

GENERAL OUTLINE

The temporal lobe is the most common site of onset of focal cerebral seizures. This provides us with abundant material for study.

Patients with temporal lobe seizures most commonly have some form of mental disturbance during or immediately following their attacks. These include automatic behavior with amnesia, illusions, hallucinations, emotional disturbances, and occasional full blown psychotic states.

Patients with temporal lobe seizures frequently have episodic or chronic psychiatric disorders ranging from personality and behavior disorders to various forms of psychosis. Relations between such apparently non-ictal mental disorders and pathological processes (lesions or epileptic discharge) within the temporal lobes is obscure.

Electrical stimulation of the temporal lobe during surgical exploration under local anesthesia has shown that memories, perceptual illusions, and emotions can be aroused in the patient by local activation of the cortex of the temporal lobe. Amnesia and automatic behavior results from stimulation of the region of the amygdaloid nucleus. This usually results in a "suppression" of the electrical activity of the temporal lobe, epileptiform and normal rhythms alike.

All of these findings suggest that the temporal lobe is of particular importance in the elaboration and control of certain forms of memory, dreams, hallucinations and delusions. It may also be related to the nervous substratum of judgments based

upon the interpretation of perceptual experience, and also to certain aspects of the affective or emotional life of man.

Further analysis of such material as is offered by patients with temporal lobe seizures, if made by a team of workers, should yield information of importance to our understanding of the normal function of this large portion of the human brain, and the mechanisms whereby its dysfunction may result in mental disorder and abnormal behavior. Such a project requires a coordinated program of work in psychiatry, psychology, neurology and neurophysiology to achieve the greatest success.

BUDGET

1. Psychiatrist, Dr. Shafica Karagulla	\$ 4,800.00
2. Neurologist, Dr. Lamar Roberts	4,800.00
3. Psychologist, Mrs. Brenda Milner, Ph.D.	3,600.00
4. Psychological technician	2,400.00
5. Research advisors in psychiatry Prof. Stanley Cobb Prof. Laurence Kubie Dr. A. V. Kral	2,400.00
6. Secretary	2,400.00
7. Miscellaneous and overhead	1,600.00
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Annual total	\$ 22,000.00
Three year term	\$ 66,000.00

PERSONNEL

L. Psychiatrist

The full-time Psychiatrist, Dr. Karagulla, is to carry out complete psychiatric examinations and intensive studies of the mental and emotional characteristics, and social behavior, of all patients included in this study. She will assist in observing the responses of patients to the direct stimulation of the temporal lobe during Dr. Penfield's operative procedures. The effects of temporal lobectomy will then be recorded in detailed follow-up studies during the early and late post-operative period. The mental disorders and disturbances in personality and behavior so commonly found in patients with epileptogenic lesions of the temporal lobe will be carefully analyzed for comparison with similar disorders in patients with chronic mental diseases.

Dr. Karagulla's capability in this field has been manifest during the past six months she has been studying these patients at the Montreal Neurological Institute. She came to us with very high recommendation from Professor Sir David Henderson of Edinburgh, with whom she has been working in psychiatry for over five years. She came out here on her own initiative to compare temporal hallucinations with those she had studied in psychotics.

She is of Turkish origin, obtaining her medical degree from the American University of Beirut, Lebanon, in 1940. She is now a British subject, has a diploma in Psychological Medicine, and is a Member of the Royal College of Physicians, Edinburgh.

Dr. Ewen Cameron has assisted us in her selection for this work.

2. Neurologist

The Neurologist would be responsible for clinical neurological studies, including special studies of speech, detailed analysis of the pattern of epileptic attacks with the aid of cinematography and correlations with electroencephalographic and pneumoencephalographic evidence. He would participate in recording and working up the results of investigations carried out in the operating room on the exposed temporal cortex. This would include responses of the conscious patient to electrical stimulation in relation to simultaneous records of the electrical activity of temporal cortex and adjacent areas of brain. Post-operative follow-up studies would then be made to help determine the effects of temporal lobectomy. He would also be responsible for pathological studies on the excised tissue.

In addition to these clinical investigations the Neurologist would cooperate with other workers in experimental studies of the physiological properties and anatomical connections of the temporal lobe and amygdaloid region in the attempt to elucidate neurophysiological mechanisms of this area as related to comparable observation on man. Such physiological studies have been under way in our laboratories for several years but much more remains to be done (see Reprints enclosed).

