another unusual case of primary spinal lymphoma. In their case, by contrast with that presented by us the spinal roots were selectively involved without the formation of a mass lesion during the disease. Moreover, CSF studies in their case showed increased protein content and pleocytosis but no neoplastic cells, which had been found in our patient. Together, the case presented by us and the case of Jellinger and Grisold underlines the fact that the range of primary cerebral and especially primary spinal lymphoma is very wide with different clinical presentation, location of manifestation, prognosis, and probably of aetiology. More cliniconeuropathological studies on primary spinal lymphoma are necessary to better understand this disease and to develop therapeutic strategies for its different types.

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Orientation agnosia in pentagon copying

Ala *et al*[1] have recently claimed that patients with Alzheimer's disease (AD) were less likely to make errors on the pentagon copying component of the mini mental state examination (MMSE) than patients affected by Lewy body (LB) dementia. Using (standard and modified) MMSE scoring criteria they found normal copies in 16 of 27 patients with AD but in only two of 13 patients with LB. Although this difference was non-significant,[1] they concluded that this feature might be useful in differential diagnosis. It is of some interest that the MMSE scoring criteria employed by Ala *et al*[1] did not regard errors of rotation as abnormal. In the light of recently identified visuospatial deficits which affect the domain of orientation, it may well be that the criteria of Ala *et al* for a "normal" copy are inappropriate. This has implications for the claimed diagnostic power of their measure.

Patients with orientation agnosia are able to recognise objects, but have a selective visuospatial impairment, in that they have lost knowledge of object orientation.[2] The most striking feature of this disorder is shown in the patients' drawing of objects, where they rotate their copy by 90 or 180 degrees relative to the original. This previously underinvestigated deficit is far from rare. In one study, seven of 63 (11%) patients with stroke grossly rotated their copy of the MMSE.[3] All had a right hemisphere lesion and showed some evidence of left visuospatial neglect. In a second study[4] 16 of 240 (7%) of a series unselected by pathology showed the same sign, but without clear lateralising features.

To better investigate this issue in degenerative disease, we reviewed the records of a consecutive series of 134 patients with AD. All had been given the MMSE, which includes the interlocking pentagon figure (aligned horizontally) as a copy task, and a battery of neuropsychological tests. Errors in copying the geometrical figure were systematically graded. In general agreement with the findings of Ala *et al*, 57 of 134 (43%) drew unrecognisable figures, adding or omitting details. Three showed signs of closing in, and seven (5% of the sample) made clear rotation errors, misplacing one or both pentagons by 90, 120, or 180 degrees relative to the original. These seven patients did not differ from the overall sample in terms of general severity of dementia, as measured by the MMSE total score, and by daily activity scales. Eight patients (6%) presented with signs of visuospatial neglect,[5] but patients with neglect and orientation agnosia did not overlap in this sample, suggesting that orientation agnosia should be considered an independent sign. Our data thus suggest that orientation agnosia is a significant visuospatial deficit in degenerative disease, which is not identified as such in the study of Ala *et al* by virtue of the criteria by which they define an abnormal performance.

In figure 2 of the paper of Ala *et al*, it is clear that some copies, scored as errorless, showed clear signs of orientation agnosia (AD cases 3, 9, 15, 18, 19, and 24). If these errors are considered, the claimed difference between AD and LB dementia disappears, confirming the results of previous studies which showed no significant difference in drawing or constructional abilities between AD and LB dementia.[6]

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References

1 **Ala TA**, Hughes LF, Kyrouac GA, *et al*. Pentagon copying is more impaired in dementia with Lewy bodies than in Alzheimer's disease. *J Neurol Neurosurg Psychiatry* 2001;**70**:483–8.
2 **Turnbull OH**, Beschin N, Della Sala S. Agnosia for object orientation: implications for theories of object recognition. *Neuropsychologia* 1997;**35**:153–63.
3 **Turnbull OH**, Beschin N, Della Sala S. Rotated drawing: a mini mental state examination performance with strong lateralising significance. *J Neurol Neurosurg Psychiatry* 1997;**62**:419–20.
4 **Solms M**, Turnbull OH, Kaplan-Solms K, *et al*. Rotated drawing: the range of performance, and anatomical correlates, in a series of 16 patients. *Brain Cogn* 1998;**38**:358–68.
5 **Venneri A**, Pentore S, Cotticelli B, *et al*. Unilateral spatial neglect in late stage of Alzheimer disease. *Cortex* 1998;**34**:743–52.
6 **Heyman A**, Fillenbaum GG, Gearing M, *et al*. Comparison of Lewy body variant of Alzheimer's disease: Consortium to Establish a Registry for Alzheimer's Disease, Part XIX. *Neurology* 1999;**52**:1839–44.

Authors' reply

We were very pleased to see the interest that Della Sala and colleagues have shown in our study.[1] Orientation agnosia is certainly a fascinating subject, and we applaud their research into its neuropsychology. We think, however, that their analysis of our our study has several weaknesses.

