indicated, should be undertaken. Vaginismus, if it exists, should also be treated.

The motor and sensory disturbances have to be met in the manner indicated above. In cases where we suspect malingering or willful exaggeration, procedures which are disagreeable or even painful are to be preferred—for instance, the cold baths, the faradic brush, the actual cautery, etc. The more minute details of the treatment must be left to the personal tact of the physician, whose capability of individualization, of treating every case by and for itself, should make it unnecessary for us to enlarge upon all the principal phases of this disease. With regard to the internal medication, let it suffice to warn against the use of narcotics, especially morphine, which can not be given in a disease of such long duration in effectual doses without creating the habit.

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CHAPTER III.

EPILEPSY—FALLING SICKNESS—MORBUS SACER—MORBUS COMITIALIS.

THE term epilepsy is often misused, inasmuch as it is applied not only to the genuine classical epilepsy, but also to many conditions, characterized by convulsive attacks, in which on careful examination we can detect various other abnormities, and which, unlike genuine epilepsy, have a tangible cause. If a person in consequence of traumatism, of fright, of peripheral irritation (pressure upon a sensitive scar), or in consequence of cerebral syphilis, etc., becomes "epileptic"—that is to say, suffers from convulsions with or without loss of consciousness—these convulsions clinically may resemble very closely those of genuine epilepsy, but pathologically as well as genetically the two conditions are entirely different.

For all such cases the term "epilepsy" is unjustifiable. Traumatic epilepsy, fright epilepsy, and reflex epilepsy are not genuine epilepsy. The difference is still greater between the so-called Jacksonian and the genuine epilepsy. In Jacksonian epilepsy the convulsive attacks depend upon a disease of a portion of the cortex. Hence the term "cortical epilepsy" is also applied to this condition (cf. p. 186).

The genuine epilepsy is a general neurosis, and we do not know that it ever produces a permanent anatomical alteration in the brain, and that the changes are not rather molecular in character, appearing from time to time in the brain, most probably in the brain cortex, and leading to the "epileptic attack" and then disappearing again. About the *rôle* of auto-intoxication we shall speak later.

Ætiology.—We are not acquainted with any essential cause for classical epilepsy. Physicians with a large experience have often enough occasion to see genuine epilepsy develop without there being any appreciable etiological factor.

It has been the custom of most writers to distinguish predisposing or general from exciting or special causes; only the former are of importance. The latter have an influence only upon the frequency and the severity of the individual attacks, but are never responsible for the production of the disease. Among the former heredity has been given the first place, and there is no doubt that hereditary neuropathic tendencies increase the susceptibility to nervous diseases in general and certainly to epilepsy; but this heredity does not by itself suffice to make of an otherwise healthy individual an epileptic. For this usually an additional cause is needed—for instance, syphilis. If an individual with hereditary tendencies acquires syphilis, he is more likely to become epileptic—that is, to suffer from a genuine epilepsy, which is neither preceded nor followed by any appreciable anatomical changes, either in the brain or in its vessels—than a person infected with the same disease but burdened with no family taint (cf. Kowalewsky, Berliner klin. Wochenschr., 1894, 4). Important, therefore, as heredity may be, it is in itself not sufficient to constitute a cause for epilepsy. The manner in which the tendencies were acquired is also irrelevant, and the question whether the father or mother, or both were given to alcoholism, and whether both or either of the two was intoxicated at the moment of generation of the child has no significance. Notwithstanding the relative frequency with which epilepsy occurs, the number of cases would be much larger if either of these factors could have a decided influence in the causation of the disease.

Age and sex seem to be of little moment in this connection. Although it is true that in the majority of cases the disease affects individuals in the first half of their lives, more especially between the ages of ten and twenty, the attacks may begin much later and may not appear until after the age of forty or fifty. Indeed, cases in which the first convulsion made its appearance between the sixtieth and the seventieth year have been recorded (cf. Mendel, Die Epilepsia "tarda," Deutsche med. Wochenschr., 1893, 45). With regard to sex, it has been noted that during the period of puberty, between twelve and sixteen, more girls than boys become epileptic; if, however, the average of all cases be taken, the difference between the numbers in the two sexes is very slight, and in early childhood—from the fourth to the seventh year—it is nil, the cases being equally distributed between the two sexes.

Among the so-called exciting causes intercurrent gastric affections play a very important part: overloading of the stomach or the ingestion of unusually indigestible food often produces an "attack" which without this ætiological factor would have occurred, only later, or perhaps not at all. I have had for years a gentleman under observation who after eating pork and beans invariably has an attack a few hours later. Indigestion is all the more hurtful if the stomach has been overloaded before going to bed.

