The Morison Lectures

ON

EPILEPSY.

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LECTURE I.—THE PROBLEM OF EPILEPSY.

THE term "epilepsy" refers to a symptom; it is the clinical expression of a group of diseases which may be to a large extent differentiated from each other. They may be divided into four primary divisions:

1. The organic epilepsies.
2. The early epilepsies.
3. The late epilepsies.
4. Idiopathic epilepsy.

THE ORGANIC EPILEPSIES.

Under this heading are included: (a) Those forms of epilepsy arising from traumatic lesions of the skull, brain, or membranes. (b) Those associated with or sequential to focal organic disease of the brain, such as tumour or thrombosis.

THE EARLY EPILEPSIES.

The epilepsies of infancy and early childhood have been placed in a subdivision, although it is admitted that they may in many instances be difficult to distinguish from idiopathic epilepsy.¹ Moreover, the two tend to fuse and overlap in later childhood. They are, however, tentatively taken out of the great group of genuine epilepsies, owing to the marked degree of mental impairment, amounting to imbecility or even idiocy, found in most cases. Many cases also are attributable to focal lesions—encephalitis, haemorrhage, and thrombosis. A subvariety is that form of epilepsy which is found with infantile cerebral hemiplegia. I have elsewhere shown that the greatest degrees of dementia are found amongst those epileptics in whom the disease commenced before the fifth year of age, a group also in whom structural stigmata of degeneration are most frequent.

THE LATE EPILEPSIES.

Under this heading are included: (a) The epilepsy associated with degenerative cardio-vascular disease; (b) the intoxication epilepsies, of which alcoholic epilepsy is the most common; (c) the epilepsy which occurs in the late stages of some dementing psychoses; (d) epilepsy which springs out of eclamptic conditions, such as uraemia, puerperal eclampsia, etc. Puerperal eclampsia is, in many cases, the acute onset of epilepsy, which is continued in a chronic form by the recurrence of ordinary epileptic seizures, of the major or minor type.

When these epilepsies have been eliminated there still remains a large group, which has received the name of "genuine," "essential," or "idiopathic" epilepsy, a malady arising about the period of puberty, usually without any tangible or ascertainable cause.

IDIOPATHIC EPILEPSY.

Idiopathic, or genuine, epilepsy may be defined as a chronic disease of the brain, characterized by the recurrence of seizures in which interference with consciousness is an essential feature, associated either with convulsions or transient psychical phenomena, occurring usually in persons with a hereditary neuropathic endowment, and eventually leading to more or less permanent mental impairment and dementia.

This definition embraces the manifold symptoms usually included under the term "epilepsy"—such as transient jerks or jumps (*petit mal motetur*), aura sensations, incomplete attacks, psychical epilepsy, automatism, the classical fit, and the psychical epileptic equivalents.

The sole feature necessary to establish the existence of epilepsy is sudden, brief loss or impairment of consciousness. Very characteristic of the epileptic attack is the temporary mental confusion which succeeds the loss of consciousness. During this phase semipurposive actions or automatism may be observed.

In any discussion upon the problem or nature of epilepsy the two primary elements of the disease requiring consideration are:

1. The convulsive element, and
2. The psychical element.

1. The Convulsive Element.

The chief characteristic symptom of epilepsy is the periodic occurrence of attacks of loss or impairment of consciousness, sometimes accompanied by convulsions.

It has been laid down as a general principle, notably by Herpin² in his classical but little known work upon minor epilepsy, that the symptoms occurring during the interval of the major seizures of this disease, such as cramps, "jumps," twitchings, spasms, partial convulsions, vertiginous attacks, cephalic sensations, visual hallucinations, or other subjective phenomena, are the major or complete seizures reduced to their initiatory symptoms or sensations. All gradations of seizures may therefore be found in the same person, from the aura as the sole representative of the fit, through the incomplete attack to the fully developed epileptic fit, with its phases of tonic spasm and clonic convulsion and the after-stage of coma. Let me illustrate my meaning by aid of a simple case:

An epileptic described his attacks as beginning with a sensation in the epigastric region. The sensation was that of spasm or cramp in the stomach, and was sometimes associated with flatulence and nausea, and occasionally with a desire to go to stool. The spasm or sensation then took an ascending course towards the throat. When it reached the pharynx a sensation of choking was experienced and the saliva collected in the mouth. About this period also an arrest of respiration occurred, probably from a tonic contraction of the respiratory muscles. A feeling of suffocation, usually associated with a sensation of fear and a desire to be alone, then came on. If consciousness was not already abolished the patient called out that he was going to have an attack, and was sometimes able to sit down. The sensation then passed rapidly into the head and consciousness was lost, but sometimes not before the convulsion had already commenced in the muscles of the head and neck. Then followed the usual phenomena of the major convulsive seizure (tonic and clonic convulsion, etc.).

In the intervals of such major seizures the patient experienced minor attacks, sometimes of the epigastric sensation alone, at other times of the epigastric warning with a further development towards the complete fit—namely, the choking sensation, the collection of saliva in the mouth, and the feeling of fear and cardiac oppression, but without the loss of consciousness.

I would especially call attention to these minor attacks as they closely resemble attacks which will be described later on. Their epileptic nature is seen by the fact that they form the aura or initiatory symptoms of an epileptic fit, and by their rapid march, the upward passage of the sensation taking only a few seconds to reach the head.

All epileptics whose major fits commence with a definite and constant warning—whether referred to the limbs, the head, the special senses, or of a psychical nature—have minor attacks consisting solely of the aura, or of the aura with a further development towards the complete attack. In other cases the warning is of a purely psychical character. One patient had as his minor fits—the aura of a "horrible sensation" which always preceded the major attacks. In another the minor seizures consisted either of a "terrible feeling of a most disagreeable character," or of this sensation accompanied by obscuration of consciousness and a fall, but without convulsion.

Attacks of this character are not uncommonly associated with what Hughlings Jackson has called "the dreamy state."³ This may be of the nature of reminiscence, or it may consist of a sense of unreality, as if surroundings were unfamiliar, or of a sensation that what is happening has been previously experienced. The patient is frequently able to predict whether the incomplete or complete seizure is likely to occur from the intensity of the warning sensation. The feeling of intense fear, with brief loss of consciousness, associated with its physical counterpart of running away as the means of escape, may form the whole of the attack.

In about two-thirds of all epileptics there is no warning of the onset of the seizure, a sudden and complete loss of consciousness occurring either immediately before, or at the same time as, the onset of the tonic phase of the complete major fit.

The minor attacks occurring in the intervals of the complete fits in this group of epileptics are common;

as there is no warning, there is, of course, no incomplete minor seizure without interference with consciousness. The varieties of the minor seizures here form common types of epileptic fits.

A not unusual type of fit is temporary blurring of consciousness with muscular relaxation, so that the patient drops what he is holding, or conversation is momentarily suspended, or he falls. In other cases slight and partial convulsion may be observed. Some cases of this type present features of a purely psychical character, the movements noticed during the attack being not convulsive, but automatic or semipurposive.

The deduction drawn from a study of epileptic attacks, as just described, supports the conclusion of Herpin already given, that the minor attacks occurring in the intervals of the major fits are the initial symptoms of these attacks, which are arrested at a period more or less advanced.

From these few remarks upon the general outlines of epileptic attacks, especially of the minor type, it may be concluded: (1) That some minor fits consist of the aura or warning alone, unattended by loss or even impairment of consciousness; (2) that others consist of the warning sensations with a development towards the more complete fit; these present a certain march of subjective symptoms and terminate with or without some blurring or obscuration of consciousness; and (3) others present the complete or major type of fit.

If there is no warning, the minor attacks consist of lapses of memory, giddiness, falls, and "sensations," with or without slight spasm or convulsions, but always with some interference with consciousness.

Although the common clinical type of epilepsy is the combined form or that in which minor or major seizures are found in the same person, yet other types or clinical groupings of fits are by no means unusual. Thus, we find groupings limited to the major or the minor type of seizure respectively. There is also a type in which major or minor seizures occur in series of a score or more from time to time (serial epilepsy). Again, there is the acute form of epilepsy known as the status epilepticus, in which one fit follows another so closely that the after-stage of coma gives place to the succeeding fit, without any return to consciousness.