Firstly, because we had not included the original interlocking pentagon models with the copies in our figures, they incorrectly inferred that six of our patients with AD made rotational errors. As mentioned in our results,[1] many different printed models of the interlocking pentagons were used in our study. To clarify for your readers exactly what the patients were shown to copy and how they performed, Figure 1 presents the models and the patients' copies for AD cases 3, 9, 15, 18, 19, and 24. To allow the study of rotational changes, the exact orientation to the bottom of the page is preserved for each model and for each copy. Although all have been reduced for publication, the relative sizes of the models and the copies are also preserved. By our inspection none of the questioned cases exhibits any significant rotational error. We also studied the copies of the remaining patients with AD and the patients with DLB in our study, and we could not form any conclusions about rotational errors with either group.

It should also be noted that we specifically used the original published criteria[2] for grading the copies of the interlocking pentagons in the MMSE. These criteria state that "tremor and rotation are ignored" (table 1 of our article[1]).

The diagnoses of our patients were neuropathologically proved. It would be interesting to know if the diagnoses of the 134 patients with AD that Della Sala and colleagues mention were also neuropathologically proved. If their patients were diagnosed clinically, we

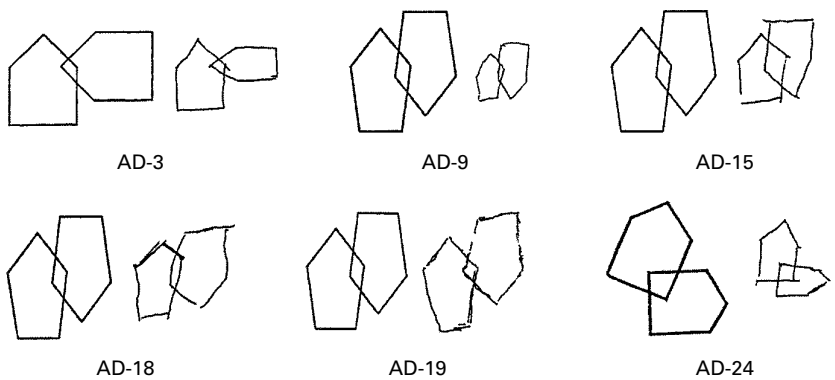

Figure 1 Interlocking pentagon models and copies from the mini mental state examinations (MMSEs) of six patients with AD. For each pair, the model shown to the patient is on the left and the patient's copy is on the right. Each patient was included among the patients with AD reported in our original article,[1] identified by the same code. Orientation to the bottom of the page and relative sizes within each pair are preserved. Each model-copy pair has been reduced in size for this figure.

would not be surprised if some patients with DLB were included in the 134. Perhaps many of those who had the orientation agnosia were actually patients with DLB who did not exhibit the classic DLB clinical symptoms of fluctuation, visual hallucinations, and parkinsonism.

Also, the study[3] that Della Sala and colleagues cite as evidence that there is "no significant difference in drawing or constructional abilities between AD and LB dementia" cannot be easily compared with ours because of the different severities of the patients involved. Based on MMSE scores, at least one half of the patients in that study were more severely impaired (median AD MMSE 10.5, DLB 9.0) than any of the patients in our study (minimum MMSE 13). That study does help confirm that constructional abilities worsen as the dementia worsens, for as we mentioned in our results,[1] none of the additional cases of AD and DLB in our brain bank with initial MMSE scores less than 13 had acceptable pentagon copies.

Finally, albeit a minor detail at variance with Della Sala and colleagues, we did report that the DLB group copied the pentagons significantly less accurately than the AD group ($p=0.002$ using the original criteria).

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References

1 **Ala TA**, Hughes LF, Kyrouac GA, *et al*. Pentagon copying is more impaired in dementia with Lewy bodies than in Alzheimer disease. *J Neurol Neurosurg Psychiatry* 2001;**70**:483–8.
2 **Folstein MF**, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychol Res* 1975;**12**:189–98.
3 **Heyman A**, Fillenbaum GG, Gearing M, *et al*. Comparison of Lewy body variant of Alzheimer's disease with pure Alzheimer's disease: Consortium to Establish a Registry for Alzheimer's Disease, Part XIX. *Neurology* 1999;**52**:1839–44.

BOOK REVIEWS

Advances in research on neurodegeneration. Volume 7

By Yoshikuni Mizuno, Donald B Calne, Reinhard Horowski, Werner Poewe, Peter Riederer, and Moussa Youdim (Pp 214, US$95.00). Published by Springer-Verlag, Wien, 2000. ISBN 3-211-83485-0

The book is part of a series based on the proceedings of the International Winter Conference on Neurodegeneration and Neuroinflammation. This particular volume arose from the seventh meeting, which was held in Karuizawa, Japan in January 1999.

The conference brought together scientists from a wide range of research areas, under the broad heading of neurodegeneration, and their breadth of expertise is reflected in the eclectic mix of studies presented here. The papers fall into four general categories, paralleling the scientific sessions of the meeting. The first deals with progress in elucidating some of the genes and gene products involved in neurodegenerative processes. It includes an interesting paper on the cleavage of huntingtin by caspases and the possibility of using caspase inhibitors to stop the aggregation and hence neurotoxicity of the protein in Huntington's disease. This section also includes papers on inherited Parkinson's disease, both autosomal dominant and recessive mechanisms, with particular attention being paid to the role of the PARKIN gene in the juvenile onset form of the disease.

