Ischaemic stroke in chagasic patients

We read with interest the paper by Carod-Artal et al. that showed the relevance of Chagas’ disease as a stroke risk factor in patients of South American origin. They also confirmed a textbook view (not hitherto demonstrated) that cardioembolism is the main cause of stroke in Chagas’ disease, in 52% of cases. This reflects in part the underlying chagasic cardiomyopathy, characterised by congestive heart failure and arrhythmias, present in 46% of chagasic patients as compared with 25% of non-chagasic patients.

Despite the lack of comparison of stroke characteristics between both groups, one very interesting finding was the significant percentage of chagasic patients who developed stroke without any known vascular risk factors or cardioopathy. As the authors stated, undetected cardiovascular disease could account for at least part of this finding. The indeterminate form of the disease is defined by the presence of infection confirmed by serological tests, in the absence of symptoms or of electrocardiographic or radiological abnormalities. Twenty five % of subjects with the indeterminate form of the disease may present mild and constant structural and/or functional abnormalities when they are fully evaluated by more sensitive methods, such as ergometry and autonomic tests.

Another possible explanation proposed by the authors would be the vasculitis phenomenon. Although there is good experimental evidence to suggest that changes in the microvasculature may contribute to chagasic heart disease, much less is known about the possible involvement of central nervous system microvascularization in Chagas’ disease. Indeed, most studies point to an important role for endothelin in the pathogenesis of microvascular changes in the chagasic heart,[4 5] but we are unaware of any similar studies of the central nervous system.

The authors also suggest the need for primary prevention in all patients with Chagas’ disease cardiomyopathy. This is a strong recommendation, as most chagasic patients derive from poor social economic backgrounds and have poor access to the health system. Chronic oral anticoagulant therapy is known to cause frequent clinical complications, especially bleeding; an alternative approach could be use of the low dose anticoagulant therapy that has been recently suggested for the treatment of deep vein thrombosis. However, further studies are still needed to investigate this possibility specifically in Chagas’ disease.

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Authors’ reply
In our recent study, we demonstrated that at least 52.2% of chagasic strokes are due to cardioembolism and 36.8% are of undetermined cause.[1] A significant proportion of these cryptogenic chagasic strokes may also be cardioembolic in origin.[2, 3] We therefore encourage the use of transoesophageal echocardiography in all patients with chagasic stroke, especially for the better definition of aetiology in the 36% having strokes of undetermined cause.

The monitored administration of warfarin is remarkably effective in the reduction of stroke recurrence in persons with cardioembolic stroke.[4] Thus, we recommend oral anticoagulation for all individuals with chagasic stroke, who have demonstrated risk factors for cardioembolism. To our knowledge, no case control study analysing these factors has yet been carried out.

Stroke of arterial origin in Chagas’ disease seems much less common than in the general population of Parkinson’s patients.[2, 5] Evidence for secondary prevention of stroke of arterial origin with oral anticoagulation as in the Warfarin-Aspirin Recurrent Stroke Study (WARSS) and European/Australasian Stroke Prevention in Reversible Ischaemia Trial (ESPRIT) clinical trials is controversial. Our follow up experience with the administration of secondary anticoagulation to persons with chagasic stroke, whether cardioembolic or not, has been encouraging in the lack of significant complications. We are therefore currently investigating the efficacy of antithrombotic therapy in chagasic stroke patients, using either low or moderate dosages of anticoagulants. Until the results of this or similar investigations are available, antithrombotic prophylaxis should be individually personalised in persons with chagasic stroke of undetermined cause, on the basis of the estimated risk of recurrent stroke and the risk of complications during anticoagulation.

We thank M M Teixeira and A L Teixeira for their comments and interest in our article.

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Efficacy of methyprednisolone pulse therapy on neuroleptic malignant syndrome in Parkinson’s disease

I was astonished to find that Sato and colleagues were able to identify 40 cases of neuroleptic malignant syndrome (NMS) in patients with Parkinson’s disease from a single institution over three years.1 At a recent neurosciences grand round in Birmingham, UK, which has an interest in Parkinson’s disease research, we could only recall two such cases in living memory.

