The Epileptic Paroxysm

By

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The whole molecular world, organic as well as inorganic, exists in a perpetual state of vibration. In the former, life is the manifestation of an inherent power, possessed by its molecule, of adaptation to surrounding circumstances, and it is the complete failure of this capability, which renders the animate as once an inanimate object. As we ascend the scale of animal life, we witness the gradual evolution of a heterogeneous and highly unstable representative structure—the nervous system—a medium of communication, not only between every molecule of the body, but between every ultimate tissue of the organism and its environment, and through which, by a process of action and reaction, equilibration is maintained. In the body itself, and its surroundings, there are many factors for ever at work, which tend to avert molecular stability, influenced as this is by three changes.
affecting the elasticity or density of the structure. If the elasticity of any body be materially augmented, we shall forthwith detect a corresponding increased proneness to be influenced by, and radiate, molecular disturbances; whilst any increase, on the other hand, in its density, must necessarily be accompanied by a diminution and limitation: bearing in these two qualities, elasticity and density, do a direct antithesis to each other. Although the causation of epilepsy, exciting, as well as predisposing, is still a question wrapt in obscurity, there can exist no doubt in the scientific mind, that the manifestation of the disorder is the result of some occult change, which has arisen in the whole or some part of the cerebro spinal system. In man, the structural arrangements of the nervous system are so complex, and the functions so entangled, that a satisfactory and vital comprehensive description of the epileptic paroxysm is rendered necessarily difficult. The most typical attacks
however are those, in which the dis-
charge, beginning in the highest nerve
centres descends in a more or less
markedly progressive and rapid manner,
and invades the whole representative
structure. The mode of onset, may,
and frequently does vary, not only in
different individuals, but in the same
individual at different times, we may
therefore encounter every possible
variation, according to the part of
the nerve structure primarily dis-
turbed, the completeness or incom-
pleteness of its molecular instability,
and proneness to radiation. When
a fuse is applied to any part of
a gunpowder tract, if the elasticity
and density throughout, the molecular
disturbance may travel in any or
every direction. It is possible how-
ever, to so alter in parts, the density
of this highly instable compound,
so to intercept effectively the
molecular wave in its passage,
and thus, limit its power of propaga-
tion. This similar, to my mind,
reveals well the true character
of a nerve discharge, and the manner
in which it may spread in those
with an epileptic predisposition.

The attendant sensory and intellectual disorders.

Deriving, as we do, all knowledge of our own existence, as well as that of an outside world, through the medium of our special senses, including the tactile — of which all the others are highly organised modifications — I propose to include in a common description, the epileptic disturbance manifested by, and attributable to changes either arising in the centres receiving, or translating impressions. Here as elsewhere, the discharge may be more or less confined, the causal instability being limited, and the surrounding structure remaining unaffected by the apparently spontaneous molecular separation, preventing its further radiation. The whole question is one wrapped in obscurity, full of complexity and surrounded with difficulty, yet teeming with interest, and from a medico-legal point of view, worthy of our most serious consideration.

Hithe to loss of consciousness was
and still is by some considered an essential sign of epilepsy, it is however a variable accompaniment of the manifestations of this disorder. In many confirmed cases, I have witnessed exactly the same epileptic phenomena in the same patient at different times, associated with complete or incomplete loss of consciousness, or wholly unattended by any sensorial or intellectual disturbance whatever. When the mental change is evinced, it is not necessarily an early symptom. Many patients retain for a more or less lengthened period of time, after the initial disturbance, a full knowledge of their own bodily state and everything that happens around them. The epileptic discharge, it is true, begins usually in the highest parts of the cerebrospinal system and descends; it may however, originate primarily in any part of this nervous tract and radiate more or less irregularly. In the most marked and severe epileptic attacks, loss of consciousness is invariably complete, and is ever, I believe, the earliest manifestation of the paroxysm. The discharge under
such circumstances, is, as a rule so rapidly transmitted, that the abolition of consciousness, and the evolution of the motor and other allied disturbances are apparently simultaneous. The period, during which there is this total interference with the reception and translation of impressions, appears to, and is spoken of, by the patient, as a "blank".

