apparently modified the definition in the reference he both cited and authored to be as follows: "Xanthochromia was defined as extinctions exceeding 0·023 at wavelength 415 nm and/or a peak in the absorption curve in the 450–460 range."[11] We sincerely doubt that in 1902 Milian used a double-beam spectrophotometer when he coined the term.

We are also in complete disagreement with Dr Vermeulen's series in 1989 in which all patients with proven subarachnoid haemorrhage underwent multiple lumbar punctures with potential morbidity and little demonstrable benefit.[11] We disagree with the concept stated in this series that the absence of xanthochromia, despite patient history consistent with subarachnoid haemorrhage eliminates the need for angiography. Dr Vermeulen states that "xanthochromia" (spectrophotometrically measured) can be detected three weeks after haemorrhage with a probability of 70%. In his series, only 20 of 111 patients had xanthochromia demonstrated after three weeks, and no mention was made of the timing of aneurysm repair or the amount of blood on the initial CT scan. Unlike Dr Vermeulen, we would not conclude that nine patients with blood stained CSF, histories consistent with subarachnoid haemorrhage, and no xanthochromia were not candidates for cerebral arteriography. We would also not conclude that, because nine such patients did not present again to the same institution with subarachnoid haemorrhage within four years of discharge, this represents the ideal standard of care, as inferred in his paper.

Similar points can be made when discussing subarachnoid haemorrhage of unknown aetiology and the need for repeat angiography. The pattern of haemorrhage on CT can be overemphasised with regard to the necessity of repeat cerebral arteriography. We stand by our statements that repeat angiography is strongly considered if the first angiogram shows significant vasospasm, fails to completely visualise the entire vascular tree, or the CT scan demonstrates a large amount of subarachnoid blood.

Articles cited by the reviewers (and authored by them) show the CT scans of patients demonstrating what they refer to as "perimesencephalic" subarachnoid haemorrhage.[12 13] In fact, these scans show interpeduncular and suprasellar haemorrhage consistent with what we have frequently found to be aneurysmal haemorrhage, proven by surgical exploration. They further state that all such patients did well at long term follow up. We challenge their contention that two years is long term.

In their series it was also noted that five patients deteriorated from acute hydrocephalus and two of these patients remained severely disabled. This explains the criticisms leveled at our use of external ventricular drainage in patients with acute hydrocephalus. We agree that there is a small risk of aneurysm rebleeding, although we have found this to be extremely rare in our practice, and consider permanent disability from untreated hydrocephalus to be unacceptable.

The final segment of our paper that merits rediscussion is the issue of medications. Drs Vermeulen and Rinkle are critical of the use of anticonvulsants, corticosteroids, antihypertensives, and antifibrinolytic medications. As far as anticonvulsants are concerned, studies have shown a 10–25% incidence of epilepsy in patients with subarachnoid haemorrhage.[14–16] We believe that the morbidity of seizures in patients with acutely ruptured aneurysms outweights the minimal side effects of anticonvulsant medication, and believe that these medications are warranted.

In a similar fashion, judicious treatment of hypertension immediately after haemorrhage has been clearly shown to decrease the incidence of aneurysm rebleeding. In the study referred to by Drs Vermeulen and Rinkle (their ref 11) 11% of patients rebled when mean arterial blood pressure was less than 110 mmHg. Contrast this with a rebleed rate of 19·6% when arterial pressure is over 130 mmHg. Considering that most of our patients undergo surgery within 48 hours of admission, and that aneurysm rebleeding carries significant morbidity, we judiciously use antihypertensives to maintain normotensive blood pressure until the aneurysm is repaired, which is typically only several days. At no time in our review article do we advocate drug induced hypotension as a preoperative treatment for subarachnoid haemorrhage.

We have found that a short course of preoperative corticosteroids relieves many patients of the symptoms of blood induced aseptic meningitis and helps to decrease the oedema associated with the trauma of aneurysm surgery.