There are two possible explanations for this high incidence of NMS. Firstly, in Japan the Parkinson’s disease population may be more prone to developing NMS when their anti-parkinsonian medication is reduced. This could be due to genotypic differences between Japanese and Western populations. Whereas a higher prevalence of the Parkin mutation has been noted in Japan,2,3,4 judging from the age range and duration of disease given in table 1 of Sato’s report,5 these were not all young onset patients as one would expect with the Parkin gene. Nevertheless, it would be of interest to know if this high incidence of NMS has been seen in other Japanese centres and whether any genotypic reason can be found.

The second possible explanation is that the reduction in anti-parkinsonian medication that precipitated NMS were substantial. NMS has been recorded in Parkinson’s disease in the past in association with so-called ‘drug holidays’, which have now been abandoned in most countries owing to the high mortality rate. Against this explanation is the fact that three patients had no change in their medication in Sato’s study.1

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The interest of this paper lies not so much with the proven benefits of methylprednisolone therapy in NMS in Parkinson’s disease, as in the high incidence of NMS in the Japanese patients treated in this unit. I would value the author’s further comments.

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References

Mesencephalic ischemia and Parkinson’s disease
I read with interest the paper by Abe et al.1 on occipital and posterior parietal hypoperfusion in 28 Parkinson’s disease (PD) patients without dementia. These findings suggest that there was a reduced regional cerebral blood flow (rCBF) in the intraparenchymal territory of the posterior cerebral arteries (PCAs) probably due to the presence of atheromatous plaques located in the distal end of the basilar artery.2 Atherosclerotic changes are of considerable importance because they can cause stenosis and/or occlusion at the origin of the terminal (PCAs) or collateral (superior cerebellar arteries) branches, as well as of the posterior perforating arteries (PPAs).

Based on the fact that in situ the donor tissues of catecholamines are normally highly vascularised and by contrast in PD the rCBF is reduced in the neostriatum, from February 1988 to December 2002 we have used two surgical procedures to treat PD:1,3 (1) transplantation of adrenal medulla into the putamen by a transinsular approach, and (2) omental transplantation on the interpeduncular fossa, anterior perforated space, and insular cortex in 16 patients with moderate or advanced stages of PD. Thus, omental tissue revascularises to the catecholaminergic (dopaminergic and noradrenergic) nuclei, as well as to the surrounding structures, and moreover prolongs the survival of the graft implanted in the putamen. In all patients, neurological improvement was better during the first weeks after surgery than in the following months or years. Our third patient is the same case previously reported by us.4 At present, 15 years postoperatively, she has only slight tremor on the left leg and does not require antiparkinsonian drugs. At the last follow-up, she occasionally receives 1 mg of clozapine at night. Her quality of life is good and she manages the daily living activities similar to any normal woman of her age.

In conclusion, the vascular impairment described by Abe and colleagues supports the autopsies findings2 and neurosurgical results.1,3 Clinical data suggest that PD is initiated in the intraparenchymal territory of the PPAs caused by atheromatous plaques located at the mouths of these arteries. Therefore, we believe that Parkinson’s disease is wrongly classified as a neurodegenerative disorder.

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References

Traumatic brain injury as a risk factor for Alzheimer’s disease
In a recent systematic review of case control studies investigating head injury as a risk factor for Alzheimer’s disease (AD), Fleming et al.6 replicated the results of the meta-analysis by Mortimer et al.6 in males (OR 2.29; 95% CI from 1.47 to 3.00) but not in females (OR 0.91; 95% CI from 0.56 to 1.47). Their findings support that males only have an association between a history of primary head injury and the risk of developing AD, but the study could not review the association between head injury and ApoE gene status as risk factors for AD.

The review by Fleming et al. was based on clinical studies alone and, as Wilson7 emphasised, did not consider the nature or severity of the original head injury, and the results of the first retrospective autopsy study of the relation between closed traumatic brain injury (TBI), ApoE allele frequency, and AD was unfortunately not mentioned. This present study has examined:

• the incidence of AD pathology in 55 consecutive autopsy cases (mean age 77.6 years, SD 7.1) with residuals of closed TBI lesions (old contusions in the frontal, temporal, or other brain areas)
• the frequency of TBI residuals in 53 age matched AD cases proven at autopsy.

In both series, ApoE was evaluated from archival brain material embedded in paraffin. The results were as follows.

