On Epilepsy, its Causes and Pathology

J. Macranonal Packer
than observing, that of the sick, who were brought to our Saviour to be healed, a great part of them were paralytics and those who were possessed of "unclean Spirits". For this he may learn how unchanged are the features of their disease, and he can not at the same time fail to appreciate all its force the mighty miracle of their cure. The most common appellation employed by Latin authors was "Inostrus committis," which was derived from the fact that, if a person was seized with a fit during the conduct of the meeting, the meeting was dissolved on account of the unfavourable omen supposed to be involved in the occurrence. Facciolati under Committis Groves says "N ex appellationes ista quaeris fortis quo committis, tenuisse illo corrumpit, committis indicari ac in alium ilium apparet recepta est." Practitioners in all ages have found considerable difficulty in continuing a
definition of it, which includes every form of the complaint, and not less perhaps in establishing the precise nosological distinction between it and the other varieties of convulsive disease. This may be attributed to a want of a proper understanding of the true meaning of disease, in opposition to the symptoms, by which it is characterized. Epilepsy is a disease consisting of a succession of paroxysms of convulsions; these paroxysms, in order to constitute true Epilepsy, must be accompanied with insensibility, continuing for a certain time after the paroxysm is at an end. Thus it is that this disease may be distinguished from the other nervous affections: e.g. Pelman, hydrophobia, agititia &c.

The first one of the most serious and distressing diseases to which the nervous system is liable, consists in an excited state of the spinal cord and
the medulla oblongata, in fact of the whole spinal system, causing painful tonic and rigid spasms of the voluntary muscles, more or less general, and of the diaphragm: while the sensibility undergoes no other alteration, than what is a consequence of that spasm, viz. pain in the muscles themselves and the intellectual functions of the patient continue undisturbed.

The same may be said of hydrophobia, which is an affection, characterized by cramps of the muscles of the pharynx and thorax. Spasmodic action of the diaphragm, a great dread of liquids, difficulty in drinking, &c., while the natural sensibility and functions of the cerebrum undergo no alteration.

Epilepsy is not attended with the same trifling and immediate fail to life as in cancer or hydrophobia: yet it is on the whole, productive of con actual distress, and may terminate in
worse than death. Dr. Watson calls it "a disease not painful in itself probably, seldom immediately fatal, often recovered from altogether, yet oft in many cases to end in insanity or fatality, and carrying perpetual anxiety and dismay into those families, which it has once entered."

The definition of Epilepsy which we read in Galen runs thus: "Vox mer. et epilepsia convulsio est omnium corporum partium, non continua et simpliciter, opisthotonos et tetanos vel qua ex temporum accidit intermittenz, "igitur volens haec pro illis mentis "quonque haereverum abolere, a facit "dictis convulsionibus difficilis; unde constat "he socon, "in superioribus corporis partibus, "cerebro videlicet, curis affectus ortus esse."

I quote one definition from a recent author, to show that the topics of after, has not materially affected the views that prevail on the subject. Dr. Copland, in his dictionary of Practical
"Pain, defined by Bayley as: "Sudden loss of sensation and consciousness, with spasmodic contraction of the voluntary muscles, quickly passing into violent convolutional distortions, attended and followed by opson, recurring in paroxysms more or less regular."

A better definition of the epileptic paroxysm, and one that more completely embraces its essential features, can probably not be devised; yet I am inclined to think that our knowledge of the disease will not increase by definitions, however accurate; as they tend to limit the attention to the paroxysm and often instead the observer, by inducing him to overlook conditions to which the definition does not apply, but which will appear after a full examination of the whole subject, to belong to the same category of diseased conditions as epilepsy."
Premontary Symptoms

These are sometimes, though not always, premontary symptoms sufficient to warn the patient of an approaching fit of Epilepsy, especially if the complaint is fully established. These warnings differ both in character and duration. They are sometimes spread over a considerable period, several hours or a whole day, elapsing before the occurrence of the warnings and the attack; in some cases being too short to allow the patient to prepare himself and procure proper assistance for the approaching fit and in other cases just long enough to allow the sufferer to remove from a situation in which a fall would be attended with unusual danger.