The individual in a state of epileptic unconsciousness, may or may not retain his equilibrium; he may, without any warning whatever, fall suddenly on the ground in a helpless and passive state; he may maintain his posture, and evince no further outward manifestation, other than a somewhat strange and vacant, yet witted, characteristic stony and fixity of the eye. In yet another set of cases, if not in every occurrence, we witness the evolution of thought more or less coherent and intelligible and the performance of actions, more or less complex and difficult of attainment, with a total suppression of consciousness; with the initiation of unconsciousness,
the individual frequently falls, sus-
taining at times severe bodily in-
juries, even fractures and dislocations.
Here, doubtless, the onset is so sudden
and shock-like in character, that
there results a complete inhibition
of the motor centres, and consequent
deceleration of the ever-existing tone, with
total muscular relaxation and loss
of equilibration. In the individual
who retains his position, the discharge
may travel and affect the whole
representative structure of the special
dense, or be confined to one or more
of these special sense centres: as
a rule, the disturbance in such
occurs in the centre appreciating
and translating impressions, and not
in those receiving them: it may,
however, occur in one or both, and
we may encounter every possible
variety. There may be complete and
very transient loss of eyesight, with
or without accompanying auditory
change. The patient may retain
the power of hearing, but be at the
same time wholly incapable of
comprehending and defining the im-
pressions conveyed to the auditory centre.
The auditory tract may remain undisturbed—the individual comprehending and retaining what may be said—yet there exists, with complete cessation of the functional activity of the visual centre a total inability to express in spoken words, thoughts resulting from these impressions (auditory). Mental phenomena may however exist and be revealed, whilst consciousness itself is in abeyance, the individual under such circumstances becoming a wholly irresponsible agent. Many of the actions performed during this state appear more or less automatic in character, often they are most complex, and may be exhibited, apart from any evident or necessary motive. During the state of epileptic unconsciousness, I have frequently witnessed the patient run forward with much impetuousity, as though impelled by some irresistible power. In one case the individual coming in contact with a bed, which happened to impede the course, was thrown violently on the floor—performing a somersault and landing on the other side of the bed. This patient sustained a
severe bruise of the left hip by the fall, and continuing unconscious for several seconds afterwards, would have succeeded in recovering the erect position and rushing on again, had she not been prevented by physical force. These movements may by some be considered as post epileptoid or even dystonic in character, that however they may be an accompaniment, and not strictly a sequence of the epileptic state, I have no misgivings. Many patients display an awkward proclivity for undressing, and it is often difficult to prevent them from throwing off every vestige of dress on the body. This peculiarity may be a concomitant of the minor attack with mere loss of consciousness, or a truly post epileptoid phenomenon, exhibited after a severe paroxysm. In one case which came under my notice, that of a female, the patient always undressed, and if possible for into bed, and this whether in her own house or that of any friend or stranger. The importance of a knowledge of such facts, from a medical legal point of view, cannot be overrated.
The act, may result from a feeling prior to the attack - of impending illness; for in the majority of our automatic movements, the cell and fibre arrangement is so perfect, that the least stimulus, may serve to call into action and evoke unconsciously, with machine-like regularity the associated train of events. The act of undressing, is doubtless through habituation become more or less automatic. In some cases, if epileptic unconsciousness, it appears totally unconnected with any feeling of indisposition. The lad I interrogated, whilst he undressing, as to why he did so, replied, "I am going to work", and this patient having already thrown off his coat and waistcoat, had unlaced and taken off his boots, and was about to take off his trousers when he recovered consciousness and redressed, retaining no knowledge whatever of what had transpired. Another patient, the subject of severe as well as minor epileptic attacks, had during the occurrence of a minor attack started to prepare the table for tea - a duty assigned to him some weeks pre-
previously—she arranged the dishes with wonted regularity, and was in
regaining consciousness, much astonished
when she saw and was told, that she
had done. Some years ago, a female
patient told me, that in her slight
fits she habitually, irrespective of
the time of day, put some tea into
the tea pot with hot water and placed
it by the fire, but never at any time
remembered anything of the act for
any reason for so doing. Suicidal
and homicidal tendencies are also oc-
casionally manifested. Lately, a
girl under my care attempted dur-
ing a state of epileptic unconscious-
ness to strangle herself, by tying
tightly round her neck, a piece of
tape used in her work, and would have
succeeded in so ending her life, had
the ligature not been cut in time.
Another female, would have committed
suicide by cutting her throat, had
the hot bean disappeared in the razor,
and this patient's father, strange to
say, subject also to epilepsy, did
in a slight attack, actually com-
mis suicide by cutting his throat.
Our feelings, thoughts, and actions,
are usually conscious, that however they are not invariably so appears more than problematical. To say the individual feels, without knowing he feels, is somewhat paradoxical, it cannot however be more so than to say the individual thinks and acts without the knowledge of thoughts or action, facts which we must admit. Although the whole structural arrangement, necessary for the reception and conduction of impressions, from the periphery to the higher centre is intact and functionally active, yet because the impressions so received fail to be appreciated by the organism, we say, the feeling does not exist. It is not the feeling which does not exist, but the consciousness of the existence of the feeling, which is nonexistent.