There are two or three good men who might be available as

full-time Neurologists for this project. Tentatively we would recommend Dr. Lamar Roberts who has distinguished himself in many ways during his work at the Montreal Neurological Institute since 1946. He received his medical training at Duke University. During his clinical training in neurology and neurosurgery it became obvious that he was a man of unusual ability. He has also spent three years in research work leading up to Master's degree and Ph.D. in the Faculty of Graduate Studies at McGill University. His doctorate thesis entitled "Alterations in Speech Produced by Cerebral Stimulation and Excision" was an outstanding piece of work which is being prepared for publication with Dr. Penfield at the present time.

Fortunately Dr. Roberts is also an experienced and very competent Neurosurgeon who will be able to assist with operative procedures, and he is able to undertake the responsibility of carrying out operations in Dr. Penfield's absence.

3. Psychologist

The full-time Psychologist would be engaged in the administration of a battery of psychological tests especially designed and selected for testing temporal lobe function. These would include analytic tests of various forms of intellectual function with special emphasis on memory, visual, auditory and tactile perception, reproductive imagery, and special tests of spacial relationships. Test results before operation will be correlated

with evidence for temporal lobe lesions, and compared with effects of temporal lobectomy by re-examinations following operation.

Mrs. Brenda Milner is an excellent candidate for this part of the work because of her proven ability and training with Professor Hebb, and because of the studies she has already carried out on patients with temporal lobe lesions and excisions. She is thirty-four years of age and married to a Scientist working in Montreal. Before coming here in 1944 she had graduated from Cambridge with first class honors and studied for five years under Professor Sir Frederick Bartlett, well known English Psychologist.

During the past three years she has been examining patients with temporal lobe seizures with a battery of tests which provided the material for her Ph.D. thesis accepted with distinction last year. She is now modifying her test battery to extend her results which have already brought to light some important and interesting intellectual defects resulting from temporal lobe lesions.

In this connection we should mention the active participation of Professor Hebb in the direction of this work.

4. Psychological Technician

In addition to the comprehensive analysis of intellectual functions proposed for the Chief Psychologist we shall need another Psychologist to work with the Psychiatrist to administer special personality tests such as the Rorschach and other tests

to aid in the objective analysis of the patient's mental and emotional make-up, and to test the changes that result following temporal lobectomy.

5. Research Advisors in Psychiatry

Professor Stanley Cobb, who has recently spent three days with the various workers and with some patients in Montreal, has proved the value of senior advisors in order to make the most of an investigation of this kind. Professor Cobb has helped to plan this project during the conference held with him recently in Montreal.

Some time ago Professors Laurence Kubie and Gilbert Glaser and Dr. Paul MacLean paid us a similar visit and left us with important criticism and constructive suggestions regarding the psychiatric implications of this work.

We have been fortunate in having the personal interest and support of Professor Cameron and other members of the staff of the Allen Memorial Institute of Psychiatry in the guidance of these investigations. These experiences have impressed us with the value of continued consultation with senior psychiatrists in order that the broad psychiatric implications of this work may be explored to the utmost.

In addition to Professors Cobb and Cameron, we are considering approaching Professor Kubie, as indicated by Dr. Penfield.

Under consideration also is Dr. A. V. Kral, a senior Czechoslovakian Psychiatrist, former medical director of the Sanatorium for Mental and Nervous Diseases in Prague, now on

the staff of the Verdun Protestant Hospital, Lecturer in Psychiatry at McGill University and Director of Technical Services on a Dominion Provincial Grant. Dr. Kral has published extensively on the subject of mental disorders in relation to pathological studies of the brain. Professor Cameron has recommended him for consideration as being able to provide valuable assistance with these temporal lobe problems.

6. Secretary

Typing, filing, and classification of the large amount of data being continually collected by the various workers on this project will necessitate a full time secretary.

DIRECTION and PUBLICATION

Professors Penfield and Jasper have been closely associated in studies of the temporal lobe, among other subjects, for about fifteen years at the Montreal Neurological Institute. The book now being published on "Epilepsy and the Functional Anatomy of the Human Brain" presents a summary of much of this work. Penfield's previous work in this field, especially his discovery of elaborate psychical experiences which can be evoked by electrical stimulation of the temporal cortex in man, and his general conception of temporal lobe function in relation to conscious mental processes will provide a valuable working hypothesis. Jasper's previous training in psychology (Ph.D. Iowa) and his previous electroencephalographic and neurophysiological studies of the temporal lobe, especially in relation to subcortical structures should also be a distinct advantage in the direction of this work.

We plan to publish this work, together with related studies from other laboratories, in the form of a comprehensive monograph on the temporal lobe.