The character also of the notice that he receives, if he does receive any, is very variable indeed. The most frequent of these warnings are: some unnatural state of the mind,
the Temple or the feelings: headache, giddiness, dimness of sight, flashes of light before the eyes, ringing and noises in the ears and coldness of the extremities; the patient is fidgety, irritable, low-spirited, timid, or on the other hand he feels unusually strong, hearty, and cheerful; the patient loses his appetite or it becomes voracious; hears extraordinary noises, or sees spectral illusions.

Dr. Watson in his Principles and Practice of Medicine quotes a case related by Dr. Gregory of Edinburgh, “who was assured by an epileptic patient, that when a fit was approaching, he fancied he saw a little old woman, in a red cloak, advance towards him and strike him a blow on the head; at which he at once lost all recollections and fell down”. Flushing of the face or lividity, or perhaps hollow delirium, difficult articulation and vomiting are
all of their common symptoms, among those which have been noticed to be precursors of Epilepsy.

A frequent and remarkable premonitory symptom is that peculiar sensation known as the Aura Epileptica. This has been differently described by different patients: it has been likened to a stream of cold water or a current of cold or warm air or the creeping of a spider or some insect; it begins at the extremity of a limb and gradually ascends along the skin to the head, when the preconception of coma and convulsion ensues. There seems to be some analogy between the Aura Epileptica, which precedes an Epileptic fit and the well known sensation of a ball rising from the stomach to the throat and constituting the Globus hystericus. In the case of Epilepsy, however, the sensation begins in the extremities and not in the stomach.
and the fit comes on when it reaches the head and not the throat.

Symptoms of a Convulsion.
The disease is characterised by a loss of sensation and the power of voluntary combined movements, the patient consequently falls suddenly down, rigidity and headd of the consequence, and convulsions of the limbs follow. In short and cases of long standing you notice distortion of the eyes and face, countenance aspersion of red, purple or violet colour, there is grinding of the teeth, difficult respiration generally stertorous, with sometimes an involuntary discharge of faces and urine. After a certain time the fit goes off, leaving the patient most commonly in his usual state; but sometimes a continued degree of stupor and lapsitude with...
headache, remain behind, particularly when the disease has frequent recurrence.

Causes

The ancients considered that epilepsy was produced by the demoniacal influence: both Greek and Roman writers make epileptics synonymous with lunatics. We find the same in the New Testament and there also the lunatic is demoniacal or convertible terms.

Thus the name Epileptic is in Matthew—chap xvi. 15—called a lunatic (σεχνιδζτοι και και νους πασοκει). It is spoken of in Luke—chap ix. 38-43—as labouring under demoniacal possession. Now in what ever light we may regard the interpretation of the phraseology of the New Testament, it is impossible
Not to be struck with the accuracy with which the "beloved Physician" Saint Luke delineates an epileptic seizure in his nineteenth and thirty ninth verse.

"And to a spirit takest he in,
And he suddenly crieth out; and it teareth him that he foameth again and bruising him, hardly departeth from him."

And again in the forty second verse of the same chapter "And as the was yet a coming, the devil threw him down and tear him."

In the present day however, no one contends, that there is any form of the disease, which is verdently to be attributed to the influence of demoniacal inscription or to evil spirits, unless it be the spirit of whiskey, gin or brandy.

We have therefore to look for agents more tangible and which.
it is more possible to appreciate in their true bearing upon this disease. Two distinct features cooperate towards the production of an Epileptic fit. The actual out-break is preceded by a protracted state of indisposition, with symptoms which may be regarded as belonging to the complete picture of the disease and which point out a peculiar condition of the body. A variety of circumstances are found to prevail in Epilepsy, before the disease has manifested itself and which, like a barrel of gunpowder, require a spark to induce an explosion.