II. The cry.

The epileptic cry is comparatively by far as I have been able to judge, in about five per cent of the fits.
Some cases it is never noted, whilst in others it is an occasional but never a constant association. It appears to be a mere casual motor coincidence, dependent upon a state of more or less complete inflation of the lungs at the time of the initial nerve disturbance. The cry, when emitted, is very characteristic, but difficult of imitation, and is a wholly unconscious phenomenon, as the patient never at any time retains any knowledge of its utterance. Sounds more or less articulate in character and associated with the consciousness of a developing aura and consequent fit are commonly uttered and are more probably the results of fear or in some few cases apparently of pain.

The epileptic cry is an invariable manifestation of a general seizure, sudden and severe, the molecular change affecting the whole representative structure in an incalculable period of time. The muscles of the chest and vocal apparatus, act in concert through habituation: the resulting automatic centre being located in the highest part of the motor nerve tract, and represented
on the surface of one or other hemisphere, according to individual peculiarity in the neighborhood for speech. The epileptic cry, so far as my observation goes, leads me to believe is especially noted in right-handed individuals, when the nerve discharge, from external manifestations, originates in the left hemisphere; rather than, when, in the same individual, the molecular disturbance primarily affects the right cerebral lobe. In left handed patients again I have invariably noted its association with an initial molecular discharge in the right hemisphere. The cry is produced, by an associated action of the muscles of the chest and vocal apparatus, whereby the air expelled from the lungs is forced through the narrowed glottis. It is a true part of the paroxysm, and may be elicited by patients equally whether asleep or awake at the time of the onset of the attack.

III. The motor manifestations of the paroxysm.

Prior to an epileptic attack,
there exists an instability, more or less uniform and complete of the cerebro spinal system, but whether of gradual or rapid production has not yet been determined. Under such circumstances, however, any slight initial excitation, apparently peripheral or otherwise, may suffice to throw the whole or any part of this nerve tract into a state of molecular vibration, and determine a seizure. In the most typical case, when the discharge begins in the highest part of the nervous system, it invariably descends, and invades in a somewhat regular manner the various motor centres, arranged, in an order dependent on structural development and evolutionary requirement. When we recall the fact, that higher organization and greater functional activity are undoubted constants of diminished structural stability, it is not at all astonishing, that wherever there is a strong epileptic tendency the highest part of the cerebral lobes should so frequently be the seat of initial disturbance. The outward manifestations,
If the epileptic paroxysm may however be limited or even assume an irregular mode of progress, facts explicable on a hypothesis of varying elasticity and density of the nervous tissue. Sometimes, I have witnessed, the motor disturbance confined to one or other or both orbicular muscles of the eye, to one side of the face, to the face and arm, to one side of the body, again although rarely, to one or other or both lower extremities. In a characteristic attack with uninterrupted propagation of discharge, the first evidence of motor disturbance is a deviation of the eyes and head, in association to one or other side of the body. Simultaneously with the deviation of the eyes and head, I have occasionally noted a rotation of the body on its own axis—one or more times—whether from left to right or right to left being determined by the side towards which the head is at first directed, the body turning to the same side, as the head. The cerebral change originates primarily in the hemisphere away from that towards which the eyes and head are
directed. If the discharge arise in the right cerebral lobe, the eyes and head are deviated to the left. Shocks however the initial molecular change occur in the left cerebral lobe, the eyes and head will be directed to the right side of the body. The right temporo-mastoid, acts so constantly in concert with the muscle of the left half of the body, that it may be considered a left sided muscle, whilst the left temporo-mastoid on the other hand becomes a right sided muscle.

