower motor neuron syndromes

Readers of the editorial by Wokke and van den Berg may be left with the impression that the immunoglobulins could provide hope for the future for patients with pure lower motor neuron disease. Their evaluation of the results obtained by Ellis et al in four of the total series of 10 patients may tend towards overoptimism, however.

We agree with their second conclusion regarding the criteria for referring this subgroup of patients with lower motor neuron disease to a highly specialized centre for further analysis. However, we would recommend referral for all patients with motor neuron disease, especially in cases in the initial stages or in atypical forms, in which the diagnosis may be difficult if strict criteria are applied, given the complexity and multidisciplinary management of this condition and the difficulty of the decision regarding when and to whom pharmacological and life sustaining therapy should be applied.

Great care must be taken to avoid misdiagnosis in the selection of candidates for therapy, as the high cost of long term treatment does not justify indiscriminate immunoglobulin use. A critical reading of the work of Ellis et al shows that only three of the 20 patients treated presented an objective improvement in the pinch and grip myometria and no statistically significant modification in the MRC scale or significant objective improvement in the paired t test (P<0.05).

Finally, of the 10 patients with lower motor neuron syndrome included in the assay, there were four cases of amyotrophic lateral sclerosis (ALS), one case of spinal muscular atrophy (SMA), one doubtful case of multifocal motor neuropathy (MMN), and four probable cases of multiple motor neuron syndromes. J Neurol Neurosurg Psychiatry 1999;67:13-19.


BOOK REVIEWS


This is a handsome and liberally illustrated guide to the use of intra and frozen section diagnosis in neuropathology. This aspect of practice remains a central part of a clinical neuropathologist’s role and this book can be recommended to trainees and practitioners for its wealth of illustration and practically oriented text. It is particularly useful to see a wide range of appearances for each tumour illustrated—for example, 20 figures illustrating metastatic tumours, 13 illustrating pituitary adenomas, and 38 illustrating various grades of astrocytic tumours. This enables the less readily diagnosed examples to be considered as well as more typical varieties. Typical varieties tend to be the only ones illustrated in a less specialised text. There are flawed regarding the role played by immune mechanisms in motor neuron diseases.1

Another point about which we have our reservations is that it cannot be affirmed that the non-introduction of this treatment leaves the patients at the mercy of the disease’s natural course. The problem lies in the difficulty in diagnosing these patients, especially those who present neither conduction block nor anti-GM1 antianglioside antibodies. As we have previously stated, the final diagnosis in 50% was ALS or SMA. Given these results, it seems more reasonable to persist with differential diagnosis by magnetic resonance neurography and repetition of neurophysiological examinations, including magnetic transcutaneous stimulation.

Patients with motor neuron disease and their relatives, who have been anxiously waiting for a breakthrough in treatment, have been disappointed time and again in recent years by promises regarding therapies that have been both expensive and of little use. It can only be hoped that the immunoglobulins will improve this situation, and that our scepticism is mistaken.

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18 chapters that cover each of the main types of tumour encountered as well as providing advice on making and interpreting smears and dealing with lesions that do not smear well. The emphasis is on using smears as standard preparations with frozen sections as back up when required—a procedure that is probably adopted in most neuropathology departments.

The success of a book like this depends crucially on the quality of the photographs. These are, appropriately, all in colour. Many are of excellent quality. Some are intentionally obscure—for example, to make the point that desmoplastic carcinomas may be too tough to examine in smears (fig 18.1). A few have rather poorly defined features and these tend to be illustrations of frozen sections which inevitably lack the crispness of smears. However, even these illustrate the points intended. The legends to the figures are full enough to avoid the need for arrows that might otherwise have obscured the images. There is a useful index, but the book would have benefited from more references—I found only six.

Smear diagnosis is best learnt by doing it, with a sympathetic, experienced colleague at one’s elbow. Often this condition cannot be fulfilled and I would strongly recommend this book as a very valuable alternative or adjunct.

MARGARET ESIRI


This book presents the normal anatomy of the brain as seen on MRI studies in a very didactic, well presented, and novel manner. Images are well chosen, and are of high quality. The authors also attempt to relate some of the anatomical structures to their functions and damage of relevant areas to disease processes. The book reflects the hard work and dedication of the authors in pursuing a good radiological-anatomical correlation, something which although being crucial for neuro-radiology, is sometimes forgotten or taken for granted.

