

## MATTERS ARISING

### Magnetic evoked responses elicited in the frontalis muscle

A recent paper by Kandler and Jarrat<sup>1</sup> describes a method for eliciting magnetic evoked potentials (MEP) from the frontalis muscle by transcranial magnetic stimulation (TCMS). Comparison of MEP latency values in normal controls and patients with Bell's palsy indicates that their prolongation beyond the fiduciary limits predicts that functional recovery will be poor.

Evocation of MEP from the facial muscle by TCMS has been the subject of several recent studies, all of which have pointed to the possibility of eliciting responses similar to the blink reflex, especially from the superior muscles.<sup>2-4</sup> Cruccu *et al*<sup>2</sup> have described TCMS-induced frontalis MEPs whose latency range differs from that of the R1 component of blink reflex.

We carried out a study in 5 healthy volunteers (4 women, 1 man) age ranged 26-38 years, to evaluate if the R1 response obtained following electrical stimulation of the supraorbital nerve showed statistical difference in latency with the MEPs recorded in the frontalis muscle.

TCMS was supplied by a Cadwell MES-10 coil ID 9.5 cm; peak magnetic flux (centre of coil) 2 Tesla. Optimum results were obtained with the coil centre 4 cm anterior to CZ (10-20 international system). Slight shifting was occasionally necessary to adjust to skull conformation and the response amplitude. Between 70% and 90% of the maximum flux capacity was delivered to the resting subject. Latency (defined as the interval between the beginning of the stimulus artefact and onset of the first component

of the evoked muscle potential) was calculated with a Multibasis apparatus (Esaote Biomedica) from the average of at least four analysed and amplified responses (band-pass 200-10,000 Hz).

A pair of Ag/Cl skin surface electrodes (cup diameter 10 mm) were used. The recording electrode was placed on the frontalis muscle, the reference electrode on the nasal bone. Both frontalis muscles were explored simultaneously.

The latency of the R1 and R2 components of the blink reflex was also evaluated by electrical stimulation of the right supraorbital nerve (figure). A blink reflex was always obtained. The mean (SD) ipsilateral R1 and R2 latencies were 10.52 (0.69) and 31.36 (0.77) ms respectively; that of the contralateral R2 was 32.9 (1.8) ms.

An early and a late bilateral response to TCMS were always observed (figure). Their latency times were: right 10.71 (0.64) and 30.92 (3.4) ms; left 10.62 (0.52) and 32.46 (4.4) ms. Student's *t* test for paired data showed that there was no significant difference between these values and those of the R1 and R2 components of the blink reflex. The morphology of the two responses was also similar to that of these components. Short and long latency responses could not be modified by the slight preinnervation of the muscle.

Blink reflex-like responses evoked in this way could stem from stimulation of the proprioceptors of the masseter muscle,<sup>3</sup> since contraction of this muscle can be induced by TCMS near the vertex. Another possibility is that TCMS excites the supraorbital nerve at the foramen, or that it activates the roots of the trigeminal nerve. An explanation would thus be found for the bilaterality of the early response obtained by TCMS and the comparable TCMS and electrical stimulation latency times.

Our data confirm that responses obtained by TCMS in the frontalis muscle do not differ in latencies from those evoked with electrical stimulation of the supraorbital nerve in the same subjects. Therefore this response may well be induced by stimulation of the trigeminal nerve, rather than true MEP.

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#### Kandler and Jarrat reply:

Cocito and Cassano's method differs from ours in two important respects. First, they have used a larger coil. Current density varies directly with coil diameter and so they will have stimulated a wider area of the cortex. Second, they positioned the coil frontocentrally whereas we attempted to locate the coil over the facial area of the cortex. It is therefore not surprising that they were able to record early and late trigeminal nerve responses in all normal subjects. That our method did not do so can be seen from our figure.

We recommend the use of a small diameter coil when trying to examine focal areas of the central nervous system with magnetic stimulation.

- 1 Kandler RH, Jarrat JA. Magnetic stimulation in Bell's palsy. *J Neurol Neurosurg Psychiatry* 1991;54:1022.
- 2 Cruccu G, Berardelli A, Inghilleri M, Manfredi M. Corticobulbar projections to upper and lower facial motoneurons. A study by magnetic transcranial stimulation in man. *Neurosci Lett* 1990;117:68-73.
- 3 Maccabee PJ, Amassian VE, Cracco RQ, Cracco JB, Anziska BJ. Intracranial stimulation of facial nerve in humans with the magnetic coil. *Electroenceph Clin Neurophys* 1988;70:350-4.
- 4 Benecke R, Meyer BU, Schönle P, Conrad B. Transcranial magnetic stimulation of the human brain: responses in muscles supplied by cranial nerves. *Exp Brain Res* 1988;71:623-32.

## BOOK REVIEWS

All titles reviewed here are available from the BMJ Bookshop, PO Box 295, London WC1H 9TE. Prices include postage in the United Kingdom and for members of the British Forces Overseas, but overseas customers should add £2 per item for postage and packing. Payment can be made by cheque in sterling drawn on a United Kingdom bank, or by credit card (Mastercard, Visa or American Express) stating card number, expiry date, and your full name.