The structural arrangements of the nervous system are more complex and habit determines the association of movements apparently governed by nerve centres far removed from each other. As we have enunciated the axiom, that the more frequently a nerve trace is traversed, the more susceptible does it become to like excitations.

The deviation of the head to one or other side of the body, has gradually through habituation, become a movement, associated with the deviation of the eyes. In early life, when reading, the head follows close-
by the movement of the eyes, as they pass from one side of the page to the other. In looking at anything placed at the extreme right or left of the body, the head with the eye deviates towards the object. The change in position of the head, affording as it does greater definition, has, through habits become unconsciously associated with the movements of the eyes. Under such circumstances there must either be in the centre regulating the movements of the eyes, a direct representation of the associated head muscle, or there exists a direct communication between the higher ocular motor centre and the lower centre governing all the movements of the head and neck. Any molecular disturbance, therefore, radiated to the ocular motor centre, is forthwith, and without any appreciable interval, transmitted to the head and neck centre. Often, I have witnessed a marked deviation of the eyes and head, for some time prior to any further motor manifestation, and in some cases even, this has been the
sole sign of muscular disturbance. I have also frequently noted that although the eye and head may at the onset of the paroxysm, be directed to one side, yet during the fit itself they are drawn and remain directed towards the other side of the body, a manifestation which indicates the spread of the molecular disturbance to the opposite hemisphere. Under such circumstance, however, the eye and head invariably return again, as the paroxysm is ceasing, to that side towards which they were at first deviated. Occasionally I have observed throughout the whole duration of a paroxysm, a rapidly alternating deviation of the eye and head from side to side. As a rule, in will be remembered, the epileptic motor regression is, in the inverse order of its progression.

IV. Tongue biting.

In the usual march of the paroxysm, the motor disturbance here spreads to the muscles of the face and jaw, and almost simultaneously to those of the tongue.
which organ at this period of the attack usually frequently suffers laceration by the teeth. Although tongue biting is a symptom of some value in the diagnosis of epilepsy, it is not in my opinion an infallible sign, as some authors would have us believe. I have often witnessed laceration of the tongue, during convulsive seizures, in which the movements were purely hysterical or purposive in character. In these cases, as I shall presently show happens invariably in true epileptic attacks, the tongue was constantly bitten on the side corresponding with that on which the convulsion was more marked. It is therefore in my judgment more than a mere casual coincidence. The mechanism of this phenomenon is one, regarding which there is still much diversity of opinion. When the mode of progress of the epileptic paroxysm is regular, I have as a rule remarked, than whenever there is manifested any noteworthy variation in the nature of the convulsion, as in affects the two sides of the body, the tongue suffers laceration...
tion on that side on which the motor
spasm has been greater. * I have
recently drawn attention to the fact, that when
anestheclamor can be developed after
the cessation of an epileptic fit,
the to-and-fro rhythmical movements
of the foot is always more readily
produced, and continues longer, the after-
to be noticed, on that side on which
the convulsion has been more marked.
I may here add, that I have con-
stantly verified the existence of
laceration of the tongue, when present,
on that side on which the anesthe
clamor has been more readily ob-
tained. It will be detected al-
most invariably on that side towards
which the eye and head are primarily
deviated. Tongue biting depends, not
on a protrusion of the organ between
the teeth, as is commonly believed,
but on an intrusion — if I may be
allowed the expression — whereby the
half primarily affected by spasm, is
drawn more or less materially
towards that side and lodged between
the teeth. The mouth seldom remains
open during the epileptic seizure, as when