Antifibrinolytic therapy merits little further discussion. We only mention its use for completeness, but rarely use it in our practice. We agree that routine use of antifibrinolytic medications results in an increased incidence of ischaemic complications. Dr Vermeulen is misleading when he cites his own study to corroborate his negative bias on these medications.[5] He only studied one dosage regimen for tranexamic acid, not episilon-aminocaproic acid (AMICAR), the drug referred to in our article,—as he stated: "The effects of antifibrinolytic therapy are likely to depend on the dose and the agent used."[5] It should also be mentioned that, although a high incidence of ischaemic complications was noted in his study, all patients underwent delayed surgery and no patients were treated with intravascular volume expansion at the onset of ischaemic symptoms. This is a very different patient population to that of our patients, who are operated on as early as possible, and aggressively treated postoperatively with volume expansion, should ischaemic vasospasm develop. Comparisons between the two patient populations would be nonsensical.

Other critical statements are merely a matter of semantics and do not merit further exhaustive discussion. It appears as though comments regarding blood electrolyte imbalances are referred to by the reviewer to cite a paper on which Dr Vermeulen is a participating author.[17] Finally, the management, both medical and surgical, of subarachnoid haemorrhage is a complex endeavour which has many areas of controversy. The nature of our review article was to present a general overview without interjecting significant personal bias in areas that are not definitively understood. Dogmatic and exacting statements such as those made by Drs Vermeulen and Rinkle are prevalent in the medical literature. We do not believe that the pathophysiology and treatment of subarachnoid haemorrhage lends itself to such statements. Our review article is a good reference source for those interested in an informed general discussion of the topics. Judging by the large number of reprint requests for our article, it must have served its purpose well.

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NOTICE

AcroMed Prize for Spinal Research: 1994 Contest. To promote research in Spinal Disorders, AcroMed will present a prize of Dfl. 10 000, at the 5th Annual Meeting of the European Spine Society in Madrid, Spain, September 8–10, 1994 to the authors of the winning paper.

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By applying, the authors agree to the publication of the paper in the *European Spine Journal* under the heading of the AcroMed Prize for Spinal Research 1994 should they win the prize.

All submitted papers will be considered automatically for presentation at the Annual Meeting of European Spine Society, unless stated otherwise by the authors.

Original manuscripts with two copies should be sent to: P F van Akkerveeken, Chairman of the Recommending Committee, Soestdijkseweg Zuid 246, 3721 AK Bilthoven, The Netherlands. Tel: +31/30-25 11 00.

BOOK REVIEWS

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Brain Activation. By PER E ROLAND. (Pp 589 Illustrated; Price: $84.95). 1993. New York, Wiley-Liss. ISBN 0-471-50867-5.

In this comprehensive volume Per Roland, one of the fathers of this discipline, takes us through all aspects of the field. The book opens with chapters on the biochemical and physiological mechanisms underlying brain activation and reviews the possible neurotransmitter candidates for coupling changes in blood flow to neuronal activity. The relationship of cortical fields as defined by a number of workers including Brodman, Flechig, Braak, von Economo and Koskinas, to activation is then discussed. Following this, the book is divided into sections which describe the cerebral systems involved in processing specific modalities such as movement, language, memory, and vision; and sections which detail the functions subserved by the different cortical and subcortical areas. Finally there is a discussion on approaches to measuring brain activation and in particular the theory underlying the PET technique.

This book is a major piece of work and its value is likely to be as a reference text for those workers already engaged in this field. The author exhaustively chronicles all activation studies reported up to 1991, including PET, Xenon, and SPECT approaches. Detailed tables of the stereotactic locations of foci that have been found in association with published paradigms are provided; these will be invaluable for anyone wishing to know whether a particular modality engages a particular cerebral area. The author also attempts to explain how all the various components of each cerebral circuit contribute to processing a particular modality, for example distinguishing shape by touch. Differences across PET groups are not always easily reconciled. If, however, one wanted to study a particular aspect of cerebral processing it would be easy to open this book and see whether other groups had attempted similar experiments.