**Recent Advances in Clinical Psychiatry—7.** Edited by K GRANVILLE-GROSSMAN (Pp 193; Price: £19.95). 1991. Edinburgh, Churchill Livingstone. ISBN 0-443-04499-6.

The title of this volume, the 7th in the series is a misnomer. Only a single chapter, on molecular and clinical genetics in relation to psychiatric diseases can truly be said to address recent advances. The remaining 10 chapters cover disparate areas of clinical interest that range from suicidal behaviour in children and adolescents to a review of psychiatric aspects of the mouth and face. Furthermore, a whole chapter is devoted to a review of what are termed "key papers covering the years 1989 to 1990".

This therefore is a book that cannot be recommended to readers wishing to keep abreast of recent developments in psychiatry. Perhaps a change of title that actually reflects the contents, such as *Reviews of Current Clinical Practice in Psychiatry* might be appropriate for future issues.

R J DOLAN

**Fractures of the Thoracic and Lumbar Spine.** By STANLEY D GERTZBEIN (Pp 293; Price: £62.00). 1992. London, Williams & Wilkins Ltd. ISBN 0-683-03490-1.

This book sets out to provide basic information and current thinking on the care of patients with spinal injuries.

In general, the book suffers from the lack of proper trials of different forms of operative and non-operative treatment that prevails in

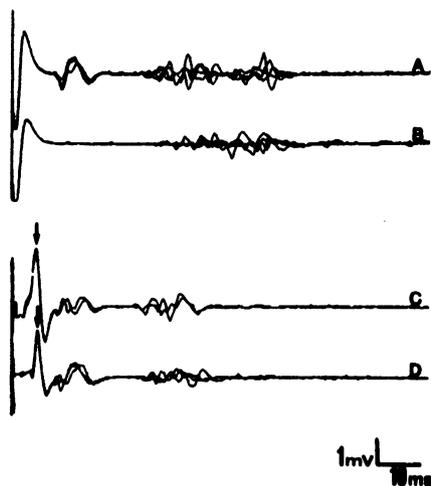


Figure Bilateral responses obtained by electrical stimulation (A, B) and TCMS (C, D) from the frontalis muscle of a 30 year old woman. A, B: ipsilateral R1, R2 and contralateral R2 responses recorded with cathode placed over the right supraorbital foramen. C, D: TCMS responses evoked by coil placed 4 cm anterior to CZ. Early and late responses were observed on both sides with TCMS. The arrow show the M response of the frontalis muscle elicited by TCMS of the facial nerve in the intracisternal segment.

Menkes' textbook will continue to provide a valuable source of basic information in relation to a broad range of paediatric neurology disorders. Inevitably for more detailed information on some topics the reader may turn to more specialised books on these subjects.

V DUBOWITZ

**Drug Therapy in Neurology.** Edited by: MERVYN J EADIE (Pp 595 Illustrated; Price: £70.00). 1992. Edinburgh, Churchill Livingstone. ISBN 0-443-04407-4.

This book provides more than its title suggests. Not only does it deal comprehensively with the therapeutics of diseases of the nervous system, but also it contains much material concerning neurochemistry and neuropharmacology including animal work relevant to clinical therapeutics.

The first section considers basic principles of drug action and pharmacokinetics. Disorders of neurological function are separated from specific diseases of the nervous system. Thus, sleep disorders, epilepsy, headache, abnormal movement disorders and many other conditions are separated from the final section where the treatment of infections of the nervous system, demyelinating diseases *etc* are considered. This format can be confusing. An accurate index becomes important and unfortunately the index leaves much to be desired. For example the main section on Valproate in the treatment of epilepsy starts on page 112 but this page is not mentioned in the index. Lamotrigine is indexed at pages 54 (GABA receptors) and 158 (chapter-end references) but in fact appears primarily at page 130. And "slip-page" of pagination seems to have occurred, at least between page 182 and page 221 where everything appears one page earlier than shown in the index.

This book is written by an eminent team of Australian physicians and surgeons. It is up to date and contains a wealth of information. Its handsome format cannot be said to be overpriced. It will provide a valuable source of information to the practising neurologist.

RB GODWIN-AUSTEN

#### **Electrodiagnosis in Clinical Neurology.**

Edited by: MICHAEL J AMINOFF (Pp 822 Illustrated; Price: £75.00). 1992. Edinburgh, Churchill Livingstone. ISBN 0-443-08795-4

This is the third edition in 12 years of a book whose popularity rests on its clear and relevant accounts of modern neurophysiological techniques in clinical neurological practice. The editor and the authors of the 27 chapters provide intelligent, well-written and admirably illustrated contributions. The book is of greatest value to the reader who already has a sound understanding of the basic scientific fundamentals in the field. A wide range of clinical material is covered: in addition to the expected neurological topics, there is some extension into the fields of paediatrics and surgical monitoring. Also given, are fair critiques of newer technologies such as topographic mapping, extensive material on, for example, blink reflex studies, electroretinography and electronystagmography as clinical tests, and a thoroughly rational and up to date review on brain death.