Certain substances which are taken into the system, whether as food or for the sake of their agreeable effects, or again as medicines, are very dangerous to the epileptic. Among these are alcohol, mushrooms, certain spices (cayenne pepper and paprika), also all narcotics, more especially, as we have learned in more recent years, cocaine. The "cocaine epilepsy" has been described by Heimann (Deutsche med. Wochenschr., 1889, 12). Under certain circumstances other medicines—antipyrine, for example—may act as poisons and provoke an epileptic attack (cf. Tuczek, Die Antipyrin-epilepsie, Berliner klin. Wochenschr., 1889, 17). In view of the wide employment of antipyrine within a comparatively short time since its discovery, and the popularity which it enjoys, on account of which it is used in all possible kinds of perfectly different diseases, this observation must be regarded as possessing great practical importance.

It is generally known that anything which exerts a sudden influence upon the cerebral circulation may be the direct cause for an individual attack, although it is an open question whether the blood current is accelerated or retarded by these influences. In an epileptic, who has been free from attacks for years, a seizure may suddenly develop in consequence of fright; indeed, a person who has been apparently well up to that time may have an epileptic seizure in consequence of fright and the disease may then continue for the rest of his life. Such a condition seems only possible in individuals who are predisposed to the disease, and in whom it only needs a slight stimulus to produce the attack. The fright is the drop which causes the full vessel to overflow, but which in an empty vessel would make no difference; a sound person never becomes an epileptic owing to fright.

In the second place we have traumatisms and more especially injuries to any portion of the head. It may happen that a person previously perfectly well is taken with an epileptic fit

after a fall or blow upon the head and post mortem not the slightest changes can be detected in the brain. In such cases we should always carefully examine the skull and overlook no scar, however trivial, because any one may be the cause of the first epileptic attack. If this is the case we have the so-called "reflex epilepsy," which has already been mentioned, and which in the stricter sense is not genuine epilepsy. Reflex attacks may also be determined by painful cicatrices on the peripheral nerves on any part of the body, or by the existence of ulcerative processes, for instance, of the finger nails. In one of my patients it was possible every time to produce an attack by pressure upon the diseased matrix of the nail, the same thing occurring also when he accidentally struck it against anything. The amputation of the terminal phalanx was followed by complete recovery after all other measures had proved fruitless. In a similar manner polypi of the ear ("ear epilepsy"), inflammatory processes in the ear, intestinal parasites, an incarcerated hernia, and lastly diseases of the sexual organs, in the male as well as in the female, may give rise to epileptic attacks. Further, we must mention the influence of the imitative impulse upon the occurrence of epileptic attacks. If nervous individuals frequently see epileptiform convulsions it may happen that they succumb to them themselves. In the royal prison of Breslau I have known thirteen of a large number of female inmates who were working together in a room to become epileptic a short time after another prisoner, who had been suffering from epilepsy for years, had been brought into the same ward.

I have reported the occurrence of an epidemic in a school (Berliner klin. Wochensch., 1893, 50). Bad air, especially in *cafés*, where there is a good deal of tobacco smoke and poor ventilation, predisposes the epileptic to attacks, especially if loud talking or music is going on. The mental excitement produced by such stimuli may precipitate an attack. Epileptics should be warned not to go to dances, since the many different factors which are here combined may aid in producing an attack.

The manner in which an epileptic patient can spend his life, the possibility of doing justice to the requirements of his calling and of being a more or less useful member of society, the outlook for improvement or even recovery—all these questions depend in the main upon the "attacks" to which he is subject,

on their nature, their duration, their frequency, their after-effects, and so forth. Hence it is our first duty in taking charge of a case of epilepsy to study carefully the attack itself.

Symptomatology.—The "Attack."—There are cases in which the attack occurs suddenly and unexpectedly, so that the patient, until now in apparently perfect health, falls to the ground as if struck by lightning. In others—more numerous—it is announced, so to speak, by certain premonitions, which, to maintain Galen's old expression, we call auræ.

In the study even of the aura we can not help being struck with the fact, which, on a closer examination of the attack, is still more impressed upon us, that no two cases of epilepsy are alike, that almost every one has its own peculiarities, so that a comprehensive description is almost impossible. The premonitions are countless and many attempts have been made to divide them into classes. Even if we have obtained a classification we are far from possessing with it a description of all.