In the TBI series, 12.7% (four males and three females) showed CERAD B (Consortium to Establish a Registry for Alzheimer’s Disease) definite AD (Braak stages 5 and 6), and 9.1% showed CERAD B probable AD (Braak stages 3 or 4); TBI history dated back from 10 to 30 years before death. Duration of AD ranged from two to seven years. Two of the subjects with AD showed ApoE3/4, and the remainder 3/3 or 3/2 of the remaining 43 subjects without AD, three exhibited 3/4 alleles. The prevalence of AD (21.8%) in this small autopsy cohort was significantly higher than in either a recent large clinical series (3.3%)8 or the general population over the age of 70 years (14%).9

In the AD cohort (all CERAD B or C, Braak stages 5 and 6), there was an ApoE4 allele frequency of 30% (similar to other AD series). Residuals of TBI were seen in four brains (two males and two females, each 7.5% of the cohort), all four lacking the ApoE4 allele. These data in small autopsy cohorts confirmed previous clinical studies suggesting that severe TBI is a risk factor for the development of AD, particularly in subjects lacking the ApoE4 allele which is considered a risk factor for AD. No gender differences were found.

Irrespective of these data, we agree with others10 that further work should consider population based cohorts and larger autopsy series of TBI and AD in order better to elucidate the relationship between TBI, ApoE alleles, and the development of AD.
The specificity of prescription patterns in secondary stroke prevention

We would like to comment on the important report by Landi and colleagues about the factors and the reduced likelihood of receiving secondary stroke prevention treatment1 and present our own data. We have demonstrated that in community-dwelling patients with chronic atrial fibrillation, living alone or in rural areas, history of previous falls, and cognitive and functional impairments are independent factors that result in physicians prescribing aspirin instead of anticoagulants, thus disregarding the current guidelines. In patients who have a reduced life expectancy, we believe that the risk-benefit ratio in comparison with anticoagulants, even when they are prescribed for individuals living alone, with a low education level and poor cognitive or functional performance, is not good enough. In these conditions, we believe that the risk-benefit ratio in comparison with anticoagulants is not sufficient. However, we really do not believe that this translates only into an “ageist cultural background without real clinical motivations”. In our study, we demonstrated that the decision of not to treat could not be considered as “undertreatment”, but related to the uncertainty about the cost-effectiveness of the treatment in a frail population. These doubts are not always unrealistic, especially among frail post-stroke elderly individuals, who characteristically have a high number and complexity of associated diseases, with a concomitant higher risk of drug interactions and adverse drug events. Furthermore, the reduced rate of treatment observed in our study is not matched by potential risks in frail elderly patients, but also by uncertainties about the potential benefits. In the most important evidence of antiplatelet or anticoagulant medications after cerebrovascular accidents is substantially based on non-disabling ischaemic stroke. Evidence about the benefits of secondary stroke prevention is much more limited in the frail elderly population with severe physical and/or cognitive impairment. In this respect, it is important to underline the fact that the data presented by Bellelli and Trabucchi are based on a sample of community dwelling patients with atrial fibrillation, that “per se” is an indication for treatment. In contrast, our study sample, which was based on patients receiving home care programmes indicating that an important and disabling health problem was in place, included a frailler population. In this respect, our results cannot be generalised to all healthy community dwelling elderly individuals. However, we acknowledge that studies addressing the efficacy of secondary prevention treatment are needed, especially for frail and functionally impaired elderly individuals who have suffered a stroke.

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Relationship between stridor and sleep apnoea syndrome: is it as simple as that?

We read with interest the article by Hirayama et al in which the authors, using an original imaging method, low field magnetic resonance fluoroscopic study, proposed that upper airway obstruction proceeds laryngeal occlusion causing the stridor in patients with multiple system atrophy (MSA). This issue of nocturnal stridor in MSA is of great importance since it is a common cause of sudden death and a recognised prognostic factor in this disease. It affects about 19% of patients as shown in our series and by others. We feel that the relationship proposed between obstructive apnoea respiratory events and stridor is not as simple as suggested by the authors and must be considered in light of classical standardised polysomnographic (PSG) data.

