EPILEPSY HANDBOOK

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PREFACE

THIS BOOK is intended to be a compact, practical compendium of useful knowledge about epilepsy. It is based on an analysis of many thousands of cases (1). Theory, discussion, and illustrations are held to a minimum; references are restricted to key articles and recent reports.

The busy doctor wants to know: What is wrong with the patient? How can it be corrected? How can it be avoided in the future? These are penetrating and entirely proper questions. They are answered here in as straightforward a manner as the state of our knowledge permits. If the answer is not always as brief as the reader expects, that is because background information is needed for understanding. In the end, understanding is a great time saver.

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EPILEPSY HANDBOOK

Chapter I

WHY AND WHEREFORE

EPILEPSY is as common as tuberculosis and can masquerade in so many forms that any busy doctor will be treating it knowingly or unknowingly. If he goes to his textbooks to read up on the subject, he will find there an extraordinary assortment of misconceptions and errors. New information has developed so rapidly in the last few years that no time has been allowed for dead opinions to be given a decent burial.

Much of the new information has come from electroencephalography. Hans Berger, the father of this technique, said, "The electroencephalogram is to the brain what the electrocardiogram is to the heart," but for understanding epilepsy electroencephalography is even more important. It makes visible what otherwise may be hardly suspected; it reveals epileptic discharges even when they are subclinical.

Over the past 20 years studies on epilepsy have been conducted by scores of electroencephalographers in separate laboratories and clinics around the world. Each has reported his findings in his own language, and though each has used his own more or less personal terminology, all statements have added up to much the same thing: Epilepsy is disordered regulation of energy release within the brain.

As a result of animal experiments, a steadily increasing stream of new anticonvulsant substances has poured out from research laboratories and pharmaceutical companies.

By using these for all they are worth, and in the most rational manner, seizures can now be controlled in 80 per cent of patients with epilepsy.

Chapter II

WHAT IS EPILEPSY*

WHAT AN observer sees as an epileptic fit and what the patient experiences before, during, or after one is but a small part of a much larger picture. The hidden part is most interesting and informative, for it is the part that tells what goes on inside the patient's brain; not his thoughts nor his emotions, nor even his "unconscious mind" but something more basic: the flow of energy in his brain. When this is brought into view, we see that the old disease, *epilepsy,* which we have known for centuries, is but the outward manifestations and subjective sensations that occur when energy release in the brain is improperly timed and spaced. This may sound complex and even philosophical, but as the following section will show it is essentially simple.

CEREBRAL DYSRHYTHMIA

To regard the brain as an engine or energy converter is not unrealistic, for energy conversion, storage, release, and limitation of energy release are important functions of the nerve cells of the brain. Sugar and oxygen are the basic fuels of the brain and, since part of the product appears as electricity, the brain can be regarded as an electrochemical generator.

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* For a detailed documentation and validation of many of the statements in this book the reader is referred to the *Atlas of Electroencephalography* (1). This contains an E.E.G. analysis of 11,000 cases and a lengthy bibliography.

A small but significant fraction of the brain's total electrical output can be registered in the electroencephalogram. Normal human adults have a fluctuating voltage recordable from the outer surface of the head as an irregular pulsation that commonly has a dominant rhythm of 10 cycles per second. Persons with epilepsy, during an epileptic seizure and often in the interval between clinically observable seizures, produce high voltage discharges that are sometimes faster and sometimes slower than the normal 10 per second rhythm. Such discharges are evidence that in epilepsy the brain's control of voltage production is defective. Since voltage production in the brain is chemical, such discharges are evidence of abnormal brain chemistry or, to use medical terminology, they indicate a disordered metabolism of the cerebral neurons.

Chapter III

WHAT CAUSES EPILEPSY

THE brain storms (paroxysmal cerebral dysrhythmias) of epilepsy that manifest themselves clinically as epileptic fits and electroencephalographically as seizure discharges are not caused by mysterious agents, but by the same physical causes that can produce serious disturbances in any other organ, for example, in the heart. The same thing that can cause a severe cardiac disorder can produce the cerebral dysrhythmias of epilepsy, for example, trauma, infection, oxygen lack, tumors, abscesses, toxins, and general metabolic diseases. But the injury that produces epilepsy cannot be too severe. It must produce an intermediate, non-lethal degree of injury to cerebral neurons. Such injury* usually is not visible with the naked eye or even with a microscope.

When neurons are killed, they do not produce epileptic seizures. Therefore, destructive lesions, the kind that show so clearly in gross pathological studies and in microscopic sections (for example, areas of softening, atrophy and scarring), are not as likely to be associated with epileptic seizures as lesions that occur when neurons are harmed but

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* Perhaps the word *injury* will seem too strong; it may be thought of as connoting structural damage, but this is not a necessary connotation. We speak of a man being *injured* by an attack on his reputation. *Harm* might seem a better word, but the difficulty arises not for want of a proper word but because we do not usually recognize that an injury can be associated with chemical derangements in a tissue and that these may be highly significant even though unaccompanied by gross or histological structural changes.

not destroyed, when their intimate chemistry is upset, not enough to make them stop functioning, but just enough to make them function abnormally.