From a study of these phenomena it would therefore seem logical to conceive the paroxysmal and interparoxysmal symptoms of epilepsy as links of a chain and not as isolated features. There may be found in the same person all stages of the fit, from the simple aura through the incomplete attack to the fully developed epileptic fit.

Whatever explanation, therefore, may be offered as the immediate cause of a convulsive seizure must also explain the interparoxysmal spasms, cramps, and aura sensations.

Applying the same principle to the clinical groupings of fits, all degrees of combination may be studied, from short series of incomplete minor fits through serial outbursts to the picture of the acute status epilepticus. Short series of minor or major fits are stages towards serial epilepsy, which is merely a less acute and more drawn-out form of status epilepticus.

2. The Psychical Element.

The recognition of the psychical element as a constituent of epilepsy has materially widened the range of epileptic manifestations. Some writers have gone as far as to relegate the convulsive element to a subsidiary position, and to place "periodic fluctuations of the psychical equilibrium" as the outstanding feature of the disease. It is now generally accepted that certain paroxysmal psychical symptoms occurring in epileptics may replace from time to time the convulsive seizures, and form what are known as psychical epileptic equivalents, and that transient disturbances of consciousness of a psychical character may be the sole evidence of an epileptic attack (psychical epilepsy).

The psychical element in epilepsy may be studied under three conditions:

- (a) In the epileptic temperament.
- (b) As the paroxysmal symptoms preceding, succeeding, or replacing the convulsions.
- (c) In the permanent dementia.

(a) *The epileptic temperament* has many features common to epilepsy and the several forms of mental deficiency.

Epileptics are on the whole self-opinionated and egotistical, possessing a conceit and assurance out of all proportion to their achievements. Their character is unstable, their mental perspective is disproportioned; they are sometimes conspicuous for their tenacity, which often reaches to obstinacy. Their conversation is usually prolix and pretentious. They frequently exhibit a religious fervour, which contrasts strangely with their actions, as their ideas of right and wrong are often vague. Like most mental defectives, their actions are characterized by indecision and doubt, by an exaggerated self-consciousness, by apprehensions and fears, by feebleness of will power and hesitancy, which prevent resistance to certain impulsions and decisive action.

(b) *The paroxysmal psychical phenomena* of epilepsy stand in three ways to the convulsive attacks. Some are found as prodromal symptoms of the seizures, others as immediate sequelae, and a third group, occurring in the interparoxysmal periods, are believed to replace the convulsions, and are in consequence known as psychical epileptic equivalents. The paroxysmal psychical symptoms are grouped under the general term of "epileptic n a-ity."

The pre-paroxysmal mental symptoms are in reality prolonged or modified phases of the prodromal stage. They consist of irritability, apprehensions, feelings of unreality, lethargy, and occasionally hallucinations. They may precede the fit by one or more days. On the other hand, they may consist of sudden impulsions, the patient doing some strange thing and then suddenly falling down in a fit.

The post-paroxysmal mental symptoms are the immediate sequelae of either single seizures, or more commonly of serial outburst, or the status epilepticus. They are inseparable from the convulsions, and disappear after a longer or shorter interval, but give in some instances a decidedly psychical character to the paroxysms.

The most frequently observed are: (1) Acute amentia or stupor, which resolves slowly during the course of days or even weeks. (2) Acute mania, or excitement, of shorter duration than the preceding, but often of intense severity. Minor varieties of this are seen in phases of talkativeness, tiresomeness, and exhilaration of spirits. (3) Transitory delusional states, and (4) automatism. Most minor fits are succeeded by some kind of automatic action, such as "exhibition," wandering or confusion of action.

The psychical equivalents are especially interesting forms of epileptic psychical phenomena. The following features may be accepted as a satisfactory reason for regarding them as equivalents of epileptic convulsions:

1. The occurrence in the family history of similar or allied conditions, interchangeable with attacks of genuine epilepsy.