In our own series, 18 consecutive patients with MSA were assessed by PSG and disturbances by all-night standard PSG with continuous synchronised audiovisual recording. Nocturnal stridor occurred in 10 patients and, except in one patient, was always accompanied by breathing disorders, mostly apnoea, with or without significant oxygen desaturation. In four patients, obstructive sleep apnoea (OSA) occurred without stridor, and one of these patients presented predominantly with central apnoea that also occurred while awake. Among the patients with stridor, four presented predominantly OSA and one mainly central apnoea. Mixed and prolonged apnoea, up to 53 s, was seen along with stridor in five patients who was isolated in two others. Episodes of mixed apnoea were typical in their occurrence as
they were always preceded by heavy, pro-
longed inspiratory effort and stridor, indicat-
ing upper airway obstruction. Such episodes
were not detected in OSA patients without
stridor. Arousal events of any type were in
most cases followed by the recurrence of
snoring and not by an inspiratory stridor
sound.
Thus, there seems to be a wide variety of
combined sleep-related breathing disorders
ranging from a majority of obstructive
apnoeas to stereotyped mixed apnoeas of
very long duration and sometimes preceded
by stridor in MSA. Nocturnal breathing
disturbances in MSA are due to the complex
involvement of multiple brainstem nuclei, lea-
ting to a defect in the respiratory control system
independ-
ently of the occurrence of stridor. Among
these breathing disorders, OSA are the most
common and may occur in non-obese MSA
patients even in the absence of stridor, thus
indicating that the mechanism underlying
the two events is different. The higher inci-
dence of typical OSA observed in MSA patients
may also be due to the severity of brady-
kinesia and the fact that patients with severe
MSA lie predominantly, if not always, in the
supine position while asleep. The reduction of
nocturnal obstructive events during lateral
position in patients with OSA has already
been reported. In our patients, who were
audio monitored, stridor was not followed by
typical obstructive apnoea nor was the
apnoea ended by a stridor. Thus, we believe
that stridor and OSA in MSA are different
and independent events. We also found that
mixed apnoea occurred stereotypically and
was very prolonged and often preceded by a
hars
h sound typical of stridor, as documented
by audio monitoring.
Non-invasive continuous positive air pres-
sure (CPAP) should be proposed for relief of
sleep breathing disorders. It has been used
successfully to treat stridor and OSA in MSA
patients. In our series, nine patients accepted
CPAP treatment (six with stridor and sleep
apnoea and three with isolated OSA). One
patient died before initiation of the treatment
and two patients who were to be started on
nasal CPAP treatments dropped out over one
week because of lack of tolerance despite
having a severe apnoea/ hypopnoea index.
Since the onset of CPAP treatment, both
patients and their spouses reported to sleep,
improved daytime alertness and wellbeing. For
some patients, getting used to CPAP took up
to a month, after which it was generally well
tolerated. After a mean follow up period of 10
months, the patients’ compliance with the con-

dued use of CPAP was satisfactory and their
relatives did not report any recurrence of
stridor.
Thus we feel that the relationship between
stridor and OSA is far from clear, especially
considering the polysomnographic association of
stridor and mixed apnoea that we found.
Complex supranuclear neurologi-
cal dysfunction may account for this associa-
tion, but further studies are however needed to
clarify this issue and better establish the
indicators for CPAP.

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Authors’ reply
We would like to thank Dr Ghorayeb et al for
their interest in our paper and their comments.
We agree with the view that the relation-
ship between stridor and apnoea in MSA is
very important. Unfortunately, in our
experimental procedure, we could not estab-
lish a correlation between the occurrence of
the vocal cords and upper airway and stridor
symptoms because it is difficult to record
airflow and vocal sound simultaneously in
a magnetic resonance imaging (MRI) record-
ing. In obstructive sleep apnoea syndrome
(OSAS), even when the upper airway was
obstructed completely, the vocal cords
were not obstructed. Therefore, stridor does
not develop although snoring may occur in
OSAS. In contrast, MSA patients had an
obstructed upper airway, which was fre-
cently accompanied by stenosis of the vocal
cords. However, we did not find stenosis of
the vocal cords without stenosis of the upper
airway. If the stridor is produced by stenosis
of the vocal cords and snoring is produced by
stenosis of the upper airway, snoring should
be accompanied by stridor in all MSA
patients. In fact, we observed that the initial
narrowing of the larynx and pharynx pro-
duced snoring. Ghorayeb et al point out that
OSA (SAS with upper airway obstruction)
can commonly occur even in non-obese
patients with MSA without the presence of
stridor. We agree with this observation, but
this study, we did not find stenosis of the
cord without upper airway stenosis, so
none of our patients developed stridor with-
out snoring. We observed the patients in the
MRI room to identify the sleep state and the
presence of snoring and stridor, and we
found that the highest pitch vocal sound
appeared after heavy and prolonged inspira-
tory effort. This phenomenon is very similar
to Ghorayeb et al’s observation of apnoea and
stridor. We also suppose that the phenom-
енon of apnoea in MSA patients occurs with
stenosis of the upper airway. Therefore, we
think that some patients in MSA with SAS
may be treated with CPAP similar to OSAS
patients. However, the effect of CPAP could
be diminished, since the