The class of circumstances which determine and modify this susceptibility are termed predisposing; while those which appear to be immediately connected with, or to stand in the relation of cause and effect—
to the outbreak itself, are called exciting causes or influencet.

It is probable that no outbreak of Epilepsy ever occurs, without the occurrence of the predisposing and exciting influence. An individual may be affected with all the predisposing causes of Epilepsy, and yet have no attack; for we see persons exposed to the influence of the same circumstances, which have been known to suit the characteristic paroxysm in others, without themselves becoming epileptic. The fit once having occurred, it may recur under a much truer, more exciting cause, than in the first instance; and in many cases it appears that the first fit was an impulse, which had set in motion a series of automatic movements, which returned as often as a certain accumulation of force had taken place, without any other exciting cause than that.
Residing in the natural functions of the body — the disease is regarded by most authors as one of debility and impaired nutrition and thus the influences that induce it are such as would weaken the individual and expose him to the reception of the predisposing influences.

Croupy appears to belong to all climes and all countries; it occurred in the early history of mankind and it prevails at the present day — among the untaught savage as among the most cultivated of civilized society. It strikes the mother from the security with which she hems over her beloved infant; it afflicts the lover trusting in the future happiness promised to him by his betrothed; it wastes the son and daughter of the. Mutability of things, where they ever thought healthy
struck down by the convulsions. Epilepsy shares no condition age or sex: it is not generally a fatal disease, but is one of those complaints, concerning the probable issue of which the patient and, still more, the patient's friends are sure to make frequent and anxious inquiries.

The disease is sometimes epidemic, as was the case at the time of the dancing mania, which affected the people of Antwerp, Cologne, and Strasbourg and many of the Belgian towns in the second half of the fourteenth century. In Hecker's work on "Epidemics of the Middle Ages," translated by Babington, a description of the convulsions is given in following terms: "These affected fell to the ground senseless, panting and labouring for breath, foamed at the mouth and suddenly springing up began their dances among
"Strange contortions."

Again we find in the Med. Chir. Trans. Vol. 26 p. 273, a more defined account of an Epidemic of Epilepsy, described by C.W. Bell M.D. which took place in Teneria in 1842. Dr. Bell gives the following delineation of the fit:

"Powerful convolution of one side; for a short time jumble in the face and chest; two threes seven opisthotonic spasm and violent grinding of the clenched teeth as in Teneria; total insensibility; pulse above 80; very powerfully excited so much so that although convinced that his disease was purely nervous and that likely to be benefited by bloodletting, and that when the violent temperature passed, it would be succeeded by a condition of proportionate feebleness and prostration. Yet I found it absolutely necessary to bleed to protect..."
I proceed to consider and make a few remarks on the predisposition of Epilepsy in the individual. English Authors all agree that the male part of the community are more liable to be affected than the female; while on the other hand all French writers regard the numbers too indicated by the two great asylumns Biétre and Salpêtrière as conclusive evidence that Epilepsy prevails most in females. Lacasson states that in 1838, there were 182 male epileptics at Biétre and 389 female epileptics at Salpêtrière. Now, without denying the accuracy of these facts, I can not but think that it is a fallacy to regard these numbers as representing the liability of the whole population to the disease.
have been confirmed not only by the statistics of the Registrar General, but also by the analyses of all the medical men of note in this country, who have at all studied the subject and have published the result of their researches.

Age also influences the occurrence of epilepsy. It is found to be most common at the period of puberty, but it may occur from the earliest period to mature old age. Indeed there has furnished us with an interesting table, in which the ages of 945 epileptics, collected from various French sources, have been analysed. See de l'Etiologie de l'Epilepsie, Memoires de l'Academie de Medicine, Tom. xvi.