2. Their association in the same person with the classical types of epilepsy, more especially at the catamenial epochs in women.

3. A certain uniformity in the type of attack, recurring paroxysms reproducing the features of former attacks.

In any particular case the psychical equivalents usually correspond to those mental phases which are directly associated with the convulsions. Thus:

1. An epileptic, whose post-convulsive symptoms were irritability, quarrelsomeness, and pugnacity, had occasional transitory attacks of a similar kind without any antecedent convulsion.

2. Another had in the interparoxysmal periods attacks of the "dream state," which usually preceded his fits.

3. A third epileptic, whose post-convulsive symptoms were catatonic rigidity and stupor, showed from time to time in the intervals of his fits catatonic stupor states, unassociated with convulsion.

These are not uncommon types of psychical epileptic equivalents. But there are others; such as epileptic impulsions (*petit mal intellectuel*, of the French writers), acute maniacal outbursts, or *grand mal intellectuel*, and transitory delusional states.

PURE PSYCHICAL EPILEPSY.

There is no doubt that a form of genuine epilepsy exists, characterized by short seizures of purely psychical type. These attacks consist of simple automatic actions performed by the patient in an unconscious state; the face is usually pale, and has a fixed staring expression. There is no subsequent recollection of what has occurred during

the seizure, although in some cases there would appear to be a state of subconscientness, in which the patient may hear vaguely what is said but yet be unable to reply to questions. The attacks are characterized by sudden onset, and usually occur without warning. They are of short duration, and recovery is rapid.

For example, a woman who was employed in a laundry performed during her attacks the movements of folding clothes, which she was in the habit of doing at her work. Other patients will rise from table and walk into an adjoining room, where they will perform some action entirely different from that which they were doing immediately prior to the attack. Other instances may be given. Thus, Spratling mentions a case of an epileptic whose duty it was to address letters in the office; if an attack came on, she would repeat the same name and address several times during the seizure. Another always got a broom and proceeded to sweep the floors when the attack came on.

They may be regarded as constituting one of the types of minor epilepsy, but differing from the common *petit mal* seizures by the purely psychical character of the fit. In the ordinary forms of minor epilepsy the stage of automatic action is preceded by transient motor spasm or convulsion.

EPILEPTIC DEMENTIA.

In addition to the paroxysmal psychical symptoms, there is observed in all cases of confirmed or old-standing epilepsy an almost constant and characteristic inter-paroxysmal mental state, presenting features of great uniformity. The general features of this mental condition, or epileptic dementia, consist of all grades of mental deficiency, from a defect of memory, more especially for recent events, up to pronounced dementia. This should be regarded as an integral part of the confirmed disease, modified to some extent by the duration, the frequency and the character of the fits.

The existence of this dementia is of value in the differential diagnosis of epilepsy from some of the allied conditions which will be subsequently described.

COURSE.

Epilepsy is most commonly found in a chronic form, with periodic seizures recurring through many years, sometimes a lifetime, but in some cases showing prolonged and remarkable remissions. The frequency of the seizures may vary from one, two, or three, or even less, in a year, to as many as a score or more in twenty-four hours.

A cure occurs in a small proportion of cases, estimated at from 10 to 12 per cent. These are cases in which the seizures are of infrequent occurrence, in which there is little or no mental impairment and in which the bromide salts are well borne.

Having in this fashion briefly defined what is meant by idiopathic epilepsy, it is necessary now to ascertain whether there are any associated pathological changes in the brain or central nervous system.

PATHOLOGICAL ANATOMY.

It is difficult to obtain *post-mortem* examinations on recent cases of the disease, or on those cases characterized by seizures occurring only at long intervals; but it would appear as if genuine epilepsy was a disease which in its early stages was unassociated with any obvious structural changes in the brain or central nervous system. In old-standing cases, however, the morbid changes found after death are well recognized, and have been described by numerous writers. Dr. John Turner⁴ has found atrophy and sclerosis of some part of the central nervous system in considerably more than 50 per cent. of the cases of idiopathic epilepsy. Alzheimer⁵ found acute and chronic changes in 60 per cent. of all cases examined.

