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EDITORIAL

Clinical Neurophysiology and Mental Illness

The problems of investigating the brain-mind interface remain enormous. Recent developments in quantitative mental state examination and biological measurement have opened up many new and promising avenues of research. The introduction of cheap, powerful microprocessors is bringing computer technology within the range of the average hospital budget. Hence much of the new technology of computer analysis of the EEG, automated cognitive testing and ambulatory monitoring should, within the next 5 or 10 years, be available to apply to the management of clinical problems. It is therefore important to attempt to predict those developments that are likely to be clinically useful. These can be presented under the headings of patient investigation and management as follows :

(A) Investigation of clinical problems :

Ambulatory EEG monitoring is clearly going to be useful for the investigation of the epilepsies. The technique of simultaneous videotape and EEG recordings has been used to intensively monitor the behaviour and FEG activity of epileptic patients over long periods (hours or days). Although brief spike – wave bursts are usually undetectable clinically, they nonetheless impair performance. It is recommended that anticonvulsant therapy should be aimed at suppressing all spike – wave bursts, not just the longer, clinically obvious ones. This can be implemented through EEG ambulatory monitoring by radiotelemetry on magnetic tapes or a small cassette recorder. Event related potential (P 300) and EEG coherence measures are likely to be useful indicators of early dementia, if the recent findings are replicated. The cerebral res-

ponse to a series of stimuli evoke a consistent pattern of potential change, which can be displayed on a visual display unit or on a platter. The greater the number of stimuli used to evoke the response the clearer is the waveform pattern evoked by the stimuli. Such a potential response is now known as an event related potential (ERP). The auditory brain stem evoked response is already established as an objective measure of hearing threshold and will probably have a routine use in the screening of language disordered children. The CNV may become a valuable non-invasive test of cerebral dominance. Contingent negative variation (CNV) is a slow negative potential change, most marked at the vertex in scalp recordings, which occurs in the cerebral cortex when a subject is preparing to respond to a stimulus. Automated cognitive testing using microprocessors is certain to find an established role in the investigation of the cognitive changes of organic cerebral disease.

(B) Management of patients :

Automated testing will also be useful in monitoring psychotropic drug effects. The EEG will also be useful in monitoring change in response to treatment in the following ways : (1) the CNV as a measure of change in sexual object preferance in sexual offenders, of response to behaviour therapy in phobic patients and as a measure of other attitude changes, e.g. to food in anorexia nervosa; (2) the readiness potential as an objective measure of drug induced extra-pyramidal effects.

(C) The CEEG profile as a means of assessing psychotropic drug action :

Quantitative pharmaco-electroencephalography to describe the application of computer analysis methods to study psychotropic drug action. In psychopharmacology, the EEG has the advantage over biochemical assay methods in that the blood brain barrier is not a problem. The EEG changes directly reflect changes in cerebral activity. Psychotropic drug action can be classified into :

A. Anxiolytic compounds : reduced alpha activity and fast beta activity.

B. Major tranquillizers : increased delta activity and reduced beta activity.

C. Antidepressants : increased delta, reduced alpha and slow beta and increased fast beta frequencies.

The research on neurotransmitter mechanisms in dementia may lead to rational therapy, e.g. the use of lecithin supplements to improve cholinergic function in dementia. The widespread deficiency in the cholinergic system affecting the cortex and hippocampus severely in presenile and senile Alzheimer was observed. Cholineacetyl transferase and acetylcholine esterase have been found to be markedly deficient. Also reduced GABA and glutamic acid decarboxylase in Huntington's chorea.

Advances in immediate clinical relevance involving high cost technology and outside the range of average Health District budget include the CT scan and cerebral blood flow technology. The enormous demand for available CT scan facilities will restrict the psychiatrist's use of this machine to the investigation of the occasional patient with suspected focal cerebral disease. CT scan research in mental illness and even the clinical investigation of the dementias is likely for the foreseeable future, to be confined to a few teaching centres. Cerebral blood flow measurement research in psychiatry will suffer from the same problems. Positron tomography for the assessment of the metabolism of neurones is another costly investigation.

Finally, promising areas of research likely to throw light on the brain mechanisms of mental illness but having no immediate clinical relevance require to be outlined. These include EEG measures of specialisation of hemisphere function in patients with language disorder and in schizophrenics, the later ERP components, CNV in relation to attention processes in schizophrenia and the other psychoses, the high risk strategy and ambulatory monitoring as a technique to study the

interaction between the environment and physiological changes in psychiatric patients. The kindling model may be useful in the experimental study of abnormal behaviour.

As a clinician, it is tempting to advocate that the cheap technology areas of clinical application should have priority in the allocation of research funds. However, research findings of current theoretical interest contribute to the pool of knowledge about brain function and may in the future be found to lead to unpredicted clinical applications. Therefore it would be wrong to apply the criterion of immediate clinical relevance too rigorously. Predictions of future developments in scientific research are as notoriously prone to error as those in politics and economic. Hence it may be better to adopt a laissez-faire approach to supporting research in our field as in others, i.e. assessing each application for a research project grant on its scientific merit regardless of direct clinical relevance.

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