Magnetic evoked responses elicited in the frontalis muscle

A recent paper by Kandler and Jarrat 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 latency 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 superio r muscles.1,2 Cruccu et al 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 shall 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 Multibias apparatus (Esalco, Biomedica) from the average of at least four analysed and amplified responses (bandpass 200-10,000 Hz).

A pair of Ag/Cl skin surface electrodes (cup diameter 10 cm) 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 latencies 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 m s); left 10-62 (0-52) and 32-46 (4-4 m s). Subjects’ 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 were then separated 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,1 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 show 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.


BOOK REVIEWS

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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 content, such as Reviews of Current Clinical Practice in Psychiatry might be appropriate for future issues.

R J DOLAN


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...
relation to the whole literature on spinal injury. The one prospective randomised con-
trol led trial that has been shown to improve outcome following spinal injury (in relation to 
high dose methylprednisolone) is not mentioned. The numerous illustrations dem-
strate almost all fractures of the dorsal and 
lumbar spine. The photographs and diagrams of the anterior and posterior immobilisation 
techniques are of high quality.
AD MENDELOW

Cerebellar Degenerations: Clinical Neu-
robiology. Edited by: ANDREW PLATYKAS (Pp 
507; Price: £430.00, US$ 210.00, 
0-7923-1490-5.

This book is a comprehensive multi-authored 
survey of the cerebellum in health and 
disease, from molecule to patient. There are 
no British contributions! It covers anatomy, 
neurochemical pathlogy, neurophisiology, 
the mighty mutant mice, eye movements, 
clinical classification, etiopathogenesis (whenver this horrible word mean). There is 
obviously something for everybody, but how 
much for anybody?

The intention of the book is to stimulate cross 
fertilisation between the clinical and basic 
sciecne, and it is likely to achieve this. 
The individual sections are too long with 
no guide or overview. As often with multi-
author texts, it reads like a number of 
separate independent reviews. The basic sci-
ence and "etiopathogenesis" sections were 
too indigestible and intimidating for this 
clinician. The section on clinical aspects has 
some well reproduced MRI pictures but 
otherwise the text is rarely broken up apart 
from laborious tables with the familiar stand-
ard error bars.

Neurochemistry and molecular biology 
will not interest the clinician until they 
become of clinical importance. We all 
remember the dopamine deficiency in PD 
but who remembers the other neurochemical 
deficiencies? This ambitious book has been 
written too soon, since there is little direct 
clinical relevance of much of the basic sci-
ence. It will not be a best seller and it is 
difficult to see who will rush out to buy it, 
whether clinician or scientist, and I suspect 
that much of the basic science data will be 
out of date soon.

Not a book for the busy clinician! Too 
detailed with too little or relevance and too 
long. (500 pages).
D BATEMAN

Pride and a Daily Marathon. By JONA-
TH COLE (Foreword—Oliver Sachs) (Pp 
Duckworth. ISBN 0-71562385-0.

At the age of 19, Ian Waterman developed 
a severe sensory neuropathy, resulting in 
almost total loss of position sense in the 
limbs. He became a "deafferented man". He 
might have remained unchanged until another 
individual battling with serious disability and 
handicap, confronting, overcoming or being 
overcome by the various frustrations of living 
in a world with limited sympathy for such 
problems. I was fortunate not meet Dr Jonathan Cole, 
a clinical neurophysiologist and a man with 
broad interests and erudition. As a result of 
this interaction, Ian Waterman's story will 
join a number of classic case studies in a 
genre which includes Freud, Luria, Brodal, 
and of course Oliver Sacks, who has written the 
foreword.

Jonathan Cole has produced a painstaking, 
intricate account of Ian Waterman's story, 
mingleingbiography, science and philosophy. 
The biographical component details Ian 
Waterman's background, and describes the 
onsset and evolution of his neurological symp-
toms. Jonathan Cole dwells on the details of 
the initial days, weeks and months of Ian's 
illness. We follow him through a series of 
good and bad experiences with nursing and 
medical staff. Some contacts with neuro-
gists seem to have contributed: largely by 
stimulating Ian to prove their prognostics 
wrong! The account of Mr Waterman's pro-
longed struggle for recovery is illuminated by 
Jonathan Cole's reflections on the physiology 
of the nervous system and the pathophys-
ology of the disorder, and the recovery process. 
Aside from his struggle to overcome physical 
disability, Mr Waterman faced personal trag-
edy, and many periods of demoralisation and 
depression. Yet he was able to reassess his 
will and continue the struggle for independence 
and fulfilment. Dr Cole muses on that quality 
of pride which drives Ian Waterman, and which 
seems to contribute so much to the 
capacity of people with neurological dis-
orders to overcome formidable obstacles?
One suspects that the imperfections of health 
care and society often frustrate, but may also 
help to motivate some individuals. Most 
neurologists, and many other health care 
professionals, will wish to share Ian Water-
man's journey and Jonathan Cole's reflec-
tions on the neurology and psychology of 
nervous injury. The writing is concise, lucid and 
entertaining. The book is nicely produced and 
reasonably priced. It will become a classic of its 
kind.
NIGEL LEIGH