In the *nerve cells* the changes vary from slight degrees of chromatolysis to advanced atrophic degeneration. The extent of the change would seem to depend largely, if not entirely, upon the mode of death. Certain nerve cells, showing well-marked eccentrication of the nucleus, which is usually of a globose character, are stated by Dr. John Turner to be typical of low-grade brains, and to represent an embryonic type of nerve cell. He regards these cells as stigmata of degeneration, and indications of a hereditarily acquired nervous instability.

The *vascular changes* consist of dilatation and atrophy of the blood vessel walls, perivascular infiltrations, and

punctiform haemorrhages. The lymph spaces are dilated and contain a foam-like exudate. Hyaline spheres or lobulated bodies are seen lying free in the lumen of the smaller vessels and capillaries, and sometimes large hyaline masses form casts of the vessels in which they lie.

Neuroglia.—There is an increase of the glial tissue, especially that situated in the outer layers of the cortex, and of the cornu Ammonis. The meninges generally show slight fibroid thickening and a moderate leucocyte infiltration. Rupture of the vessels with extravasation of red blood corpuscles and a delicate unorganized foam-like exudate are always present.

The lesions found in the brains of epileptics are of wide distribution. The cerebellar membranes are often more affected than the cerebral. The glial changes are distributed unevenly over the whole surface of the cerebrum, but some regions are more especially involved, namely, the frontal and occipital regions, the cornu Ammonis, and the gyri around the fissure of Rolando.

It is now the generally accepted view that the changes just described are the effects and not the cause of the seizures in epilepsy. The acute or cell changes vary according to the manner of death, and the chronic or glial changes are dependent to a great degree upon the duration and severity of the disease. The most acute changes are found in the brains of persons dying in the status epilepticus (Alzheimer), and the most pronounced degrees of gliosis are observed in the brains of those in whom the disease was of long standing, and characterized by the severer grades of mental deficiency and dementia. Frequent repetition of epileptic fits brings about destructive changes in the nerve cells and fibres, whose place is taken by proliferated neuroglial elements. Hence there ensue, in the later stages of the disease, pronounced mental deterioration, and a slow and slouching gait, so well known to those conversant with the late stages of the confirmed malady.

ETIOLOGY.

In furtherance of the discussion upon the problem of epilepsy, three factors bearing upon the causation of the disease have now to be taken into consideration. These are:

1. The predisposing causes.
2. The exciting causes.
3. The immediate cause of individual seizures.

The Predisposing Causes of Epilepsy.

A statistical investigation of a large number of cases of epilepsy shows equal percentages with and without a history of ancestral neuropathic disorders. Even allowing about 20 per cent. for those in whom the family history may be either unknown, forgotten, or withheld, there still remains about 30 per cent. of all cases of epilepsy in which a history of family predisposition cannot be obtained.

Some explanation ought, therefore, to be forthcoming of so large a proportion of cases in which, on careful inquiry, no obvious heredity is obtainable. The existence of epilepsy in some of these cases may be partly explained by the presence of a diathesis, infective disorder, or intoxication in one or other parent at the period of conception.

It is not unlikely also that the presence of some symptoms, classified under the general term of "nervousness," may be of great importance in the genesis of epilepsy. Inquiries ought to be made into the question of parental neurasthenia, hysteria, migraine, or periodic headache, psychasthenia, obsessions, tics, chorea, and, in particular, those epileptoid symptoms which will be referred to in the account of the borderland of epilepsy. These are symptoms which do not, as a rule, strike the patient or his friends as of any importance in the causation of fits, nor does the physician usually direct his attention towards them.

A further explanation of some of these cases may be found in the presence of small foci of encephalitis or of thrombosis occurring in infancy or early childhood. In many of these cases resolution has so largely taken place that the only permanent defect is some impairment in the finer movements of one or other hand. Defects of this character should always be looked for in cases in which no clear predisposition is ascertained, or where the absence

of well marked "stigmata" suggests that a hereditary influence is not obtrusive. I find it impossible, however, to support the views of Freud, Marie, and others, that all cases of epilepsy are due to organic affections of a focal character occurring in early life, although it is quite clear that a small group of apparently genuine epilepsies arises in this way.

