RES MEDICA
Journal of the Royal Medical Society

Epilepsy

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Abstract
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The epileptic fit

The treatment of epileptic fits is a quite different subject from the treatment of epilepsy. Most epileptic fits require no active treatment whatever and provided that the patient is safeguarded from obvious hazards — falling into water and drowning or being run over by passing vehicles — then recovery will occur naturally and the patient can resume a normal life until next time. Occasionally there are complications, such as if a patient should vomit during an attack and from this point of view the treatment of the epileptic fit is not different from the management of unconscious patients in general.

ISSN: 2051-7580 (Online) ISSN: 0482-3206 (Print)
Res Medica is published by the Royal Medical Society, 5/5 Bristo Square, Edinburgh, EH8 9AL

Res Medica, Autumn 1974: 2-4
doi:10.2218/resmedica.v0i0.909

EDITORIAL

This issue of Res Medica is largely concerned with the subject of epilepsy, a chronic and often crippling condition, against which even the forces of modern medicine and surgery can only offer a feeble opposition.

One man in Edinburgh who was concerned about the plight of the epileptic was Professor Norman Dott. A great pioneer in the field of surgical neurology, his interests extended outside the operating theatre to the problems of his patients and their fellow sufferers in the community. He campaigned actively for them as leader of the Epilepsy Society in Edinburgh.

We were greatly saddened to hear of his death during the preparation of this issue, he will be sadly missed.

We would like to thank our contributors, and Dr. G.W. Ashcroft, Miss H. Harkins, and Mrs. P. Strong for their assistance in producing this issue.

EPILEPSY

HORACE R. TOWNSEND

Epilepsy is an unusual disease. For most of the time the sufferer does not suffer at all except from apprehension, the expectation that he or she may have a fit.

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The treatment of epileptic fits is a quite different subject from the treatment of epilepsy. Most epileptic fits require no active treatment whatever and provided that the patient is safe-guarded from obvious hazards – falling into water and drowning or being run over by passing vehicles – then recovery will occur naturally and the patient can resume a normal life until next time. Occasionally there are complications, such as if a patient should vomit during an attack and from this point of view the treatment of the epileptic fit is not different from the management of unconscious patients in general.

Status epilepticus

Very rarely, when the condition of epilepsy is severe, fits follow one another so frequently that there is no perceptible gap in between, and the patient is said to be in 'status epilepticus'. Such a condition is an acute medical emergency and is extremely difficult to treat. Management usually involves anaesthetising the patient, paralysing the muscles with curare and thereafter maintaining the respiration by mechanical means. The condition of Status Epilepticus, however, is almost always precipitated by some severe cerebral insult – a head injury, poisoning or the presence of an intracerebral clot – and treatment to be effective must be directed at removing the cause.

The diagnosis of Epilepsy

As I have said, however, the actual fit and its treatment or management is not the problem. The patient comes to his Doctor because he is apprehensive about attacks in the future. The diagnosis of epilepsy involves an estimate of the probable frequency, nature and intensity of future fits, which implies some idea of the causal factors. One hundred years ago Hughlings Jackson wrote "...we do not make a diagnosis worth calling one, if when we are called to a person who has had a severe convulsion and of whose case we have had no history we turn out to be right in having said 'It is a case of epilepsy ....".

Treatment of epilepsy may be aimed either at removing or reducing the cause of the attacks or may simply involve trying to modify that re-action of the brain which manifests itself as epileptic fits.

Theories of Epilepsy

Almost any brain injury, whether caused by violence, with contusion or actual piercing or tearing of the structure of the brain, or caused by inflammation, or bleeding within the brain, or by infarction due to shutting off of the blood supply to a region of the brain, or by the presence of a

congenital malformation or new growth, all may irritate the brain substance and cause the occurrence of epileptic fits. Jackson hypothesised that epilepsy was accompanied by a "discharge" in the grey matter of the brain "convulsions and other paroxysms are owing to (1) sudden (2) excessive and (3) temporary nervous discharges" and "it is the function of nervous tissue in health to 'store up' force and to expend it in an orderly manner at the provocation of special excitations. The discharge in disease differs from the expenditure of nerve force in health, in quantity and in that it is provoked by a more general excitation". When Hans Berger in 1929 published the results of his recordings of electrical potentials from the surface of the brain, and scalp, it became possible to demonstrate this discharge in the form of an electrical disturbance in living and conscious patients. Since then Jackson's insight has been amply confirmed and electroencephalography has proved to be a most valuable tool for the study of epileptic phenomena. The work of Penfield and Jasper in Montreal, Canada, showed the relationship of the spike discharge to cortical scars and traced from the reports of conscious patients the subjective phenomena accompanying these discharges. Not only did their work emphasise that epilepsy is frequently triggered from a focus of brain which is functioning abnormally, but not dead, around the edges of the scar but they also showed that these scars could be excised surgically and that if the resulting wound was carefully made to avoid leaving ischaemic regions of cortex then it would heal with minimal irritation of surrounding brain and the patients were commonly free, or almost free, from epileptic manifestations thereafter.