or two occasions however, I have had the unusual advantage of noting, under such circumstances, the probable manner in which motor spasm of the tongue could determine the seat of laceration. In one case, the fit was more especially confined to the left side of the body, and the tongue was so markedly deviated towards this side, that had the jaws been forcibly closed the organ almost inevitably have suffered laceration. The patient invariably bit the left side of the tongue, and in all the attacks I witnessed, the left side of the body was more especially affected by motor spasm. Protrusion of the tongue is an act associated with depression of the lower jaw, and consequent elevation of the hyoid bone, and although it is possible, that disassociation of these movements, during a fit may result in laceration of the tongue, yet the close relationship that exists between this phenomenon and the nature of the convulsive seizure compels us to seek a further explanation. It is a true part of the motor manifestations, and more
more than a mere causal coincidence. In the early days of unilateral atrophy of the tongue, the patient so suffering, usually complain that during mastication the organ has frequently been bitten on the wasted side; the healthy muscles, being in such cases defectively opposed, and as yet unaccustomed to the morbid change, thrust the organ between the teeth. Here the weaker side practically represents that unaffected by spasm, at the commencement of the epileptic paroxysm. If, therefore, the tongue biting in epilepsy, were due to a progressive movement of the organ, we should seek the laceration on the side away from that primarily affected by motor spasm.

Motor disturbance in the limbs.