Problems with this book were, firstly, the poor quality of the diagrams. These have largely been reproduced from other works. The PET scans showing activation changes are also at times unconvincing. It must be said that some of the author's findings are idiosyncratic, such as the finding of depression of striatal activity during learning which then reverses as performance improves. This is not the experience of other PET groups.

An important omission from this book is the absence of cerebral activation data in stroke and motor neurone disease, dystonia, Parkinsonism, and involuntary tremor. There is also little space devoted to functional magnetic resonance imaging in spite of the large amount of interest in its potential to measure cerebral activation.

In summary, this book is a valuable reference work. It should form part of the collection of anyone working in the field of cerebral activation. I greatly enjoyed reading it and have every expectation that it will be widely appreciated.

DAVID BROOKS

Electroencephalography: Basic Principles, Clinical Applications, and Related Fields/3rd Edition. Edited by ERNST NIEDERMEYER and FERNANDO LOPES DA SILVA. (Pp 1164 Illustrated; Price: £100). 1993. London, Williams & Wilkins. ISBN 0-683-06511-4.

This substantial book is the third edition to appear since 1981. The editors have sought the aid of fifty-three contributors mainly from the Americas to produce a volume of sixty-two chapters that covers the subject comprehensively. Both editors make substantial contributions to the text; Niedermeyer being involved in seventeen chapters either alone or in collaboration and Lopes da Silva in six. The chapters vary in length appropriately according to the topic considered. It is impossible in this brief review to list all of the areas dealt with but in addition to basic neurophysiology as related to EEF, recording methods, principles of EEG interpretation are covered. Other chapters consider the evaluation of candidates for surgical treatment for epilepsy and describe the place of sub-dural and depth electrodes as well as electrocorticography. EEG monitoring during surgery and prolonged monitoring in the evaluation of episodic disturbances of brain function are described. Clinical Neurophysiologists in this country may find the seven chapters on evoked or event related potentials superfluous as they will have dedicated texts dealing with these techniques. Outstanding are Lombroso on neonatal polygraphy and Niedermeyer on epileptic seizure disorders. All the chapters have merit and the editors have encouraged contributors to express personal opinions even when they conflict with those of the editors. Generally well illustrated, well referenced and with a god index the book can be highly recommended with the reservation that some transatlantic practices differ from those used here but no comparable British text exists at present.

DAVID BARWICK

The Headaches. Edited by J OLESEN, P TFELT-HANSEN and KMA WELCH. (Pp 893 Illustrated; Price: $208). 1993. New York, Raven Press. ISBN 0-7817-0069-8.

This volume is a valuable collection by many respected headache workers and scientists. It is aimed at Neurologists and Researchers. After the International Headache Society's detailed classification, it has taken a great deal of effort from Prof Olesen and his expert colleagues to put together this well-contrived encyclopedia on the subject. But, the IHS classification is not without its detractors. One of us recently refereed a migraine trial using IHS criteria in which half the patients had neither aura nor nausea or vomiting: it was impossible to decide what sort of headaches were being treated.

The first section looks at the historical background, genetics, and epidemiology, and also gives a fair account of the new classification. The chapters of applied anatomy, physiology, psychology and pharmacology are well supported with figures and illustrations. The social impact of headaches is well discussed by Richard Lipton. Clinical descriptions and appraisals of therapy are of varying quality which the discerning reader will readily identify.

The middle section is devoted to migraine and there is a good but rather biased collection of work by a large number of authorities making this section highly technical. Different workers have obtained divergent results while studying cerebral blood flow but some of the conclusions drawn at the end are confusing. At the beginning of certain sections is an authoritative "how I do it" type of general overview discussing the general approach to treatment, but providing no references. Preceding the scientific accounts with references one might be forgiven for confusing it, at this stage, with a chapter meant for the medical students.

There are some interesting editorial arrangements such as having two authors for each chapter, one each from either side of the Atlantic. The editors must be congratulated for being largely successful in producing a liberally referenced comprehensive text. It can be confidently recommended as a reference source of up-to-date opinion to headache researchers.

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