A few of the chapters describe systems 
which are outmoded and appear extremely 
primitive when considered side by side with 
the very sophisticated systems described else-
where in the book. There are a few muted 
warnings of the dangers of surgical sense 
being overwhelmed by sophisticated com-
puterage but the breadth and future possibil-
ties of these developments are obvious. The 
book is well bound and well printed but the 
illustrations are disappointingly drab. This is 
not the book that the system it describes will 
be quickly superseded, it should certainly be in the library of any unit 
engaged in or entering the field.
ER HITCHCOCK

JOHN H MENKES (Pp 832; Price: £55.00). 
UK Distrib: Williams & Wilkins Ltd. ISBN 
0-8121-1266-0.

Menkes' Textbook of Child Neurology has 
become well established now as one of the 
small elite of texts covering this broad sub-
ject. In the introduction to this new edition 
Menkes draws attention to the difficulty that 
single authors or those in one's cohort of 
contributors, have in keeping abreast of all 
the major developments within a field. In the 5 years since the publication of 
the 3rd edition there have been major devel-
lopments in relation to the application of 
imaging, and particularly magnetic reso-
nance imaging, to the nervous system and 
also the impact that has already occurred 
from the advances in molecular biology. He 
has attempted to integrate some of these and 
the illustrations of magnetic resonance imag-
ing scattered through the text. There is a new 
introductory chapter on the neurological 
examination of the child and infant and 
potted summaries of some of the new inves-
tigative procedures and their potential 
value.

In addition to an update from the contrib-
utors to the 3rd edition, which include a 
very comprehensive review of infections of 
the nervous system by Marvin Weil, neuro-
logical manifestations of systemic diseases by 
Harry Chugani and disorders of mental devel-
ment by Marcel Kinsbourne, Menkes has 
also enlisted the collaboration of a 
neurosurgeon, Kenneth Till, in the chapters 
on malformations of the central nervous 
system, post-natal trauma and injuries by 
physical agents, and tumours of the nervous 
system.

In some sections such as malformations, 
infections and metabolic diseases of the 
nervous system are covered in great detail 
whereas other sections provide a very broad 
baseline with relatively short vignettes on 
individual diseases.

In this book on neurological aspects of 
incontinentia pigmenti. There was 
nothing in the text but a reference to Table 
10-13 (page 571) which listed the basic 
components of the syndrome plus a reference 
(number 248) which was to the Doman-
Delacato treatment of neurologically handi-
capped children (1968). In contrast Breit's 
textbook contained some 3 pages on the 
subject. On the other hand, a section on 
schizencephaly provided a very comprehen-
sive review of the subject, which in turn was 
unindexed and not visible in Breit's book.

Computers and Stereotactic Neuro-
surgery. (Contemporary Issues in Neuro-
logical Surgery, Series edited by P J KEI-
DIN and J A KALL (Pp 365 Illustrated; Price: 

One of the great revolutions in neurosurgery 
has been the introduction of stereotactic 
techniques which have become increasingly 
important largely because of improvements 
in imaging and the ability to integrate sophis-
ticated medical images with the stereotactic 
apparatus. This revolution continues with the 
expansion of computer imaging techniques 
which not only reveal the target co-ordinates in 
relation to the surgical system but also has the 
ability to demonstrate a large variety of 
lesions in three and even four dimensions. 
This book brings much of this work together.

Admittedly a great deal of the text has 
appeared elsewhere but the collation of this 
international expertise has been achieved very 
successfully. It deals with computer-
based image processing with a particularly 
good description of the Analyze Software 
Package and goes on to describe computer-
based stereotactic atlases, on-line analysis 
and functional mapping. The value of com-
puter systems in surgical planning is covered 
extensively and there is a section on robotic 
systems.