In the most characteristic epileptic attack, the motor spasm so far as the limbs are concerned, appears at first in one or other upper extremity as the case may be, the initial manifestation being always in that toward which the head is primarily deviated. It then spreads in a somewhat regular manner
to the lower extremity of the same side, to the lower extremity of the opposite side, and finally attaches the remaining upper limb. The march of regression is, as a rule, in the inverse order of progression, the spinal is appearing first in the group of muscle, last affected, and continuing longest in those primarily disturbed. It is but rare, however, that we witness this complete uniformity in progression and regression, the nerve structure being so complex and irregularly liable to change as to allow of almost every conceivable variation. The convulsion itself is usually divided into two stages, the tonic or initial, and the clonic or sequential. Here again we rarely see the regular association, and may often detect the simultaneous existence of these two muscle states, and every possible intervening gradation, in the different limbs. Experimentally, if a stimulus of regular and never varying quantity, traverse the nerve tracts of a muscle, no change in its structural state, as evidenced by contraction, will
result. In order that a muscle may be thrown into contraction, the force or quantity of the stimulus must vary, and according to the rapidity with which the waves of molecular motion follow each other, so do we develop a tonic or clonic spasm more or less distinctly. The tonic state results, if the waves of excitation are uniform, and follow each other with such rapidity, that the influence of each preceding impulse has finally disappeared, a new wave of motion has already been transmitted. Clonic convulsion, on the other hand, is the outward manifestation of impulses, or groups of impulses, transmitted to the muscle, but separated by more or less distinct intervals, which allow of the muscle returning, after each excitation, to a state of comparatively inactivity. Initial tonic convulsion, eventually, replaced by clonic, is commonly observed in pure functional or so-called dysphatic epilepsy, whilst initial clonic spasm, on the other hand, is a common feature of epileptic form disorders, dependant, as a rule, on some coarse cortical lesion.
of the cerebrum. Clonic convulsion, when a sequel of tonic spasm, apparently depends for its development, upon a somewhat exhausted state of the still highly unstable nerve cells. Its frequent though not invariable occurrence, however, with the venous turgescence, resulting from interference with the respiration, renders it highly probable that the impregnation of the blood with carbonic acid, may aid in determining clonic spasm, through increasing the density of the disordered nerve tissue. Tremor more or less limited in extent is frequent, as a motor manifestation of the epileptic paroxysm. During the paroxysm, and under certain circumstances, I have been able to develop this tremoration, especially in the lower limbs, by merely straightening the leg already slighly bent by a feeble yet maintained tonic contraction. I have also witnessed the spontaneous development of this variety of spasm or clonus, when the leg, slightly bent at the knee, the paroxysm, has become straightened and remained
Stiff during the fit itself. Whilst the character of the convolution may vary, so may the extent and manner in which the muscles are involved; and this in the majority of cases without any very apparent cause. In a few cases with distinct cerebral or optical lesion, I have noted a definite alteration in the character and evolution of the motor phenomena in dystrophic epilepsy. Some years ago I saw a girl epileptic from childhood, in whom, the convulsive seizure had always been general affecting all four limbs. At the age of ten, this patient during a fit, suddenly developed a complete hemiplegia of the left side, the result apparently of haemorrhage into the right cerebral lobe. In all attacks hereafter, the convulsive phenomena were confined to the right half of the body. The girl is now fourteen years of age, and although she has acquired a fair amount of voluntary power over the left arm and leg, the
Convulsion never spread to this side. Although, prior to the occurrence of the haemorrhage into the right hemispheres, the left arm and leg had always wavered in the distal area, they now remain perfectly quiet, throughout the year. The cerebral lesion is the undoubted cause of alteration in the paroxysm, its mode of operation however is, as present, difficult to determine. In another case, I witnessed the rare association of epilepsy with para-plegia, the result of pressure in the bone, in the region of the end, from Potts disease. It is more than likely true, in this case, the epilepsy was truly sympathetic and cerebral, and wholly independent of any cord lesion. The curvature had existed from childhood, and gave rise to no material inconvenience, until the age of forty-five, when complete para-plegia occurred. He regained the limited power in the legs, in the course of twelve months, and it was not until one year later, that he was the subject of his first
epileptic fit. The attacks then after recurred more or less regularly, every three months, always in the night and during sleep. At the age of fifty-two, seven years after the first attack of paraplegia, he came under my notice having again lost completely the power in both lower limbs. Gradually he began to amend, and on the day previous to an epileptic seizure, I had noted that he was able to move freely and very imperfectly the left leg, foot, and toes; on the right he had no power whatever. During the fit which was typically epileptic the head was drawn from side to side alternately, both upper limbs were at first the arms, then the back, and afterwards the clonic spasms. The left leg, at first straight and somewhat rigid, manifested during the existence of clonic spasms in the upper extremities a general tremor, whilst the right leg, throughout, evinced no change. Later on, having recovered almost completely power in both legs, all four limbs alike were the seat of convulsive disturbances during the epileptic fit.
It is more than probable that, in this case, the pressure on the lower dorsal part of the cord, determined the freedom from motor disturbance of the right leg, and existence of respiration instead of chronic apnoea on the left during a paralyse, when the paresioplegia was almost complete. Epilepsy, purely dispassively in character, is often found co-existent with infantile or adult hemiplegia. The association may be a mere casual coincidence. In many such cases, the motor manifestations are confined to the hemiplegic side, and the fact that there is frequently no intellectual disarrangement whatever, is indicative of an epileptiform, rather than an epileptic disorder, and points to some cause cortical lesion, as the cause of the chronic motor apnoea. The length of time which may elapse between the occurrence of the hemiplegia, and the epileptic or epileptiform manifestations, may vary. In one case, which came under my notice, twelve years had elapsed, and the convulsions were markedly general, not limited or confined to the hemiplegic side. The whole question is
one wraps in obscurity, for it is quite possible, that apart from the hemiplegia, this last, might have been the subject of idiopathic epilepsy.