My earlier figures, taken from 676 cases of epilepsy, reveal the fact that the most common predisposing cause of epilepsy is ancestral epilepsy. In a further series of 214 cases, in which parental alcoholism as a predisposing influence was especially inquired into, the same conclusion was arrived at—namely, that ancestral alcoholism was a relatively minor factor compared with ancestral epilepsy in the causation of the disease.

TABLE I.

	First Series.	Second Series.
No heredity known ...	330, or 49.0 per cent.	106, or 49.5 per cent.
Epilepsy	252, or 37.2 ..	81, or 37.8 ..
Insanity	37, or 5.4 ..	7, or 3.2 ..
Alcoholism	21, or 3.1 ..	15, or 7.0 ..
Other Disorders	36, or 5.3 ..	5, or 2.3 ..
	676, or 100 per cent.	214, or 99.8 per cent.

This is a point of especial interest when comparisons are made between figures obtained in different countries. The outstanding feature of Table II is the enormous percentage frequency of alcoholism noted by the French observers, an ancestral disposition far outweighing the combined percentages of epilepsy and insanity, according to Déjerine's figures. The German figures, on the other hand, show the predominating influence of insanity, whilst the American give almost equal prominence to epilepsy and alcoholism.

TABLE II.—Showing the Percentage Frequency of Epilepsy, Insanity and Alcoholism as Predisposing Factors in Epilepsy.

	Déjerine.	Binswanger.	Spratling.	Turner.
	Per cent.	Per cent.	Per cent.	Per cent.
Epilepsy... ..	21.2	11.0	16	37.0
Insanity	16.8	29.6	7	4.8
Alcoholism	51.5	22.0	14	4.0
No heredity	—	—	—	47.0
Totals	356 cases	150 cases	1,070 cases	890 cases.

Stigmata of Degeneration.

Evidence of a family neuropathic tendency may be found in what are known as "stigmata" of degeneration.

Structural stigmata have formed the subject matter of considerable investigation since attention was directed to their importance by the writings of Morel and Moreau (of Tours). In the most pronounced forms of mental deficiency, such as are seen in imbeciles and idiots, anatomical variations from the normal are frequent and well marked.

In the slighter forms of neuroses, such as neurasthenia, migraine, and simple melancholia, the neuropathic stigmata are less frequent and less pronounced than are seen in the more exaggerated conditions above mentioned.

In epilepsy, as in the other degenerative neuroses, stigmata of degeneration are present, and have received considerable attention. In addition to the cranial asymmetry which Laségue⁶ considered to be constant in true epilepsy, Féré⁷ has called attention to the frequency of cranio-facial asymmetry amongst epileptics. Among other features of a degenerative character, the configuration of the hard palate deserves special attention. This has been the subject of much investigation and discussion, and its study and relation to the several degenerative neuroses is associated with the names more especially, in this

country, of Langdon-Down and Clouston.⁸ Deformities of the ears have for long been regarded as important structural stigmata of degeneration. Abnormal implantation of the teeth in connexion with epilepsy and the developmental neuroses has recently been the subject of careful investigation by Talbot.⁹

In addition to the above-mentioned stigmata, Féré has also drawn attention to, and described in detail, various asymmetries of the thorax and pelvis, unequal length and size of the limbs, and syndactylism, found in epileptics. In whatever form they are found, it has to be borne in mind that stigmata of degeneration are deviations from the normal, and occur in those who are subjects of a hereditary degenerative predisposition.

Of the two quinquennial periods in which the onset of epilepsy is more common, that from birth to five years of age is the most fruitful in stigmata. It is during this period that the growth and development of the brain is most active; and it is during this period, as Clouston has shown, that other degenerative neuroses and psychoses develop—such as stammering, backwardness in walking and talking, delayed dentition, and some forms of idiocy and imbecility.

Amongst epileptics in whom the disease commences about the time of puberty, quite a considerable number present no obvious structural stigmata, even when parental epilepsy was given as the probable cause of the disease. The most common stigma observed in epileptics is a deficiency in the physical development. Many epileptics are, on the other hand, physically well formed.