The second, and largest, group of papers address the very topical subject of cell death mechanisms in neurodegeneration. The areas covered range from the role of the anti-apoptotic protein Bcl-2 in spinal muscular atrophy, in vitro experiments looking at the effect of α-synuclein mutations in neuronal cell cultures, to the possible role of polymorphisms in the myelin oligodendrocyte glycoprotein (MOG) gene in models of multiple sclerosis. Perhaps surprisingly, there was relatively little on the toxicity associated with amyloid precursor protein processing in Alzheimer's disease. However, that may not have been such a bad thing in this context, as a thorough discussion of this topic could easily require a separate volume in itself. Also included in this section (although it's not entirely clear why) is an interesting re-evaluation of basal ganglia circuitry, by one of the editors, Professor Riederer, based on a review of clinical and experimental evidence.

The third section reflects the burgeoning interest in the role of cytokines in neurodegeneration and includes papers on the role of cytokines in Parkinson's disease and in oligodendrocyte death. Unfortunately, there is no discussion of their role in Alzheimer's disease where their involvement has long been suspected. There has subsequently been a major increase of interest in this area with the discovery of polymorphisms within the genes for interleukin 1 and their effects on disease prevalence and age of onset.

The final section is more speculative and deals with some possible future therapeutic interventions. These include the use of adeno-associated viral vectors for gene therapy in Parkinson's desease, neuroprotective therapies in multiple sclerosis, and the possible efficacy of transglutaminase inhibitors in the treatment of polyglutamine disorders.

Overall, I found this an interesting volume to dip in to but it suffers from the common problem of all meeting proceedings in that two and a half years down the line some of the findings are already beginning to look somewhat dated. It is perhaps worth noting that, according to the publisher's website volume 8 of this series, based on the meeting in Bavaria in February 2000, is already available.

Stephen Gentleman

EMG waveforms: video companion to electromyography and neuromuscular disorders

By David C Preston and Barbara E Shapiro (Pp 42 and PAL video, £55.00). Published by Butterworth-Heinemann, Woburn, 2000. ISBN 0-75-067278-1.

The practice of electromyography, despite many advances in signal analysis, quantification, and computer modelling, remains to an extent an art. The experienced electromyographer relies as much, if not more so, on his ears as well as his eyes to recognise patterns of muscle electrical activity.

Transferring this experience to trainees is a challenge, and this collection of video clips covering spontaneous activity (fibrillation, complex repetitive discharges, fasciculations, and various forms of myotonia and neuromyotonia) and voluntary EMG activity is a useful addition to our material. Each clip shows a standard EMG machine screen with an audio soundtrack and is introduced by a static video frame. Clips run for up to a minute and often display waveforms at different time resolutions. The making of measurements is also shown. It would have been preferable for a voiceover to have introduced each clip to highlight the points to be made. Reading the accompanying booklet works but has less impact. Some screen shots either show redundant information or small characters indicating, for example, amplitude, too small to read.

Nevertheless this is a valuable resource to introduce trainees to the range of electrical muscle activity which might be encountered in clinical practice.

Kerry Mills

Neuropsychological evaluation of the older adult: a clinician's guidebook

By Joanne Green (Pp 311, US$69.95). Published by Academic Press, San Diego, 2000. ISBN 0 12 298190 1

This book gives comprehensive and thorough up to date coverage of this topic. It starts from the premise that neuropsychological evaluation of older people is a useful and productive endeavour, and then sets out to assist in making the process as efficient as possible, while being clearly respectful and humane. It guides the reader through every aspect of the process, from tasks which need to be addressed before the patient arrives, through the clinical interview and the formal testing, onto interpretation of test findings and report writing, rounding off with providing feedback and follow up. The practical aspects are supported by example letters, documents, forms, and reports, together with 11 useful case studies. In addition there are chapters reviewing in detail assessment procedures for memory and other cognitive functions, and four useful chapters examining the neuropsychological profiles of the most common (and a few rarer) conditions likely to be encountered in clinical practice, from Alzheimer's disease through to normal pressure hydrocephalus. The important topic of depression, its assessment, and its impact on neuropsychological performance, receives a chapter in its own right.

The author is to be congratulated on producing a book which travels well outside the North American context in which it was written; by largely concentrating on the Wechsler tests (and the most up to date versions of them) the detailed discussion of tests and their uses and properties seems familiar and accessible. The book is soundly based in current research and theory—for example, on Lewy body dementia and the vascular dementias—but at the same time conveys a strong sense of clinical experience and wisdom. The reader will not find here a defence of the contribution of neuropsychology to the management of cognitive disorders in older people, but a better account of the state of the art would be difficult to imagine.

Robert Woods

Thrombolytic therapy for stroke

Edited by Patrick D Lyden (Pp 398, US$125.00). Published by Humana Press, New Jersey, 2001. ISBN 0-896-03746-0

The end of the 20th century saw a transition in the approach to acute stroke from therapeutic nihilism to enthusiasm. Stroke is now