Matters arising

the method of choice for functional imaging of patients with temporal lobe epilepsy.

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Fish replies:

1. Although we discussed previous PET and SPECT studies in epilepsy in our introduction, our study did not compare these techniques with XeCT. While we stated that SPECT cannot measure CBF quantitatively, at no time did we imply that SPECT was not a useful technique for imaging patients with focal epilepsy.
2. It is difficult to compare studies using different methods of functional imaging unless they use a similar patient population. The patients we studied were a highly selected group with intractable focal epilepsy who had unequivocal unilateral EEG abnormalities on repeat studies, usually including a sphenoidal, ictal recording. The PET study by Bernardi *et al.* quoted by Duncan and Patterson involved a population of 10 patients, four of whom had evidence of bilateral EEG abnormalities, and eight of whom also had generalised seizures. Engel *et al.* studied 50 patients with focal

epilepsy using PET and found a side to side difference in glucose metabolism of 8-56% (mean 24%).¹ Franks *et al.* reported CBF PET studies using ¹⁵O on 25 patients with focal epilepsy.² The CBF on the side of the focus was reduced by a mean of 22.5% in the 21 cases with normal CT (and by 68.5% in four cases with abnormal CT). The results of these larger PET studies on patients with focal epilepsy correspond well with our mean side to side rCBF difference of 25%.

3. Out choice of controls is appropriate because xenon CT is to be used to look for a focal abnormality in patients known to have intractable epilepsy, and not to differentiate patients with focal epilepsy from normal subjects. The mean 14% side to side CBF differences found for our controls probably reflects background noise rather than a true CBF variation. We agree with Duncan and Patterson that the scatter in our control data means that only xenon CT scans with greater than 30% side to side differences provide useful information. 50% of our patients with focal seizures had positive xenon CT scans using this criterion. In all these patients xenon CT correctly localised the epileptogenic side. The use of normal subjects as controls in studies involving x-rays raises important ethical questions and, after discussion with the Chairman of our Ethics Committee, this was felt to be inappropriate.
4. Paragraph 5 of Duncan and Patterson's letter is difficult to interpret because the reference which they quote by Theodore *et al.* does not include any quantitative data in patients with primary generalised epilepsy. Six out of our 12 patients with focal seizures had clear side to side differences in CBF and in all six cases the side of the epileptic focus had lower CBF than the contralateral (presumed normal) side. We would agree that CBF asymmetry is more important than absolute flow values.
5. We agree that the medial temporal strip on the epileptogenic side of patient 7 yielded a very low CBF value. In general we found that medial strip CBF values showed great variability, probably reflecting tissue heterogeneity. As discussed in the paper we suggest in practice attention is focused on lateral strip CBF data.
6. It is apparent from the quality of our images that PET is a superior technique in terms of signal to noise ratio.

Unfortunately it is not widely available. We were surprised that Duncan and Patterson should state that SPECT is surely the method of choice for functional imaging of patients with temporal lobe epilepsy without giving any supporting data or references. We are not aware of a published comparison between xenon CT and SPECT in patients with focal epilepsy. Helman *et al.* have studied nine patients with cerebral vascular disease using both techniques and found both approaches useful.³ They reported that the main advantages of xenon CT were its greater resolution and potential for non-invasive quantitation of rCBF, while the major advantage of SPECT was visualisation of the entire brain on transverse coronal and sagittal section. Xenon CT is a far cheaper technique if a CT scanner is available.

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Book reviews

Microneurosurgery Vol IIIB: AVM of the Brain, Clinical Considerations, General and Special Operative Techniques, Surgical Results, Nonoperated Cases, Cavernous & Venous Angiomas, Neuroanesthesia. By M Gazi Yasargil with M Curcic, M Kis, P J Teddy, Anton Valavanis. (Pp 479; DM 360.00.) Stuttgart: Georg Thieme, 1988.

Like the other volumes in this beautifully presented series this is primarily a treatise on technical neurosurgery. The book reviews the management of 500 cases of arteriovenous malformations handled by Yasargil over a 19 year period, of which 414 were operated upon.

Professor Yasargil has categorised AVMs into two groups; convexity and deep central.

He further subdivides these into 13 distinct types, for each of which the surgical approach is described. Valuable technical points are made with respect to AVMs in general and with respect to each type. The descriptions of the approaches are highlighted by exceptionally clear and effective three dimensional drawings, describing the neuroanatomy of each region. The book would have been further enhanced by more of these drawings and by operative photographs illustrating the anatomy and details of the approaches for AVMs in different brain regions.

The book is profusely illustrated with numerous pre and post-operative CT and angiographic studies and many could have been omitted and replaced by drawings or operative photographs.