The general conclusions which may be made from a study of the stigmata of degeneration in epilepsy are:

1. That the absence of a family neuropathic history is of little account in face of well-marked structural signs of degeneration.
2. That the early epilepsies, or those commencing under five years of age, show not only the most marked mental defects but also are the most prone to stigmata.
3. That stigmata are most common in that type of epilepsy known as the combined seizure type, which is the most intractable and most dementing form of epilepsy.
4. That stigmata are common in those cases of confirmed disease which go on to marked dementia.

I therefore look upon the presence of well-marked degenerative stigmata in epilepsy as a factor of great importance. The future course of the malady may be gauged to some extent by their study.

Age of Onset.

The age at which epilepsy arises is an important factor in the study of the predisposing causes. Although there is no age-period which may be regarded as entirely exempt, there are certain age-epochs during which the onset of epilepsy is more common.

The first epoch is from birth to 5 or 6 years, or that period corresponding to infancy and early childhood. About 25 per cent. of all cases commence during this epoch. These cases are usually associated with marked mental deficiency or backwardness. Many of them are based upon organic lesions of the brain.

The second epoch is from 10 to 22 or 23 years of age, or that period corresponding to puberty and early adolescence. No less than 54 per cent. of all cases commence during this epoch. It is *par excellence* the age of onset of genuine epilepsy. The mean age of maximum onset is 14 years, but the onset of the disease in young women is later by about two years than in the male sex.

The third epoch embraces the remainder of life. There is a rapidly lessening tendency towards the onset of genuine epilepsy from the age of 30 onwards. Most of the epilepsies occurring in this epoch are founded upon organic lesions, arterio-sclerosis, or intoxications (alcohol, lead, etc.).

From these facts it is obvious that genuine or idiopathic epilepsy is a disease of youth, coming on at a time when the development and growth of the central nervous system and the maturation of the organs of reproduction are taking place. It is during this period that causes, insignificant or insufficient in stable nervous systems, may light up the tendency to convulsion or epilepsy in those hereditarily prone towards it.

The Exciting Causes of Epilepsy.

I have attempted to show that the predisposing cause of epilepsy is, in the majority of cases, an inherited neuropathic disposition, and that epilepsy may arise independently of any exciting or determining cause, being a spontaneous development attributable to the normal processes of brain growth and sexual maturation in predisposed persons.

In a number of cases, however, some exciting influence is at work in the production of the first epileptic seizure. It is a cardinal principle that the cause of epilepsy is that circumstance to which the first fit is apparently due. The instability of the brain, once induced, becomes a characteristic feature, so that further attacks recur quite independently of the original or any other obvious exciting cause.

The common period for the onset of epileptic fits is puberty, and in girls its onset is frequently accompanied by irregularity in the catamenia. There is little or no evidence to support a popular view that the regular establishment of the monthly period is attended by arrest of the seizures in those in whom the disease has arisen a few years earlier. The relation of epileptic fits to menstruation is well established. In most cases the seizures occur immediately before or shortly after the period, and in chronic cases the monthly period is characterized by an increase in their frequency.

The normal process of pregnancy has also some influence in the causation of epilepsy in women. We find that pregnancy may be the exciting cause of the disease in some cases, that it may induce a relapse of the seizures in cases in which a cure has apparently been established or in which a long remission has occurred. On the other hand, pregnancy has been known to produce a temporary arrest or amelioration of fits, and there are well-authenticated cases in which a permanent arrest has been brought about in this way. Accouchement and the puerperium have also an important bearing upon epileptic fits. I have seen a number of cases in which the disease clearly originated at this time in the form of a puerperal eclampsia and persisted for many years as confirmed epilepsy. These cases are interesting, as they argue in favour of the view originally propounded by Féré—that some types of puerperal eclampsia are merely the onset of epilepsy in an acute form in predisposed persons.