First of all, we may subdivide the auræ into psychical and somatic. In the former case the patient may either become surprisingly quiet and look meditative, or he may present signs of excitement, walk anxiously up and down the room, and seem bewildered. The transition from the aura to the actual pre-epileptic disturbance of consciousness, the pre-epileptic insanity, is not appreciable (Mendel, Eulenberg's Vierteljahrschrift, N. F., 1885, Bd. 42, Heft 2). This prodromal state may extend over several hours, although it may not last longer than thirty seconds or a few minutes. In two cases the patients told me that, immediately before the attack, reminiscences of bygone days forced themselves upon their minds, and that portions of their past lives rapidly passed before them. A psychical aura of this kind is rare. Sometimes an irresistible desire in the patient to run away constitutes the aura. Just as we shall see in the form of epilepsy called epilepsia procursiva, the patient escapes from his home and runs great distances. While he is running he is seized with the attack. Midway between the cases in which there is a psychical and those in which there is a somatic aura come those instances in which the patient complains of vertigo, violent headache, and slight disturbances of consciousness, symptoms which may last but a very short time, and which, indeed, may be of such brief duration that the patient has not time to guard himself against falling. Here, too, be-

long the hallucinations which occur in the domain of the nerves of special sense, which we are accustomed to call "special sense" auræ. The patient hears, sees, smells, tastes things which either are not there at all or are in reality different from what he deems them. I know instances in which immediately before the fit the patient thinks he is standing in a sea of light; most intense brightness surrounds him, and he is cognizant of wonderful light effects. In other cases again the patient thinks he is standing amid utter darkness, he sees nothing, and the densest obscurity reigns everywhere. To this class belong the instances reported by Heinemann in which bilateral amauroses constituted the aura (Virchow's Arch., 102, 3, 1885, p. 522). The optic as well as the auditory auræ vary in different patients. Sometimes they hear delightful melodies, sometimes they find themselves amid the wildest tumult of confused noises. Complete loss of hearing, transient deafness, which would be analogous to the transient amaurosis, I have never had an opportunity to note.

Sometimes, not often, the patients imagine they hear distinctly different voices, Then the aura is a genuine hallucination and infringes upon the domain of pre-epileptic insanity. Well-pronounced gustatory and olfactory auræ do occur, but are decidedly less frequent than those just described.

The somatic auræ are either motor, sensory, or vaso-motor. The motor more frequently consist of symptoms of irritation than of paralysis. There are isolated twitchings in the fingers or toes, in the arms or legs, which progress from the periphery to the centre; contractures in certain fingers have also been observed. In addition to or in the place of these there may be twitching movements of the head or neck, twitchings of the facial muscles, or well-marked strabismus. Paretic symptoms, heaviness and fatigue in the extremities, are more rare. Spasm of the glottis, bronchial asthma, palpitation of the heart, retching—all have to be regarded as varieties of motor auræ.

The sensory auræ consist of peculiar paræsthesias in the extremities, formication, numbness in the fingers, the patient feeling as if these were working their way up to the head or to the heart. Not uncommonly they are associated with a pronounced feeling of anxiety and oppression. The sensations which appear in the extremities, sometimes in the fingers, sometimes in the toes, are extremely variable, from a pleasant

slight tingling to a painful burning and stinging, which, as we have said, proceeds from the periphery to the centre.

In vaso-motor auræ the hands become cold and pale, the cutaneous veins look less full than normally, and the patient complains that he is getting cold. A general feeling of chilliness, associated with chattering of the teeth, has also been noted (Douty, Lancet, March 20, 1886). In other instances, possibly on account of a paralysis of the vaso-motor nerves, blushing of the skin and sweating occur. The degree of fullness of the cutaneous vessels and the larger veins of the skin is in some cases sufficient to tell the patient whether or not he will shortly have a fit.

Innumerable transition forms and countless combinations of different kinds of auræ occur. No definite laws can be given, and we must here again recall the inexhaustible varieties of the prodromes by which the attack may be ushered in.

The question whether the origin of the aura be central or peripheral can not as yet be answered. Certain facts point to the first possibility, others to the second (cf. Oliver, Lancet, April 21, 1888, page 769). That the aura may have an anatomical basis is proved by the case reported by Hughlings Jackson (Brit. Med. Journal, February 23, 1888). The patient, a man of fifty-three years of age, complained regularly of a horrible, indescribable stench which immediately preceded every attack. At the autopsy a tumor was found situated in the temporo-sphenoidal region. We would remark, by the way, that this case is a point in favor of Ferrier's localization of the sense of smell.

