examination unremarkable except for some skin changes in the previously irradiated area.

Chest *x* ray and bone scan were normal. Myelography revealed minor posterior protrusion of L5/S1 disc on flexion of the back. Cerebrospinal fluid contained normal cellular constituents but elevated protein at 0·8 g/litre. Motor conduction velocities in left posterior tibial and both lateral popliteal nerves were normal as were sensory conduction velocities in superficial peroneal nerves. Electromyography of left gastrocnemius and peroneus longus revealed fasciculations, complex repetitive discharges and positive sharp waves with reduced voluntary activity suggesting denervation in the territory of L5 and S1 myotomes. Surface electromyography showed profuse fasciculations in the legs below the knee bilaterally, fewer in the right upper leg and none in the left upper leg or arms.

By June 1990 movements of both feet were weaker and fasciculations were also visible in the hamstrings bilaterally. Both ankle jerks were absent. Nerve conduction studies again showed normal motor and sensory conduction times and amplitudes in the upper and lower limbs. Proximal conduction assessed by F-waves was also normal. Central motor conduction time measured by magnetic cortical stimulation was normal in both upper and lower limbs. Electromyography from right tibialis anterior showed fasciculations, motor units of prolonged duration and high amplitude, and a discrete interference pattern. Electromyography from the right vastus lateralis showed fasciculations, recurrent trains of motor unit potentials, some large motor unit potentials and a moderate interference pattern. Electromyography of the arms was normal. Motor unit counting revealed reduction in number and increase in size of motor units from the extensor digitorum brevis bilaterally, consistent with anterior horn cell loss.

Following lumbar field irradiation a slowly evolving painless amyotrophy may develop, with lower motor neuron paresis and absent or depressed tendon reflexes.[3] Fasciculation of affected muscles is variable, but absence of pain or sensory signs and normal sensory nerve conduction velocities are characteristic. Myokymic discharges on electromyography are also a typical feature.[4]

In this case the onset of symptoms was 23 years following radiotherapy. Despite this, the characteristic clinical picture and electrophysiological evidence favour x-irradiation as the cause. Lumbar root infiltration may be excluded by the absence of pain and sensory features, the very slow rate of deterioration and normal radiographic studies whilst the localisation of abnormalities to the irradiated area of the nervous system distinguishes this condition from amyotrophic lateral sclerosis.

The development of radiation-induced neuropathy is only partially dependent on radiation dose and fractionation, and there is marked individual variation in susceptibility. Nothing is known of the factors influencing the latency of the onset of symptoms, and once established the disease is often slowly progressive, though some patients appear to stabilise.[5] The electromyographic features place the likely site of the lesion at the anterior horn cell or most proximal parts of the lower motor neuron.[6] The development of purely lower motor neuron damage after irradiation of the entire neuraxis of some patients[1] demonstrates the particular vulnerability of these cells to radiation-induced damage. Primary injury to the highly metabolically active anterior horn cell body is a possible pathology, and lumbosacral motor neurons with their very long axonal processes may be particularly susceptible.

This case illustrates that the latent period before the onset of radiation-induced lower motor neuron damage may be more prolonged than previously realised. The delay before symptoms become manifest suggests that the direct effects of radiation may become lethal to neurons only with the additive effects of cellular ageing. Vascular endothelium is very sensitive to injury from ionising radiation and ischaemic damage from radiation-induced microvascular disease is an alternative possible cause of delayed neuronal injury.

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Delusions and cyclosporine toxicity

Since the introduction of cyclosporine there have been a small number of case reports of side effects that might be attributed to some action on the cerebral grey matter. These have included myoclonus and epilepsy but also incidents suggesting much more complex cortical activation. One incident report featured complex visual hallucinations[1] and referred to three previous examples. Other examples have included cortical blindness,[2] hemiplegia and focal convulsions,[3] prolonged confusion of possible epileptic origin[4] and complex movement disorders, akinetic mutism and dysphasia.[5] These often occurred with cyclosporine levels within the therapeutic range. Delusions have not previously been reported and we describe a case in which we believe cyclosporine was responsible.