respiratory centre is eventually involved with
the progression of disease in MSA, and cen-
tral apnoea and abnormal respiration may
appear. Further study is required to clarify
the indication of CPAP in patients with MSA.

The mechanism of SAS in MSA is unclear.
Our study showed complete obstruction of
the upper airway and vocal cords occurred in
MSA even with the presence of tongue
atropathy and without narrowing of the larynx.
Thus, we suggest that there is another
mechanism involved distinct from that of
OSAS. Some reports have stated that a
dystonia-like phenomenon was present in
the vocal cords in the stridor through
electromyographic study, suggesting a similar
mechanism to be present in the progression
of upper airway obstruction.

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BOOK REVIEWS

Biological psychiatry, Vol 1 and 2
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The European editors of these two volumes
have brought together contributions from all
over the world and from a range of relevant
specialties. Although the majority of the
authors work in psychiatry, the other discip-
lines represented include neurology, psychol-
ogy, physiology, and pharmacology. Guided
by clear concepts regarding the anatomy of
the book overall as well as the individual
chapters, the editors have succeeded in
providing an integrated and comprehensive
review of biological psychiatry.

The introductory chapters address concep-
tual and measurement issues in biological
psychiatry. The next section comprises a
series of chapters on basic principles, review-
ing topics such as animal models, neuro-
transmitter systems, neuroendocrinology,
immunology, physiology, neuropsychology,
and brain imaging.
The bereitschaftspotential
 movement-related cortical potentials


The Bereitschaftspotential (BP; readiness potential, although the sense of the German word is rather more imperative) was discovered and named in 1965 by Hans Kornhuber and Lüder Deeke. In their original description it was a negative going wave of cortical potential that was first detectable 1–1.5 s before the movement occurred. Like the discernible evoked potentials, it was a technological advance (the computer of average transients or signal averager) that permitted detection of these minute waveforms. The discovery (with its implications for volition and free will) acted as a catalyst to the stimulus to research. This book brings up to date the state of knowledge concerning the BP and other brain potentials occurring around the time of a motor act.

It is an expensive text. What does the reader get for the money? The book consists of 17 chapters in 7 sections. There is a brief introduction by the editors that states the aims of the book. These are: to explain the processes that the BP reflects, to quantify the number of components responsible for the BP, to explore the anatomical substrate for the BP, and to flag up areas for future research. These are commendable aims, and, to the extent that much information on all these aspects is contained in the book, they are achieved.

However, the arrangement of the material into the 7 sections of the book does not neatly reflect these aims and it is left to the reader to pick out the information where it occurs. This approach of presenting a number of unconnected papers on the same topic has its pros and cons. In its favour there is a mass of new data from experts in the field and an element of historical and personal background and critical commentary that one would not otherwise find in the scientific literature. Against it is the difficulty of obtaining a coherent overview of the subject. This is compounded by inconsistent terminology (a glossary of abbreviations is a serious omission, the more so as the abbreviations are often inconsistent), and poor proof reading (there are very many minor errors). The general reader will find the introduction useful and will enjoy the chapters by Libet and by Joose and Kornhuber but, as a whole, the book is strictly one for the specialist.

T R E Barnes

Classic cases in neuropsychology, Vol 2


Why read the classics? If you’re still not sure why it might be worth bothering, this book would really be wasted on you. Better that it should fall into the hands of someone who really appreciates that modern neurology and neuropsychology owes an enormous amount to the careful descriptions of single cases. And, despite the whizz and bang of functional imaging, this is likely to continue to be the case.