The attack itself is characterized by complete loss of consciousness, and is sometimes ushered in by an initial piercing cry or a noise like the roar of a wild beast which the patients emit at the moment of falling. This cry is by no means to be regarded as the expression of fear or surprise, as it does not occur until consciousness is lost and is a reflex act. It is observed in about fifty per cent of all cases, while in the remainder it is either absent or replaced by tears. A tonic muscular contraction accompanies the cry. The head is at the moment of the fall drawn backward or to one side, the jaws are pressed together, the back is spasmodically curved, and the fingers are clenched over the adducted and flexed thumb. Respiration ceases, because the muscles performing the function take part in the spasm, and the face becomes discolored and cyanotic.

A convulsive tremor runs over the whole body, and in the muscles of the face as well as in the rigid extremities twitchings begin to appear, which spread, and spare no part of the body. The head is violently knocked against the floor or the couch, the tongue rolled around in the mouth, protruded, perhaps, and retracted alternately, so that it is often injured by the teeth; the eyeballs are deviated, the pupils dilated and inactive. Arms, legs, and trunk are now the seat of violent, irregular, rapidly changing jerkings. The mechanism of these motions has been studied by Unverricht (Ueber tonische und klonische Muskelkrämpfe, Leipzig, 1890). Corneal and skin reflexes are lost. The tendon reflexes can be obtained if the tetanic rigidity of the extremities allows it. The pulse is slightly quicker, the respiration greatly hurried. With each expiration the saliva, often foaming and mixed with the blood coming from the injured tongue, bursts forth and covers the lips. The temperature remains normal. In more protracted cases it may rise from one fifth to half a degree Fahrenheit. The involuntary evacuation of urine and fæces, possibly also of semen, is not rare. In one case only have I seen the attack regularly associated at its onset with vomiting.

Gradually the body becomes covered with sweat in consequence of the excessive muscular strain; next, the convulsions lose some of their violence, the limbs gradually become less rigid, the cyanosis disappears, respiration, though it may still be difficult and snoring, becomes more regular, the coma abates and passes insensibly either into a deep, long sleep or gives place immediately to complete consciousness, so that in some cases the patient may in a few minutes again be in an apparently perfectly normal condition, without, however, having the slightest idea of what has been going on during the attack.

We have said that the symptoms immediately preceding the attack present an endless variety of forms; the same must be said of those that belong to the period following it. These "post-epileptic" phenomena may again be divided into psychical and somatic. The psychical phenomena are very interesting, because they are not always of the same intensity, but may assume all gradations between a complete insanity ("post-epileptic insanity," post-epileptic moria, Samt) and a slight bewilderment. In the first case the patient has to be regarded as a madman, and must not be held responsible for his actions,

not excluding any crime that he may commit at such times; in the latter he resembles a drunken man, who, although he later can not remember what has happened, will answer questions if they are repeated often enough and in a sufficiently loud tone. Not uncommonly there exist on first waking up speech disturbances, in the form of a motor or sensory aphasia, which lasts from a few minutes to several hours. Total aphasia following the attack has also come under my notice, and I have seen it persist for half an hour. The patient appeared to have regained consciousness pretty well, he understood, apparently, the questions which were asked him, but was not able to answer them in any other way than by signs. Fürstner has reported instances of post-epileptic stammering (Arch. f. Psych. und Nervenkrankheiten, 1886, xvii, 2).

Among the somatic post-epileptic phenomena there is, besides the difference in the size of the pupils, which is of some value for the diagnosis of nocturnal attacks occurring during sleep, a concentric contraction of the field of vision, which may last for twenty-four hours. Of this I have been able to convince myself several times positively. Further, there are certain conditions of motor irritation, "cortical movements" (Rindenbewegungen of Zacher), which consist of either typical clonic twitchings, or of choreoid or athetoid movements, and which may persist for hours. Contractures, occurring more frequently in the upper than in the lower extremities, usually on one side, have been observed only in exceptional cases (Lemoine, Deutsche Med.-Ztg., 1888, 20). Among the vaso-motor changes there are circumscribed reddenings which may occur symmetrically on both sides of the body in the most diverse places. Transient increase of the patellar reflex, transient albuminuria and violent vomiting are common after epileptic attacks.

As to the time at which the attack may be expected, we may broadly say that there is not a moment in the life of the patient in which he can feel safe from them; that any particular time, either of the day or of the night, is especially dangerous in this regard can not be maintained. This much only can be said, that in some individual cases the fits occur only during the night while the patient is in bed and asleep; this so-called epilepsia nocturna possesses great practical importance, because it may persist for a very long time unremarked and unrecognized, especially if the patient sleeps alone. If such be