For each of the 13 groups of AV malformations described in the book, the clinical details are tabulated. The primary purpose of these data is to document the excellence of the surgical results. The indication for surgery was haemorrhage in 78%. Sixty-five per cent demonstrated intracerebral haematomas on CT and in the majority these were small and not a source of significant disability. Forty-five per cent of the patients operated upon had seizures but in only 22% was seizures or neurological deficit an indication for surgery. Despite these relatively conservative indications for surgery, the results were excellent, even for malformations in deep central structures. The overall mortality rate in this series was 2.4%, and only 2.6% had a "poor" outcome. Many patients were improved by their surgery, according to the data tabulated. For example, for frontal AVMs 62% of patients had pre-operative seizures whilst only 13% had seizures post-operatively! Similarly, in 10% of patients with occipital AV malformations, pre-operative quadrant visual field defects disappeared after operation.

The majority of patients in this series underwent surgery when in good neurological condition (Grades 0-II on the Hunt and Hess Scale). The data presented support the conclusion that large AV malformations tend to bleed less severely and frequently, and when they do bleed their haematomas tend to be small. On the other hand, smaller AVMs appear to be associated with larger haemorrhages more often. A policy of observation and late surgery is therefore advocated for large AV malformations associated with small haematomas while small malformations associated with large haematomas are more often operated upon urgently.

The association between deep central AV

malformations and obstruction or stenosis of the straight sinus, vein of Galen, sigmoid sinus or transverse sinuses is very striking in this series. Abnormalities of these major posterior venous structures were observed in 60-80% of patients with central AVMs. Malformations of the venous system may result in increased venous pressures within an AV malformation, and reversed flow in the deep venous system. This is as a major reason for using the sitting position to deal with malformations of the posterior half of the brain and posterior fossa, in this series.

Unfortunately, the book does not detail any of the newer radiological techniques used to manage AV malformations such as pre-operative and per-operative embolisation and balloon occlusion. Similarly, this series was operated upon without intra-operative angiography.

Large malformations were operated upon almost exclusively by one stage procedures in this series, and Yasargil dismisses post-operative "normal perfusion pressure breakthrough" as a phenomenon caused primarily by occlusion of perfusion and drainage vessels in the tissue surrounding the AV malformation, leading to haemorrhagic infarction.

This volume shows that AV malformations, even those of large size involving evocative areas of brain tissue, may be resected without significant neurological deficit.

In common with the other three volumes in the series, this book, although expensive is a valuable source of reference for neurosurgeons and should find a place in the library of most larger departments.

ROSS BULLOCK

Computed Cranial and Spinal Imaging. By John M Stevens, Alan R Valentine, Brian E Kendall. (Pp 248; £35.00.) London: Heinemann Medical Books, 1987.

This book is concerned with computed tomography (CT) and magnetic resonance imaging (MRI). It emphasises in which situations one is better, and where they are complementary. Inevitably and correctly with the present disparity in availability of the two imaging methods, much more emphasis is given to CT.

There are chapters on the technical aspects of each imaging modality, on practical techniques and functional anatomy in addition to those on the demonstration of pathology. The orbit, petrous bone and paranasal sinuses are included as is the post

operative scan. All important disease entities have been covered. Of necessity the description of each is short but the significant factors have been included. Invariably reference is made to the appropriate definitive article. The illustrations are of high quality and the standard of production very good.

There are a few small points with which I take issue. MRI and NMR are used haphazardly. It would have been better to have used MRI exclusively. Some CT scans are viewed as from above and others from below, even in the same chapter. Again I would have recommended consistency. Corpus callosum injury shows on CT as haemorrhage much more frequently than as low density which has been put first. The three components of fig 5.7 have been printed upside down with the result that the legends refer to the wrong images. In some MRI sections, signals from pathological tissues are compared with the signal from CSF. As this is so long and variable it is better to make comparison with grey or white matter. To the confusion of those who may be sitting MCQs, differing statements are made in different chapters regarding the signal intensity on T2-weighted images of epidermoid.

However, these are minor criticisms in comparison with the overall quantity of the book. As a practical introduction to CT and MRI it more than fulfils its aim and as such is strongly recommended.

P MACPHERSON

Basics of Magnetic Resonance Imaging. By William Oldendorf and William Oldendorf Jr. (Pp 159; \$58.50.) Dordrecht: Martinus Nijhoff, 1988.

In their preface to this book the Drs Oldendorf indicate that it is intended as an introduction for non experts. The book is indeed a very basic text and takes the uninitiated through the principles of magnetic resonance imaging at a very basic level using a wide variety of everyday examples to reinforce their explanations. There is no attempt to take the reader into more complex principles and indeed flow is given but a brief mention in the text. The book is well illustrated with useful diagrams which complement the text and there is no attempt to describe in words or in images MRI appearances encountered in different pathologies.

The bulk of the material, however, is clearly written and concise although there are areas that are of limited value. For example, I can see no reason for including