In this volume, you will find discussion of Babinski’s cases of anosognosia for hemiplegia, Wernicke’s case of conduction aphasia, Goldstein and Gelb’s description of form agnosia, Dejerine’s case of alexia without agraphia, and many other gems from the distant past. But, in addition, you will also be pleasantly surprised to see more recent “classics” such as Bisiach and Luzzatti’s descriptions of right hemisphere Milanese patients who, when recalling from one imagined viewpoint famous Piazza del Duomo (the city’s central square), reported places that would appear to their right, neglecting those to their left. But, when asked to imagine turning round, they failed to report locations they had previously mentioned and described instead places that now fell to their right from this new viewpoint. This description of “representational neglect” has had a profound impact both on stimulating research into the syndrome and understanding the nature of mental representations of space.

Of course, the qualities of the contributing chapters do vary considerably but the subject matter that is covered in this collection is wide ranging, and also entertaining. The chapters that work well are those that place their case study in their historical, as well as scientific context. There are important lessons here, for instance, about the dedication and obsessive nature of some neurologists. Dejerine, for example, himself carried out the postmortem on his patient with pure alexia within 24 hours of his death—at the patient’s home. He clearly wanted to find out how the lesion location differed from that of a patient he had reported on the previous year who had alexia with agraphia, and no administrative difficulties at any hospital were going to prevent him!

This is a good book, well worth reading for pleasure and for learning about some of the most important cases that have shaped our understanding of higher cortical function.

Why read the classics? Why be a neurologist.

M Husain

Assessment of aphasia


This book surveys existing tests for people with aphasia, with particular emphasis on reporting studies that address their reliability and validity. In this it is admirably comprehensive, at least for the tests it covers. These are exclusively tests published in English, with, within this, a strong bias towards those originating in the United States. Many tests widely used in the United Kingdom with people with aphasia, in both research and clinical practice—for example the Graded Naming Test—do not warrant consideration. Those used in Europe, including the Aachen Aphasia test that has the best psychometric properties of any aphasia test, get only the briefest mention.

For the tests they do consider, Spreen and Risser are admirably comprehensive in surveying the literature on reliability and validity, as they point out the development of these tests “psychometric development has been less than optimal in many instances and neglected in others” (p 33). These weaknesses are serious. They report a number of tests where the reported test-retest reliability is around 0.7 or even less. The authors do not point this out, but any test with a test-retest correlation coefficient this low is seriously compromised. The implication is that around 50% of score variance is error. As a result the test will be almost useless in monitoring change, and any of its scores will need to be treated with real scepticism.

Many of the interesting issues in the assessment of aphasia are not really addressed. Many clinicians assess people with aphasia in order to identify the nature of both their impairments and their intact processes because that provides the basis for devising treatments that are directed at the impaired functions and use the strengths of the intact processes. This book provides no guidance on how that might be done.

Many existing aphasia tests, including the two most widely used, the Boston Diagnostic Aphasia Examination and the Western Aphasia Battery, aim to classify people with aphasia into “diagnostic groups”—for example those with Wernicke’s and Broca’s aphasia. Sadly Spreen and Risser never explore whether assigning syndrome labels in this way has any impact on patient management.

This book is an excellent source of references addressing the validity and reliability of American aphasia assessments, but less satisfying on the many complex issues that surround the uses of assessments for different purposes with people with aphasia.

D Howard

Reference

Intraoperative imaging in neurosurgery MRI, CT and ultrasound


This book forms part of a series of symposia reported by Springer-Verlag. The topics covered are important and timely. Most neurosurgical units would be evaluating the need for intraoperative imaging, the options, and possibilities. A factor that emerges is the importance of structure, and indeed then the need for courses and refresher symposia on modern operative anatomy and in particular to fully understand the fibre tracts of the brain. The first section, on interventional MRI, covers systems currently in clinical use and some background development and potential that would be valuable and necessary reading for a unit contemplating the introduction of such technology. The authors are experienced and the contribution significant. The second section deals with the role of intraoperative MRI and glioma surgery. It appears that data are emerging that the use of intraoperative MRI allows for more complete resection and probably a better outcome for patients with this devastating disease. It also gives a description of some of the difficulties that will be encountered when using neuro navigation together with the MRI system. The third section provides thoughtful reflections on the use of intraoperative ultrasound for cranial surgery and a chapter on the use of intraoperative CT scanning for navigation in spinal surgery. The final chapters provide some personal reflections on intraoperative MRI imaging technology and the use of functional MRI, together with a chapter on the cost benefit ratio of the technology. In the postscript Dr Yonekawa again highlights the need for courses and refresher symposia on modern operative anatomy and in particular to fully understand the fibre tracts of the brain.