Sleep is another physiological condition eminently favourable to the onset of epileptic fits. In many cases fits only occur during sleep, so that a clinical type has been recognized as nocturnal epilepsy. There can be no doubt that cases of nocturnal epilepsy may exist unrecognized for many years, until a convulsion in the daytime establishes the existence of the disease. Voisin mentions the following phenomena as suggestive of the nocturnal form: Intermittent wetting of the bed, occasional periodic and temporary mental dullness and irritability, well-marked lapses of memory, somnambulism, and unexplainable outbursts of temper. Pick has called attention to the frequency of fits during the hours of deepest sleep—namely, during the first hour or two after falling off to sleep, and again before waking. My own observations show that the greatest number of fits occur during the hour or two after falling off to sleep—a period which probably coincides with the greatest degree of cerebral anaemia. Whether these facts are to be explained on the theories of brain anaemia (Pick), of lessened inhibitory control (Clark), of the alkaline tide (Haig), or of increase in the rate of blood coagulation (Turner),¹⁰ are points on which evidence is insufficient.

A second and smaller group of epilepsies is found in which a definite extraneous cause acts as the excitant of the first fit, and, as such, of the disease. These causes may be:

1. *Psychical influences*, such as emotional excitement, fear, shock, anxiety, grief, or overwork. Gowers, in particular, regards this as the most potent of all the immediate causes of epilepsy. It was the ascribed cause in only 4 per cent. of my cases, being twice as common in females as in males. In most of the cases a strong neuropathic predisposition was found.

2. *Infective diseases*. The most frequent is scarlet fever, but measles, pertussis, influenza, and diphtheria, have also been observed. An interesting feature in this connexion is the occasional temporary arrest of the fits in consequence

of an attack of pyrexia, probably due to the arrest in the chloride excretion with corresponding retention of bromide salts (Hoppe).

3. *Reflex causes* play an important part as excitants of epilepsy, more especially in children and young adults predisposed by heredity to nervous instability. I would especially call attention to the necessity of a careful examination of the nose (for adenoids, polypi, or foreign bodies), of the eyes (for errors of refraction), of the ears (for chronic otorrhoea), of the teeth, the genital organs, the stomach, and of the intestine (for the presence of worms).

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OPTIC NEURITIS AND SUPPURATIVE OTITIS.

A FURTHER INVESTIGATION INTO THE FREQUENCY AND SIGNIFICANCE OF OPTIC NEURITIS AND OTHER VASCULAR CHANGES IN THE RETINAE OF PATIENTS SUFFERING FROM PURULENT DISEASE OF THE MIDDLE EAR.

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A PAPER by us on this subject, giving the results of the examination of the eyes and ears in 100 consecutive cases of purulent middle-ear disease, appeared in the *BRITISH MEDICAL JOURNAL* of November 23rd, 1907. Since then we have continued this investigation, and examined a second series consisting of 60 cases, and the results of these, along with those of our first 100 cases, are embodied in the present article; the conclusions arrived at, therefore, are founded upon the examination of the eyes and ears of 160 cases. Where possible, each individual case has been kept under observation until the termination of the ear affection in recovery, either as the result of local treatment or after operation. Of the 160 cases, 100 presented themselves after an interval of several months for a second ophthalmoscopic examination, and quite a number were seen three or four times.

We desire to emphasize the special importance, when examining the eyes in this class of case, of duly considering the effects of age, occupation, eye strain, and errors of refraction. These considerations constituted at first the greatest difficulties we had to contend with, and explain the large residue of 46 doubtful cases. A wider experience of the types met with has to a large extent obviated these difficulties.

The plan of this paper is, first, to give the results of the examination of the second series of 60 cases, comparison being made, in tabulated form, with those of the first series of 100 cases; secondly, to present the results obtained from the total number (160 cases); thirdly, to discuss one or two of the more interesting problems in connexion with optic neuritis of otitic origin; and finally, to state briefly the conclusions arrived at as the result of our investigations.

I.—THE EXAMINATION OF THE SECOND SERIES (60 CASES).

As in our first series of cases, the aural examination included: (1) A history of the ear affection; (2) the testing of the hearing distance by a watch normally heard at 36 inches; (3) the application of Rinne's and Weber's tests when the age of the patient permitted, a tuning-fork