The book is divided in 19 chapters, 18 of them covering different anatomical regions of the brain. The last chapter presents some anatomical variants, as well as pitfalls on MRI, which should not be confounded with real lesions. In general, the book will be useful for the training neuroradiologist, and also for all of us dealing with neuroradiology and MRI and having to exercise our anatomical knowledge on a daily basis! Although the authors base the book’s structure on classic anatomy, sometimes putting too much emphasis on anatomical classifications that may not be too useful for neuroradiologists nowadays, it results quite enjoyable, easy to read, and a useful teaching tool to have.

Those chapters dealing with the vascular anatomy on MRA are specially useful, in my opinion, since MRA is playing an increasingly more important role in neuroradiology, replacing conventional angiography for many clinical indications.

BEATRIZ GOMEZ-ANSON

Everything you need to know about Old Age Psychiatry. Edited by ROBERT HOWARD (Pp 292, £45.00) Published by Wrightson Biomedical Publishing, Petersfield, 1999. ISBN 871816 38 6.

There is a bewildering and almost paralysing amount of information currently aimed at the clinician. The number of journals available seems to increase exponentially often with “evidence based” or continuing professional development in their titles, to impress themselves upon you. Many evenings can be wasted surfing websites purporting to be a valuable source of information for the clinician.

Is there room for such a book as this? I would envisage that a wide range of health professionals would find a place in the clinic as a practical pocket guide. The authors are members certainly have the expertise and their grasp of the subject matter is comprehensive. Gerantologists, neurologists, and psychiatrists all have a part to play in the medical management; while the contribution of neuropsychology, a non-medical discipline, cannot be underestimated. Consequently books which offer a comprehensive patient oriented clinical approach to the subject can be hard to find.

The Dementia Research Group of which the authors are members certainly have the credentials to effect such a synthesis and this book manages to provide a brief but useful synopsis spanning the various fields as well as some areas (for example, support services) usually absent from any medical text. Recent developments in diagnosis and treatment of the dementias have made past algorithms obsolete; especially diagnostic, where the philosophy of the “standard” CAT, thyroid and B 12 assays, and a syphilis test was to exclude rather than establish a diagnosis. In this sense the book is also timely with handy summaries of major categories as well as rare causes of dementia. There are also useful prescribing guidelines for the new antidepamnent drugs.

In attempting to squeeze such a comprehensive checklist into a small space there is the risk of becoming feckless. Thus we learn in the “blood tests” section that HIV testing is indicated “in suspected HIV infection”. Likewise such brevity may become overly dogmatic: the reader is advised that echo-cardiography (oddly listed as a neurophysiological test) should be performed in suspected vascular dementia. But these are only pedantic criticisms for a book which should find a place in the clinic as a practical pocket reference.

PETER NESTOR


This book is a clear concise and up to date account of current management of Alzheimer’s disease. The reader is led through the diagnosis and management of Alzheimer’s disease in a readable, well structured, and well presented way. As such, I would envisage that a wide range of health professionals, who have frequent contact with Alzheimer’s disease sufferers, including general practitioners, general physicians, geriatricians, specialist nurses, and neurologists, would find this new edition extremely useful.

The text is divided into several sections, from the initial chapter on definitions and diagnostic criteria, to the diagnosis of Alzheimer’s disease and differential diagnosis, the evolution of the disease, medical and social management, and finally ethical and legal issues. The perspective throughout the book is practical, helpful, and informative. For example, the chapter on typical clinical features is full of tables illustrating the symptomatology of the disease. The chapters on structural and functional neuroimaging contain many good quality illustrations and there are also interesting chapters on behavioural problems and functional autonomy. However, perhaps the best section is that on medical management. The confusing issues of the current state of play of drug therapies in Alzheimer’s disease are clearly reviewed in a well structured way dealing with symptomatic, stabilisation, and preventative strategies. The social and psychological aspects of the disease are not ignored and the chapters on competence, support of the families, and community services are vital to the comprehensive review of management this book provides.

With the recent explosion in Alzheimer’s disease research, the editors may find that there will be need for frequent new editions. However at present, the wide appeal of this book is guaranteed by the excellent coverage of the clinical and management issues in Alzheimer’s disease.

CLARE GALTON


Clinically, dementia is an unusual area in that it cannot be pigeon holed into any single specialisation. Gerontologists, neurologists, and psychiatrists all have a part to play in the medical management; while the contribution of neuropsychology, a non-medical discipline, cannot be underestimated. Consequently books which offer a comprehensive patient oriented clinical approach to the subject can be hard to find.

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