A 63 year old man with a history of treated hypertension from 1979 had a myocardial infarction complicated by a left ventricular aneurysm and cardiac failure in 1981. In the early months of 1991 he had episodes of intermittent mild confusion and bifrontal headaches. These were felt to be related to low cardiac output related to his now end stage heart failure and he received cardiac transplantation in May 1991 at which he was started on prednisolone, azathioprine (10 mg daily) and cyclosporine (initially given intravenously but changed postoperatively to 3 mg/Kg/day orally, a low dose being used because of his slightly impaired renal function), nystatin, ranitidine, thiamine and aspirin. There was some early post operative confusion without localising features which progressively increased. A CT brain scan one month postoperatively showed deep white matter changes and a small left parietal infarct. Two days after this he began to have episodes of dysphasia and right sided weakness lasting from 30 minutes to several hours with full recovery between episodes. He was transferred to Charing Cross Hospital for further assessment. On arrival he was unresponsive and exhibited version of head and eyes to the right with shaking of the right arm and facial grimacing. He was treated with intravenous diazepam which abolished his focal fitting, allowing him to recover consciousness and speak when he was immediately orientated, able to give his name, the place and date of cardiac transplantation and obey three step commands. There were no focal neurological signs. The cyclosporine dose was reduced to 2 mg/Kg, he was given a phenytoin load and the diazepam maintained as an infusion for 18 hours. Carbamazepine was introduced 12 hours after admission because of persisting focal fitting.

Full blood count revealed a haemoglobin of 11·0 g/dl with normal indices, a white count of 11·8 $\times$ 10^9/l and a platelet count of 273 $\times$ 10^9/l. Biochemical evaluation showed normal sodium, potassium and glucose, a urea of 9·9 mmol/l, creatinine 145 μmol/l, bilirubin 1·3 μmol/l and alkaline phosphatase 276 U/l but urate, proteins, aspartate aminotransferase, calcium and phosphate were all normal. Magnesium in serum was 0·74 mmol/l and in red cells 2·21 mmol/l (normal range in red cells 1·8 to 2·7 mmol/l). The CSF contained no cells, a protein of 0·5 g/l and glucose of 4·8 mmol/l. Repeat CT scan revealed no new abnormalities. Serum cyclosporine levels were 59 ng/ml on admission and 105 ng/ml three days later (therapeutic range 75–150 ng/ml in serum) despite the dose reduction.

As the focal fitting abated at 24 hours post admission frequent bilateral myoclonic jerks became apparent which persisted for a day after the fitting ceased. At this stage his higher intracranial functions were rapidly returning to normal except for the development of a delusion. This was very clearly described and accurately repeated on requestioning days later. On first hearing it the clarity of the description was such that it was believed for several minutes. He reported that a piece of a cork ceiling tile had fallen into his open mouth while lying on his back on a trolley on the way to the CT scanner. The cork had lodged behind one of his vocal cords and had caused a sore throat and explained the difficulty he had had with speech. He felt that his throat was still uncomfortable and that it should be examined for the cork. This delusion persisted for many days but abated with maintenance of his cyclosporine at the lower dose. On follow up one month later he recalled the delusions

but now reported that while they still seemed real he realised that they were not. At this stage the dose of cyclosporine had been returned to 6·5 mg/Kg/day orally, the higher dose being made necessary by his oral anticonvulsants.[6]

Our patient had prolonged confusion, intermittent hemiparesis and dysphasia, focal epilepsy and myoclonic jerks all of which are consistent with a cyclosporine encephalopathy. No metabolic cause could be demonstrated. The deep white matter changes on CT scanning would not explain any of his events and it is unlikely that the focal left parietal lesion was responsible for the fits, intermittent focal hemiparesis or dysphasia. It was incorrectly sited and seemed old on CT scan, a suggestion supported by the lack of evolution between the two scans. The delusions responded to a reduction in cyclosporine dose and in the context of his other neurological deficits, all of them compatible with cyclosporine neurotoxicity, we feel that the delusions had the same aetiology. The levels of cyclosporine, lying within the normal therapeutic levels, would be in accordance with recent reports that have also demonstrated neurological complications of cyclosporine levels within the normal range, a phenomenon which may be attributable to the toxic agent being a metabolite[4] rather than cyclosporine itself. The course of events would support the observation that these complications are reversible and that it is safe to reintroduce cyclosporine at a lower dose. We feel that physicians should be alerted to the concept that neurological disturbances may arise without any apparent close relationship to the levels of cyclosporine itself and that the drug should be suspected whenever unusual neurological symptoms arise in patients taking it if there is no other reasonable explanation.

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BOOK REVIEWS

Diseases of the Nervous System. 2nd Edition. Clinical Neurobiology. (Two vol. Set). Edited by A K ASBURY, G M MCKHANN and W I MCDONALD (Pp Vol 1 848, Vol 2 1619; Price: (Set) £151.00, $250.00). 1992. London, WB Saunders Co. ISBN Vol 1 0 7216 3209 2, Vol 2 0 7216 3211 4, 2 Volume Set 0 7216 3208 4.

