

Meeting on the Temporal Lobe - January 31st, 1953.

Present: Drs. Penfield, Cobb, Hebb, Jasper, Feindel, Roberts, Milner and Karagulla.

Dr. Penfield: The pathology of these cases is frequently that of herniation of the mesial aspect of the temporal lobe across the free edge of the tentorium.

Stimulation has produced:

1. Illusions of interpretation on the inferior, superior and slightly on the lateral aspects of the temporal lobe.
2. Emotion of fear or loneliness in approximately the same places as 1.
3. Hallucinations in the upper lateral and superior aspects of the temporal lobe (temporal speech area is in the same zone).

Automatism may occur:

1. After any major seizure.
2. With 3/sec. wave and spike discharges in the centrencephalic system.
3. With temporal lobe discharge. In the latter instance there is knocking out of the mechanism in the centrencephalic system which deals with memory recording. This is located close to the uncus and amygdaloid nucleus. It is postulated that the carpet of cortex dealing with memory and interpretation passes through the amygdaloid to the centrencephalic system.

Dr. Jasper then pointed out that Dr. Gastaut with implanted electrodes in the amygdaloid nucleus in cats had produced during stimulation smacking movements and searching similar to the automatism seen in patients.

Dr. Milner: The results of psychological testing of these temporal lobe cases may be divided into three types of disturbances:

1. Visual disturbances, as illustrated by the difficulty in identifying the incongruities in picture absurdities and also in Wechsler's picture arrangement tests. These disturbances may occur with lesions in either temporal region but not in frontal or parietal lobes. They are more marked in patients with bilateral E.E.G. abnormalities in the temporal region and have not been seen in a few cases with relatively small removals on the lateral surface of the temporal lobe.
2. The patients with right temporal lobe involvement have very poor spatial ability, as illustrated in tests with block construction, both visual and tactile, and also in their drawings. These difficulties have not been observed in lesions of the left temporal lobe. Non-dominant parietal removals may give the same type of spatial disturbances. In one patient with a left temporal lesion with an I.Q. of around 120, there were difficulties in spatial ability as seen in those cases with right temporal lesions. No effect on speech was produced on stimulation and there was no aphasia after operation. In another patient who was left-handed and had a right temporal removal,



there was a typical spatial loss, as seen in a right-handed patient; and there was no speech disturbance. However, there are some truly negative cases, as that of Stutzman, who had superior intelligence and two operations, the first removal of the occipital lobe and the second removal of the temporal and parietal lobes on the right side. He showed none of these spatial difficulties. Another patient, Mary Martin, had a large right temporal removal, with bilateral temporal lobe disturbance electrographically, and she had no spatial difficulties.

Dr. Hebb pointed out that this might be explained by shift to another locus or that the patient may never develop a specific locus as a normal one would.

3. Memory disturbances have been noted to be most severe in those cases with bilateral E.E.G. abnormalities, as in Burnham and Carsky. Another patient, O'Leary, with the same removal as Burnham, had no difficulty but he also had no electrographic discharge in the opposite temporal region. I have insufficient data so far to draw any definite conclusions as regards memory disturbances.

Dr. Penfield pointed out that the mesial zone of the temporal region was probably the most essential.

Dr. Karagulla:

I have studied 39 patients with temporal lobe seizures, of whom 23 have been operated upon. Twenty were unilateral and 19 bilateral. Twenty-seven of the 39 patients presented psychiatric problems, and 14 had to be hospitalized for psychiatric reasons. Of the patients with bilateral temporal E.E.G. abnormality, 18 out of 19 had psychiatric problems and 11 had to be hospitalized. Only 50% of those with unilateral involvement had psychiatric problems, and only 20% had to be hospitalized.

The 18 patients with bilateral E.E.G. involvement had the following psychiatric problems:

- 4 Definite mental retardation
- 2 definite memory difficulty
- 1 irritability
- 1 behavioural disturbance
- 5 manic depressive
- 3 post-epileptic psychosis
- 1 suicidal attempt
- 1 paranoid trend, post-epileptic.

Some patients showed post-operative memory disturbances with clouding of consciousness and disorientation. The patients with severe memory loss did not show confabulation. They had insight with no attempt to cover up the periods of loss of memory; Mr. Hudson, for example, admitted a period of months for which he had no memory. Those patients with hallucinations not related to overt seizures also had good insight.



Part of the difficulty in those patients with mental retardation is due to subclinical aphasia. If one gives them something to repeat that is well known, they speak much faster than ordinarily. They show retardation without mood disturbance. Their slowness may not be related to seizures or to medication.

Dr. Cobb pointed out that this slowness is seen in a lot of epileptics but is hard to separate from the effects of drugs. Dr. Penfield then stated that some of it might be due to the seizures themselves. Dr. Cobb then pointed out that if the seizures are relieved there is improvement in the whole socialization.

Dr. Karagulla stated that in some patients the memory might be so bad that they would be unable to hold their jobs. In others, for example, Mary Johnson, aggressive, impulsive behaviour is noted. The nature of the seizures might be such that the patient could not be employed though he might not be otherwise psychiatrically disturbed. Dr. Karagulla pointed out the difficulties that might arise from prolonged automatism, and she mentioned the personality changes that might occur in patients with seizures as regards their personal appearance, the way they dress, etc.