Mary Brazier, in her authoritative introductory chapter, gives an engaging account of the emergence of electrophysiology as an aid to neurology. She cites much interesting and unexpected detail such as the account of Elizabeth, daughter of Carl Linnaeus, observing the apparent flashes of light given off by orange marigolds and fire-lilies at twilight in their Uppsala garden but commends Goethe for demonstrating that this was a retinal contrast effect and not an electrical flash. A 1786 drawing by Dubois-Reymond shows Galvani experimenting outside his house—the precise street (Strada San Felice in Bologna) being identified in the legend to make our travels the more interesting.

It is an unusual pleasure to peruse this book afresh and to note the advances since the last edition.

PAMELA PRIOR

#### **Greenfield's Neuropathology 5th Edition.**

Edited by J HUME ADAMS AND LEO W DUCHEN. (Pp 1557; Illustrated; Price: £145.00). 1992. Sevenoaks, Edward Arnold. ISBN 0 340 54629 8.

The 5th edition, eight years after the last, and 34 years after the first edition and the year of J G Greenfield's death has been enormously updated with an influx of new talent both from the fields of pathology and research orientated clinicians. To see such changes in an eight year period is always a reassuring sign that we really are making progress.

This latest edition of this standard work is an extraordinary achievement for which the editors and authors deserve much credit. Undoubtedly, several of the chapters will be considered luminary works and excellent sources of information and references for several years. From a clinician's bias, not surprisingly, some of the most successful chapters are those in which clinician and pathologist are joint authors. The whole range of neuropathology with the exception of tumours is covered and includes chapters on the pathophysiology of raised intracranial pressure, lysosomal disorders, nutritional deficiencies and metabolic and toxic disorders and epilepsy. The edges of any subject are a danger zone in such books and a firmer line about what is to be covered in each chapter may need to be undertaken.

For instance, issues on brain banking for neurochemistry and much of chemical pathology, at least for the commoner disorders, is only covered erratically. Similarly, the molecular basis in certain instances, is cribbed rather than dealt with in depth. Understandably, some background may be necessary for pathologists reading the book but if these aspects are going to be covered comprehensively, more extensive chapter collaborations will be needed. Having said that, reading this book was enormously educational for this reviewer. When one comes across areas in one's own expertise, there are often an alarming number of inaccuracies or the information appears dated or improperly referenced. One other surprise was how few colourful neuropathology demonstrations are there.

Despite certain caveats, there is no doubt that all clinical departments of neurology and neurosurgery should have this book easily available.

A WILLIAMS

**Clinical Brain Imaging: Principles and Applications** (Contemporary Neurology Series). By J C MAZZIOTTA AND S GILMAN. (Pp 480; Price: £92.00). 1992. Philadelphia, F A Davis & Co. UK Distrib: London, Williams & Wilkin's Ltd. ISBN 080-365-944-X.

This multi-author volume has been kept to a uniform and high standard by the Editors. The opening chapters describe the physics of CT, MRI, PET and SPECT with useful technical comments on the cause and appearance of artefacts. The nine chapters that follow describe the appearances of these four techniques as they are applied to neurological problems such as tumours, epilepsy, dementia, cerebellar and paediatric disorders. Helpful flow charts are offered in many sections of the book but frequently include somewhat unusual advice: for example MRI is stated to be the examination of choice for epilepsy, followed by CT if a mass is found.

Furthermore, there is an assumption that PET is, and indeed should be, a routine clinical test but nowhere is there a definite indication of circumstances in which PET is the sole discriminating test. The recommendation of angiography in the preoperative assessment of cerebral metastases also would not find support in the UK. The use of isotope studies in dementia and cerebrovascular disease is well explained and illustrated and the refreshing use of colour brightens the text. Each chapter is extensively referenced but for a publication dated 1992 disappointingly few references are after 1989. Even the final chapter: Epilogue: Future Visions, includes only four references from the 1990's.

Overall the book is sound, correct, well laid out and illustrated, but it lacks the sparkle and stimulus that could have enlivened this essentially technically based approach to brain imaging. The ideal reader for the text has not been identified but it would form a good introduction for a trainee in any of the clinical neurosciences as well as for specialist radiologists. However, for "state of the art" information about clinical practice a reader will need to consult a more recent publication.

E TEASDALE

#### **Correction**

**Herman: Childhood Epilepsies** published in the November 1992 edition of the *Journal of Neurology, Neurosurgery & Psychiatry*, (page 1102).

We would however like to point out that the ISBN quoted is for the paper back edition published 13 April 1992 and not 1989. A cloth edition 471 91270 0 was published 29 March 1989.

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## SHORT NOTICE

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**Academic Recovery After Head Injury.** By D RUSSELL AND A SHARRATT. (Pp 93; Price: \$22.75). 1992. Illinois, Charles C Thomas. ISBN 0 398 05788 5.