Dousset, for example, describes ways in which individual cells may be tracked in the central nervous system after labelling with new iron oxide based contrast agents. Filippi, Rocca, and Rovaris review applications of both magnetisation transfer and diffusion weighted MRI to defining early axonal injury in normal appearing areas of a white matter. There is a further discussion of methods of diffusion tractography, which allows axonal tracts to be mapped, giving both information on the anatomy of major tracts and their integrity. Rashid and Miller describe applications of arterial spin-labelling magnetic resonance, a technique for defining perfusion changes that potentially provide an absolute measure of brain activity. The importance of better understanding cortical functional changes is emphasised in a nice review of functional MRI demonstrating ways in which the organisation of brain systems may change adaptively with the progression of pathology in MS. Part of the future of MRI clearly lies in enhancing sensitivity and spatial resolution of the imaging. An exciting approach to this has been development of ultra-high (> 5 T) field magnets. Kangarlu and his colleagues present images of human brain from an 8 Tesla (that is more than 5 times as powerful as a conventional clinical scanner) imaging system with individual plaques of MS shown.

This volume can be read quickly and the chapters are well written. It is highly recommended for neuroscientists and radiologists who want a brief, authoritative introduction to the current state of the art.

P Matthews

History of neurology in The Netherlands


Pride of place in the first century or so of Dutch neurology must go to the basic sciences of anatomy and physiology. These were my first points of contact with the Dutch neurological tradition, now almost 50 years ago. To the fledgling investigator working on proprioceptive reflexes, Ariens Kappers et al.'s work in the comparative anatomy of the nervous systems of vertebrates including man (New York, Macmillan, 1936) was the place to turn for the structural background to physiological experiments. And in physiology, the work of Magnus, de Kleijn, and Rademaker were essential to understanding posture and gait. Studies on pathological peripheral and central nerve fibres were illuminated by the early pathological studies on Beri Beri by Winkler (1855-1941) and Pekelharing (1848-1922), and Hans van Crevel's work in the laboratory of Verhaart (1889–1983) in Leiden.

The book reviews the origins of this great tradition and charts its continuation into the late 20th century through Dusser de Barenne (who became professor of physiology at Yale) and Nauta (who also emigrated to the United States) and his student Hans Kuypers who was professor of anatomy successively in Rotterdam and Cambridge. Other aspects of neurology (the editors prefer the traditional use of the word to denote all aspects of the study of the nervous system, normal and pathological, including neurosurgery) were later in achieving the well deserved international recognition they now have.

The book provides a wealth of detail about the evolution of the different neurological centres in The Netherlands and the contributions coming from them. As in Germany, psychiatry and neurology remained closely linked until well into the 20th century. The development of the subspecialties is considered in some detail. A special feature of the Dutch scene was the way in which high quality original work came not infrequently from non-university settings.

Of particular interest to the general neurological reader are the more detailed accounts of the life and work of a number of the major neurological figures in The Netherlands. Ariens Kappers emerges not only as the important contributor he was, but as a rather remote, self centred individual with his eye always to the main chance, and not especially appreciative of the work he got others to do for him. He, like most of the others in this section of the book, seems to have lived a rather austere life concentrated on his professional duties. There was tragedy for some, including Bernard Brouwer (1841–1949) who as Rector Magnificus did his best to limit the inroads of Nazism in the University; the authorities closed the university down. But after the liberation in 1945, Brouwer was judged not to have done enough in opposing the Nazis, and was refused an opportunity to return to the university. His colleagues, however, believed in his integrity and in 1947 he was appointed Director of Amsterdam's Central Institute for Brain Research, where he continued to work until his death.

The book is well produced and illustrated, with portraits and a number of scientific illustrations from both the early and the recent literature.

I McDonald