Epileptics from Birth 87
Epileptics in infancy 25
From 2 to 10 years 281
From 10 to 30 years 364
 20 to 30 111
 30 to 40 54
 40 to 50 13
 60 to 70 4

This table would seem to confirm the opinion, that the occurrence of Epilepsy is regulated by the same laws in France, which govern it in this country; and that therefore the marked differences between the two in point of sex will be shown to depend upon an erroneous basis having been supposed for the calculations.

Hereditary influences are very palpable in Epilepsy, it is obviously an hereditary disease in many instances. In some the patient and relatives of the patient may not be. It is true, suffer from actual Epilepsy, but they will often be found affected by other maladies of the same class.
Such as Palsy or Mania &c. Considerable difficulties, however, are always opposed to inquiries into the existence of such affections in families, as there is a great tendency on the part of individuals and their connections to conceal facts of this kind. But the truth is, that nervous diseases of all kinds are so widely spread, that but few families entirely escape them; and the more we extend our intimate acquaintance with the domestic relations of our friends, the more frequently do we meet with instances of insanity and Epilepsy, when we previously imagined that there was complete exemption.

The medical men in search for the causes of Epilepsy, endeavours to discover the habitat of the morbid condition, and to trace it to some local affection; but hitherto all
attempts to demonstrate a lesion, either during life or after death, have failed. We have not been able to find out the relation between the functional or organic changes in this as in many other diseases: for example in Pneumonia, we know that the deposit of lymph in the air-vessels and the cough and dyspnea bear a certain relation to one another and we may as a general rule measure one by the other.

Epilepsy is a cerebral spinal disease, in which both the cerebral lobes and the spinal cord are implicated, but it is impossible to overlook the relation, that the state of nutrition and the condition of the Blood Streams upon the Nervous System; for of all the causes we can trace to the production of Epilepsy, we see none that operate so frequently, as those
which are connected with some derangement of nutrition; and yet no change in the secretions and secretions of the body have been demonstrated in all cases.

Dr Bright has pointed out, that the kidney excretes a very marked upon the occurrence of Epilepsy.

Dr Henry Halford also shows the connection between epileptic conditions and suppression of urine and it appears from the researches of Dr Chippin, Burt, and others, that in these cases of imperfect secretion of urine, ura can be detected in the serum of the blood. When Epilepsy occurs in parturient females it has been said by Dr Simpson, Leaver & others, that in a large majority of cases, albumen has been found in the urine; however here too, though a predisposing influence, it
is evidently not essential for convulsions occur without the existence of albuminuria.

In other individuals no such uniformity is to be traced between the existence of epilepsy and albuminuria. The latter when present, by impoverishing the blood, or by the retention of urine for the same purpose fluid, may and frequently does appear to cause epileptic seizures; but in the great majority of cases no evident derangement of the renal system can be demonstrated.

In examining the urine of epileptics we meet with every variety of derangements, that is found to accompany different forms of dyspeptic conditions. There is sometimes an excess of the phosphate, nitrates may be in large quantities, and lastly so large a quantity of ura...
has been found in the urine, that on the addition of equal parts of citric acid the whole liquid has been almost solidified by conversion into dihydrate of urea.

Epilepsy has been met with preceding and following scarlet fever and measles and indeed the convulsions that usher in all the eruptive fevers coagulation of Epilepsy.

I think from the above remarks we may justly come to the conclusion that Epilepsy, at least in some cases, is associated with and dependent on an impaired state of the digestive system.

The relation between the sexual organs and Epilepsy is one that deserves our special attention. The physiological character of puberty is the development of the sexual powers, any thing that unduly promotes
or interferes with that development is certain to give rise to violent reaction in the system; but how far sexual derangements are to be regarded as a predisposing or exciting cause, is by no means determined. All writers unanimously consent that the sexual organs are very frequently at fault in Epilepsy, but it certainly does occur from other and manifestly different causes.