The many computer driven data retrieval systems that are now available have given easy access to a previously unthinkably large body of medical literature. It is not therefore surprising that many have challenged the contemporary role of the large textbook in any specialty. The last three years has nonetheless seen published several new texts and new editions, many in two volumes and of a size not at all friendly to those who read in bed.

This 2nd edition contains 123 sections, each with several chapters, the whole filling 1600 pages. The preface attempts a self-justification by emphasising the importance of the neurobiological approach—"bridging the gap between basic neuroscience and clinical neurology". To this end most sections have a valuable preamble devoted to basic mechanisms.

The authors have been well chosen from heavyweights on both sides of the Atlantic; their authority is evident. The plan and access to the contents is odd. I sought in vain for spinal tumours in sections on both neoplastic disease and spinal cord; nor does it figure in the index under spinal or tumour. Subacute combined degeneration does not appear in the index.

The text is up to date, with good selected references. There are accounts of topical problems, with outstanding contributions: Immunosuppressive therapy (Steinman), Parkinsons disease (Fahn), Head injury (Jennett), and Prion diseases (Baringer). Certain chapters, for instance some of those on Neurologic manifestations of systemic disease, and Environmental disorders, appear to be included more for the sake of completeness than for interest or explanation. They are of limited help to the reader, and in many such sections the vital issue of treatment is neglected.

The general standard is high with a wealth of quality tables, classifications, illustrations and radiographs. The editors have achieved a satisfactory uniformity of style, which if a touch impersonal, compares well with its recent competitors, though inevitably a modern fact-laden text does not bear comparison with the literary standards of FMR Walshe.

Asbury and his colleagues have given us a comprehensive corpus of information, generally authoritative and certainly educational. When trying to remedy factual ignorance, or when starting a search of the literature, it is often easier to pick a volume from the office bookshelf than to be showered by paper print-outs from the library computer.

JMS PEARCE

Textbook of Clinical Neuropharmacology and Therapeutics. 2nd Edition. Edited by H L KLAWANS C G GOETZ and C M TANNER (Pp 666; Price: $124.00). 1991. New York, Raven Press. ISBN 0 88167 797 3.

Clinical neuropharmacology and therapeutics is today an area of major clinical importance. This book steps into a significant void. Does it satisfactorily fill it?

The second edition has 53 contributors (including 18 from Chicago and only 2 from outside the US) writing 48 chapters. Ten of these are written by the editors.

Some chapters are long and scholarly dissertations, others succinct practical therapeutic essays. Migraine attracts 15 pages and 51 references, but Myotonia 27 pages and 176 references! Only 85 of the 2420 references are post-1989, but this seems to be par for the course, and the most recent references are not necessarily always the best.

The book starts with 2 excellent chapters by Irwin and Nutt on the principles of neuropharmacology. The ensuing four chapters on convulsive disorders provide extensive coverage of the field, but the degree of overlap is surprising since one author contributed to all four. Most of the chapters contributed by the editors are excellent, but the one on Huntington's chorea is rather dated. The chapter on Wilson's disease is a gem. Even if one does not agree with everything it says, the didactic chapter on therapy of acute stroke by Estol and Caplan is excellent, as is Bennett's chapter on dementia. The chapter on Acute Bacterial Meningitis is not user-friendly to any resident in the middle of the night, and is sorely in need of an algorithm or flow chart or at the very least a table or two. I was surprised to read in the chapter on Viral Infections that "biopsy remains an important test to make the diagnosis" of herpes simplex encephalitis.

A number of drugs are not mentioned, principally because they are not available in America. There is no mention of the methyl prednisolone trial in Guillain-Barré syndrome.

This book does help to fill a void, but inadequately. In trying to be a comprehensive textbook (its main ambition) it generally succeeds well, but patchily. It is currently the best available offering in the field. Libraries should and will buy it but individuals probably won't because of its high price. However, what the market still also needs is a softback guide a third the length and a quarter the price.

NP QUINN

The Spine. Third Edition Vols. 1 and 2. Founding Editors: R H ROTHMAN and F A SIMEONE (Pp Vol.1 1–970, Vol.2 971–1996; Price: £150.00, Illustrated). 1992. London, W B Saunders & Co. ISBN Vol.1 0-7216-4036-2, Vol.2 0-7216-4037-0, 2 Vol. Set 0-7216-3203-3.

"The Spine" has been prepared under the direction of six consulting editors, all orthopaedic surgeons. There are over one hundred authors of whom about 70% are orthopaedic