There are no characteristic structural changes in epilepsy, for the pathology of epilepsy is not structural but

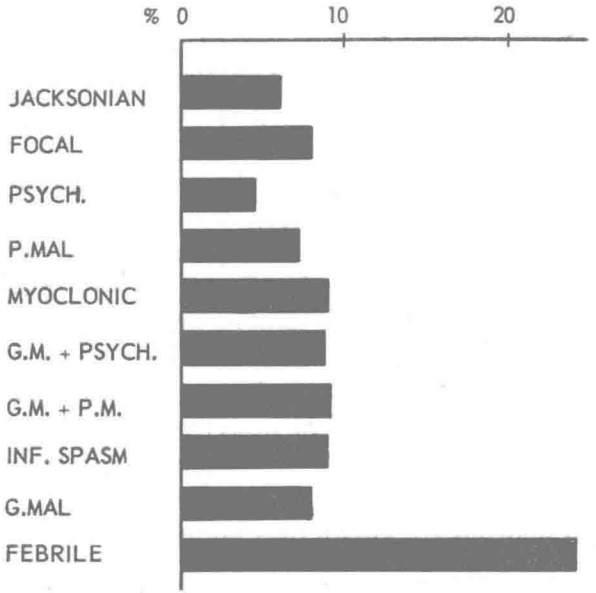

FIGURE 1. Incidence of a positive family history of epilepsy in different types of clinical epilepsy. A history of seizures in parents, siblings, grandparents, aunts, or uncles was considered a positive family history (more distant relatives were not included).

For the purpose of the analysis no distinction was made between cases in which several relatives had seizures and cases in which only one was affected. Abbreviations are as follows: INF. SPASM, infantile spasms; MYOCLONIC, myoclonic seizures; FOCAL, focal convulsions; JACKSONIAN, Jacksonian seizures; G.M. and PSYCH., grand mal and psychomotor seizures; G.M. and P.M., grand mal and petit mal; P. MAL, clinical petit mal with no other type of clinical seizure; G. MAL, clinical grand mal with no other type of clinical seizures; PSYCH., psychomotor seizures; FEBRILE, febrile convulsions.

physiological. Epilepsy shows in the electroencephalogram but not in stained sections. This does not mean that epilepsy is not due to *real* injuries. The injuries that produce epilepsy are less extreme but just as real as those that produce structural damage.

Around an area of destruction in which function has been abolished, there is often a zone of less severe injury in which seizure activity develops. So also during recovery a stage of intermediate recovery may develop which corresponds to mild injury, and in this state seizure activity is likely to occur.

To put this in a nutshell: Epilepsy is what the brain does when it is slightly injured. For this reason, epilepsy is a common and also a treatable disorder. It is functional, reversible, and hopeful, in contradistinction to the classical neurological disorders which are structural and, therefore, largely irreversible and hopeless.

HEREDITY

Without doubt there is a constitutional factor in epilepsy (2, 3) as there is in almost all other diseases, but this factor has been greatly exaggerated. It is no greater than in diabetes and is not anywhere near as great as in hemophilia, Wilson's disease (hepatolenticular degeneration), or for that matter manic-depressive insanity. By referring to Figure 1 it will be seen that, in general, one case of epilepsy in ten has a positive family history of epilepsy among near relatives. However, patients with febrile convulsions (see page 32, Chapter X) are exceptional, for one case in four has a positive family history of epilepsy. Fortunately, this most inheritable type of epilepsy is also the most benign; seizures usually cease after five years of age and do not recur in later life. (For a discussion of the possibility that epilepsy will occur in offspring see page 81.)

For many years a distinction has been made between *symptomatic* and *idiopathic* epilepsy. Persons with idiopathic epilepsy were believed to have no brain injury but only a constitutional defect. Careful study of the matter reveals, however, that constitutional factors are no more important in epilepsy than in many other disorders. With increasing knowledge the dichotomy *symptomatic-idiopathic* has been found to be too coarse and arbitrary for clinical purposes.

IS IT A DISEASE?

The term *convulsive disorders* has been used by some authors to avoid the alarming connotations of *epilepsy,* but these two terms are not synonymous. A large part of the symptomatology of epilepsy is nonconvulsive; convulsions occur only when the discharge starts in or spreads to a motor system.

Since there are many forms of epilepsy, perhaps it would be better to refer to the *epilepsies* except when speaking of specific types. However, different types are often found in combination in the same case, and (as with diabetes and neoplastic disease) it is most convenient to include all forms, the pure types, transition forms, and mixed types, under a unitary general heading. Just as we do not say "the diabeteses" we do not find it convenient to say "the epilepsies."

Some authors have concluded that because epilepsy does not have a specific etiology it is not a disease but only a symptom complex. The same objection can be raised to *diabetes, nephritis,* and *arthritis.* A type of disordered functioning of an organ system is a valid basis for diagnostic classification.