The view however in which sexual derangement are commonly found to induce Epilepsy, is by overpowering the system; by producing excitability of the nervous system, an impatience and inability, which on the application of an exciting influence of sufficient strength, gives rise to the epileptic paroxysm.

The influences which we have hitherto considered, as having some relation to Epilepsy are enumerated among the predisposing causes of the
Affection. There is another set of causes, called exciting, because they are supposed to exercise a more direct influence upon the production than of the complaint; however we must bear in mind that in a large number of cases, neither the physician nor the patient can detect any peculiar circumstance to which the outbreak of the paroxysm can be immediately attributed.

The exciting causes may be considered under two heads. The mental or those that act by direct stimulation of that part of the nervous center which is immediately concerned in the production of the paroxysms. Among them we may mention Great Mental Work, Anxiety, Fright, Fear, Joy, Anger, Painful Impressions, Disappointment. The physical or those that operate by direct stimulation of the same part.
according to the laws of diastatic action, e.g., child birth, the critical age, venereal operations, ovarism, Pregnancy, Intermittent Derangement, Scarlet Fever, and the other epidemic fevers. 

Dentition &c.
The mental exciting causes operate much more frequently, in the production of Epilepsy among females than among males, on account of the greater impressionability of females. They also depress the nervous and vascular system, a point which must be borne in mind in directing the treatment of Epileptics. As it is quite as much the duty of the physician to operate on the body, through the mind, as upon the mind through the body, he can not conclude the consideration of the exciting causes of Epilepsy without adverting to the influence of sleep.
Physiologists differ in opinion as to whether the brain is in a more or less confused state during sleep than when awake, but they all agree that the process of nutrition and excretion is different during the sleeping and waking state. Dr. Edward T. Smith says in a paper published in the Med. Clin. Proc. vol. XXXIX. 122-5. "On the Hourly pulsations and respirations in Health," that "Vital actions are at their maximum during the day and their minimum during sleep the night, and the action of the one and the reaction of the other may be in excess or in defect and need regulation. Thus the action of the day may be in excess from great sunlight or from too much or too frequently repeated food; or too varied by long intervals between meals, whilst the reaction of the night would be..."
too great of the food taken in day had been in defect or the day light had been absent. So the former may be in defect from the absence of light, food and wakefulness and the latter in excess from the presence of these influences.

The foregoing remarks of Dr. South that there can be no doubt of the decided influence of normal variations upon the epileptic phenomena, through an affect exercised upon respiration, circulation and change of tissues apart from pathological conditions. The respiratory process is carried on with less vigour and the blood reaches the brain in a lower state of oxygenation; thus consequently during sleep the blood becomes more charged with Carbonic Acid and the heart acting with diminished contractile power the blood circulates with life.
rapidly through the Brain.

We must conclude from this and from the results of observations on children and adults where asleep, that the state of the Brain during sleep is one, if not of actual congestion, still one in which such condition is more readily induced than in the waking state; and that when the nerve power is depressed and few causes of congestion arise, then changes of respiration result, which induce the Epileptic paroxysm.

Among the exciting causes of Epilepsy it is necessary to allude to intemperance. In the army, this is alleged to be a common excitant of the paroxysm, and may be supposed to act by increasing the venosity of the blood and thus inducing congestion of the Brain.

Now, having mentioned briefly the chief causes of Epilepsy, we see it
is impossible to trace a definite influence of any kind. But as far as the evidence goes, that has been collected, there appears to be no room for doubt, that more of the causes, that are productive of epilepsy, operate by infecting the system at large, and by impoverishing the blood, lay open the venous system, more particularly to injurious impressions, which in health would have no effect.

If we fail to discover an exciting cause, it is taught that we have to do with a diseased condition immediately affecting the brain and the disease is then called central epilepsy. But we shall see that there is seeming a morbid condition which has not been found in connection with epilepsy of which every one of those pathological states.
occur more frequently independently of Epilepsy. It would therefore appear more in consonance with observed facts to regard Epilepsy as an affects an invariable, dependent on some bilateral unexplained arrangement in the nervous system, often dormant for years and even for life, unless the exciting cause comes into operation.