The Borderland of Epilepsy

The older neurologists, such as Gowers, had not only realised that muscular jerkings were a form of epilepsy but also has speculated upon many unusual phenomena involving short-term disturbance of consciousness or behaviour which had some of the characteristics of, or were associated with, epileptic fits. The contribution of electroencephalography has been to elucidate the details of the relationship between disturbances in particular parts of the brain and these overt disturbances of behaviour. The temporal lobe has turned out to be a region particularly associated with memory as well as including receptor areas for the peculiarly evocative senses of smell and hearing. A generalised theory of epilepsy has grown up which seeks always to identify the focus of origin of epileptic attacks. "Jacksonian" attacks have a clear focus of origin in the motor cortex. Similar attacks involving a march of sensation along a limb have a focus in sensory cortex. Attacks involving flashing lights or more or less formed visual hallucinations (these are rare) have foci in occipital cortex. The disturbances of consciousness and behaviour which used to be known as "epileptic equivalents" appear to arise because of focal discharges in the temporal lobe, and almost more surprisingly epileptic discharges may occur in the frontal lobe without and discernible subjective or objective concomitants (just as quite large lesions of this region of the brain may be made without discernible impairment of normal cerebral functioning).

Idiopathic Epilepsy

But what of the ordinary or old-fashioned varieties of epilepsy, the Grand Mal and Petit Mal of the French neurologists! Grand Mal epilepsy characteristically is accompanied by immediate loss of consciousness and a generalised tonic contraction of all muscles of the body simultaneously passing gradually into the clonic phase of jerking which is the fit proper and followed by a more or less prolonged period of unconsciousness and confusion. Sometimes the patient is aware of an impending attack. This awareness, a state of altered sensibility, sometimes a feeling of heightened clarity of vision and all forms of perception which may last for hours or even days, was termed an "aura". By contrast, there is Petit Mal, a disease of children and teenagers, characterised by brief, sometimes almost imperceptible, losses of consciousness usually without and other objective phenomena such as jerking or falling. These are of course classical descriptions. Every fit, like every patient, is an individual. Nevertheless, they have features in common. In general, sudden complete loss of consciousness. The implication in terms of the focal theory of epilepsy is clear, the discharge must be occurring in the sea of consciousness itself, but where can this be?

The Centrencephalon

Since the pineal body fell from favour as the probable seat of the soul there has been a tendency to discount the possibility of one small region of the brain being the seat of consciousness. In the event a rather unlikely structure emerged, the central retricular activating system, dismissed generally in the anatomy books as "a layer of grey matter containing numerous multipolar nerve cells", the central retricular system has been promoted to the *centrencephalon* discharge in which causes instant loss of consciousness and propogates disturbances to all parts of the cortex which may result in the generalised motor phenomena of the Grand Mal fit.

Research

It is a sobering thought that we are scarcely any more advanced in our concepts than were Jackson and his contemporaries. Our knowledge is more detailed, diagnosis of cerebral lesions is more reliable, the techniques of neurosurgery are immeasurably improved, but we still know very little about how to treat Idiopathic Epilepsy. The difficulty lies in the nature of the disease, fits occur at unpredictable intervals. All attempts to produce a reliable test for epilepsy have failed, and hence all measurements of the effects of drugs must be based on statistical techniques. The use of laboratory animals in whom epileptogenic are induced can provide material but computer techniques must be used to make the very large numbers of measurements needed to obtain statistically significant results.

The Patient

With all the statistics, the computers, and the drama of Neurosurgery we must not forget the individual for whom all this work is being carried out. The patient, as I said at the start, suffers not from Fits but from Fear. His own fear that he may suffer a convulsion at a dangerous or socially embarrassing moment. The fears of his parents and his friends, of his employer and of society at large. It is an open question whether the truculence of the "epileptic personality" is a result of any specific organic leison or merely a response to the intolerable pressures of "living with fits". Education can help Society to loose its irrational fears. Psychiatrists and Social Workers can offer support. The Doctor's role is to try and find and treat the cause, but most important of all, to help the patient to plan his life with realism and to live it with confidence.

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CURRENT TOPICS IN EPILEPSY

IAN TULLOCH

Introduction

Human epilepsies, by definition, are recurrent, self-sustained, paroxysmal disorders of brain function characterised by excessive firing of cerebral neurones. The underlying biochemical and morphological disturbances in the brain which are responsible for epilepsy are not clearly understood except that they appear to be diverse and hence the immediate difficulty in advancing a common mechanism for these disorders. Most probably they are different diseases but the clinical manifestations of these are similar. This view would certainly be compatible with the complex nature of neuronal control mechanisms both at the cellular and organisational level. In this article there will be a stress on possible biochemical disorders both in humans and in experimental epilepsies, the drug treatment of these, and an evaluation of the clinical relevance of experimental animal models.

Many cases of epilepsy are idiopathic, in that no underlying lesion can be found in the brain. This has led to the view that everybody has a threshold for epilepsy and it is this which determines whether or not seizures may develop. Genetic make-up seems to be important in some cases, especially gene-dependent errors of metabolism which are inherited as autosomal recessives, such as phenylketonuria, which results in accumulation of products of phenylalanine, and this is often accompanied by convulsions but the cause-effect mechanism is unknown. Numerically, however, these particular diseases are rare. *Conrad* (1935–38) did a study of twins with idiopathic and symptomatic epilepsy. He studied monozygotic and dizygotic twins and his results showed that 19 out of 22 of the monozygotic twin pairs were concordant with regard to epilepsy, and in 127 dizygotic pairs there was concordance only in approximately 4%. His studies were an attempt at measuring the correlations between a given genetic make-up, and brain electrical activity as measured by the EEG; he concluded that heredity did have a determining role in epilepsy which was idiopathic in nature. Symptomatic epilepsy, i.e. where there is a known lesion, was also included and heredity only played a minor part in this syndrome.