Following the presentations of Drs. Milner and Karagulla, the meeting was opened for discussion.

In answer to Dr. Hebb's question, Dr. Karagulla stated that she had no controls.

Dr. Penfield stated that it was his impression that psychiatric problems were more frequent in temporal lobe cases.

Dr. Karagulla stated that the automatism produced by stimulation was like that seen in patients with psychiatric difficulty which was prolonged over a period of months and for which the patient had no memory. She stated that Dr. LeGros Clarke was publishing a paper on psychiatric disturbances in connection with lesions of the amygdala.

Dr. Feindel wanted ~~to~~ to know if the disturbances appearing ictally should not be distinguished from those ~~which~~ which were inter-ictal.

Dr. Cobb stated that this was a matter of semantics and that all were psychiatric problems. For example, a typical schizophrenic reaction can be produced with ACTH and that it may last for only four or five days.

Dr. Karagulla stated that lysergic acid treatment gives the same psychiatric disturbances.

There followed a discussion of terminology, in which it was decided that "episodic", "acute" and "chronic" would



be useful words. The acute conditions might be manic depressive, schizoid, etc.; and the episodic usually would be epileptic ~~xxx~~ phenomena.

Dr. Jasper pointed out that Dr. Gibbs had been able to control the seizures in some patients but had never been able to improve the chronic mental disorder, and that it may be even worse.

Discussion then followed on visual hallucinations produced in the blind field after operation. When asked, Dr. Karagulla stated that she was unable to make any generalizations of the hallucinations.

Dr. Hebb reported on the following experiments: Of the effect on individuals of as much sensory deprivation as possible. These people were put into a soundproof box, goggles over their eyes and with their hands and feet wrapped. After a period of 20 to 36 hours, all of them had visual hallucinations and one had auditory hallucinations. For example, one person awoke from sleep stating that he had had a vivid dream which had continued after awakening. Usually the dreams have been very simple at first, but gradually more complicated and bizarre. If the patient were attempting to solve a problem or were talking to the experimenter, the hallucinations disappeared. During this time they did not do as well in arithmetic and other problems and they appeared to leap to conclusions and act like a "drunken man". They were oriented except as to time, which might be several hours up to twelve hours off after a period of four to five days. During the first twenty-four hours they slept a great deal but after that they did not sleep very much. This experiment was started because of the assumption that normal behaviour depends upon a great variety of stimuli. Dr. Hebb also mentioned that Lippman had shown in patients with migraine a distortion of the body image in that the limbs might feel full and changed.

Dr. Jasper then asked if that meant that some of the effects might be negative rather than positive.

Dr. Hebb replied that that is possible and also that his observations were like the results of stimulation and the sequence of the hallucinations.

Dr. Jasper pointed out that Dr. Davies had shown a generalized "floating effect" in the E.E.G. with the onset of sleep. He then asked why the hallucinations continue in some patients after that part of the cortex had been removed. He stated that hallucinations could occur without E.E.G. abnormality. He stated that discharge in the amygdala was associated with flattening of the E.E.G. record at the onset of a seizure; this might be just on one side and not on the other and involve the temporal region but not the frontal and parietal and occipital. He also stated that this type of flattening has been seen in psychotic patients. He stated that hallucinations might be accompanied by



after-discharge or by no obvious change in form in the electrocorticogram.

Dr. Jasper also pointed out that automatism in its purest form might be temporal, with subcortical connections of course, but that the comparison of automatism with the temporal cases and those in petit mal and after a major seizure might show clinical differences. To which Dr. Penfield agreed.

Dr. Cobb then suggested that there might be two systems, one involving the diencephalon and the neocortex, and the other involving the amygdala and archipallium and caudate nucleus and the orbital gyri and temporal lobe.

Dr. Penfield then stated that it was hard to see how local discharge could knock out memory recording from the opposite temporal lobe. Dr. Feindel suggested that the bilaterality might be through the anterior commissure without involving the centrencephalic system.

Dr. Jasper said that the commissure of the fornix might also be involved.

He then asked if automatism might be produced by simple withdrawal of cortical function of the temporal lobe.

Dr. Penfield stated that that portion of the centrencephalic system that deals with motor and sensory, etc. is not knocked out in automatism. By that Dr. Jasper demonstrated that the petit mal is more knocked out.

Dr. Penfield, however, stated that all grades are seen with a temporal lobe lesion.

Dr. Jasper then stated that if petit mal automatism is indistinguishable from temporal, then the hypothesis is wrong.

Dr. Cobb, however, said that you would expect one part not to work alone but in conjunction with others.

Dr. Jasper then brought up the discussion of the connections of the temporal lobe with subcortical structures. He pointed out that Pribram and Lashley had shown retrograde degeneration to the pulvinar. After-discharge and single shock studies have shown the lateral temporal region to be connected with the thalamus, hypothalamus and striatum. Dr. Penfield then asked if this was funnelled through the amygdaloid, and Dr. Jasper said no. He then pointed out that the fornix is composed of, first, the connections of the hippocampus to the mammillary bodies and, second, connections of various portions in the temporal region to the hypothalamus, mammillary bodies and septal nuclei. He also stated that the striae from the amygdala go to similar areas. It was also pointed out that psychiatric disease has frequently been shown to be associated with involvement of the mammillary bodies and the diseased process.