In a disease characterized as Epilepsy, is, by symptoms referable to the brain, or at all events, invariably associated with evidence of disturbance of the functions of the cerebrum. Pathologists naturally have looked specially within the cranium for some organic lesion to which they might attribute the disease. They have so far gained their object; that in a number of cases, which have died of long standing Epileptic Affections,
Cerebral lesions have been found. This, however, is by no means always the case; for no definite relation between a lesion of a single portion of this organ and the convulsions of epilepsy have been clearly established. We often find the lesions which have been associated with epilepsy occurring in patients who have shown no epileptic symptoms.

When attempting to come to a definite conclusion and to find out the real cause of epilepsy, we are surrounded with difficulties, since the disease in a majority of cases is seldom fatal, and when the subject do die the post mortem appearances do not help us to any definite conclusions. It is only by the symptoms and their mode of occurrence, that physicians look to the nervous system, especially the brain, as the organ at fault.
The pathology of Epilepsy is a mystery, which has not yet been unravelled. Nor will it ever be, if we rely on the results of post-mortem examinations. We must rather note the physical changes that take place during the life of the patient and in their seek for the true cause of this disease, I have premised these remarks that the post-mortem appearances met with in Epilepsy may not be received and estimated beyond their value. Let us now turn of the post-mortem changes met with in the brain. The blood vessels of the brain and its membranes are sometimes distended with blood; there is also an increase of the subarachnoid fluid that found in the ventricles of the brain. As when we have said this we have given the sum total of all the post-mortem appearances noted by numerous observers.
It cannot be denied, that in ease when patients have died in the fit and when they have enjoyed good health between the intervals of the paroxysm, the brain and its membranes have been injected and gorged with venous blood: but we can not truthfully come to the conclusion that this was the first and sole cause of death. Do we not see the same appearance in persons who have died by hanging or asphyxia? These do not explain the cause of the attack, for they are but peculiar to Epilepsy; they only tell us the mode in which it has been fatal. Therefore we can not consider congestion of the brain as the cause of the paroxysm: for in the first place judging from the external appearance and other physical signs of the fit, we see that the congestion does not come on until the worst marked
Symptoms of the Paroxysms have begun to subside and disappear; and secondly it is not easy to imagine that this convulsion could take place and disappear so rapidly as it does. What then are the post-mortem appearances of those that die of this affection? We have seen that Pathologists have discovered nothing to account for the well-marked symptoms in patients who have died in a fit of Epilepsy, uncomplicated with any permanent disorder of the intellect or of the faculties of voluntary motion.

Let us now consider and look into the state of the nervous system in those persons who have afflicted with Epilepsy and who before death had shown symptoms of some impairment of the mental functions or general activity. The most common alteration says
Dr. Watson met with in the brain in such cases are the following:

"Induration of the white matter of the brain, which presents a dull appearance; sometimes beside the hardening a general injection of the white matter and in the majority of cases a marked dilatation of the vessels. In most cases the consistence of the white matter is diminished. It is soft and flabby; but there is the same dilatation of the vessels. These changes pervade the whole of the white matter of the brain. At the same time the grey matter is found irregular on its surface, marbled on of a purplish colour and sometimes altered in its consistence, and in many places the meninges be found to be adherent in some part to the convolutions with which they lie in contact."
The same author in another place tells us, "These are the consequences of repeated attacks of Epilepsy. They are the same that are frequently met with in cases of Insanity complicated with Paralytic, and they elucidate therefore the connection of these affections; but they certainly teach us little or nothing of that actual condition of the nervous system upon which the Epileptic Paroxysm depends, and in truth to expect to find in the brain the traces of convulsions, that have passed away, would be as unreasonab as to expect to find them the trace of former voluntary movement."