The position of the limbs may, during the paroxysm, vary in the same as well as different attacks. One or more of the extremities may be unaffected, and occasionally although rarely, the motor evolution may be increased, the spasm being located in the upper extremity on one side and in the lower on the other. When three limbs are invaded, it is more commonly noted in one upper and the two lower than in the two upper and one lower. Sometimes one or more limbs may be involved, and one or more may be strong. In one case, the upper limbs were invariably raised above the head during the attack, while in another, they performed a to and fro movement. If a patient, during an approaching paroxysm holds anything in the hand, the object is tightly grasped, while the tonic state lasts, but is invariably dropped with the onset of the clonic convulsion. Flexion is a common posture assumed not only by
the upper, but also by the lower limbs. In the upper, when flexion predominates, the arm is usually adducted and drawn across the front of the body, the elbow and wrist are more or less markedly flexed, whilst the thumb is bent in the true palm of the hand and the other fingers, too. When the lower limb is similarly involved, the thigh is bent in the abdomen, and the leg on the thigh, whilst there is an associated extreme dorsal flexion of the foot. With strong flexion in the limbs, the head is often bent forward in the chest, and so prone and supine is this initial posture than I have seen the patient, so curled up, thrown out of bed with violence on the floor. In some rare instances, I have witnessed a dominating extension of the lower limb, associated with well marked plantar flexion of the foot, so extreme, so to make the foot and leg almost straight. Occasionally, under such circumstances, there is held a slight disposition to arched of the back, the head at the same time being drawn back.

Micturition.
During the fits there is frequently a voluntary passage of urine. This, by some authorities, is considered a pathognomonic sign of epilepsy, as however I have occasionally witnessed the coexistence of this phenomenon with convulsive epilepsy, typically hysteric in character, I cannot view it as an infallible symptom. Although urination is often a consequence of the severe epileptic paroxysm, with total loss of consciousness, yet the act is one which may be manifested, apart from the combination, either with intellectual perturbation alone or the motor spasms, without loss of consciousness. In one case, which recently came under my notice, the patient, occasionally the subject of fully developed attacks of epilepsy, frequently experienced a mere sensation of the nature of a general fine cold in the right leg. In such minor attacks, and with any intellectual disturbance whatsoever the bladder invariably expelled its contents, the patient retaining a full knowledge of the act, but being wholly unable
to prevent it. I have also wit
nessed the bladder empty itself dur
ing simple epileptic incontinence,
unaccompanied by any other manifesta
tions. The boy was the subject of
minor as well as severe epileptic
attacks. In the minor, consisting in
complete loss of consciousness and
eight tremors of both upper extremi
ties, especially the right, the vesical
contents were invariably expelled. This
patient never fell during the minor
attacks, but if standing, when so af
fected, maintained the erect position.
In some cases, the face and sole
arose of an approaching paroxysm,
is the feeling, of a desire to inhale,
and if the act can be forthwith
accomplished, the caesarean passes
are to be made at once, or for the epileptic malform
ation issues. If from surrounding
incumstances the bladder cannot be
emptied, the sensation may occasionally
pass off, but more commonly it de
termines a fully developed fit, in
which the vesical contents are then
expelled. In some few cases,
there is apparently a hypersecretion
Of urine, the water passed immediately
after the attack, being paler than
usual and of unusually low specific
gravity. This anomaly is probably
comparable with the uncommon exist-
ence of saline which I have noted,
due to which I shall presently
draw attention. In three oc-
casions, I have detected a slight
trace of albumen in the urine,
after the paroxysm, but have any
trace of sugar.

The emptying of the bladder during a
fit apparently depends on the
state of distension of this viscus at
the time of onset. In some cases,
it appears to result from an in-
duction of the bladder by the

rule, however, it is effectuated by
a direct contraction of the bladder
muscle, aided by the upward incisant
pressure exerted by those of the
abdominal walls.

Erection of the penis, and emission of

In severe attacks of epilepsy, I
have witnessed on several occasions,
erection of the penis, but have as
any time ejaculation of semen, nor
have I been able to detect, after
the fir, any evidence of it exists. It is possible however, that should the circumstances favorable for the act exist, curbing may result. Tectum, appears to result, from a general involvement of the body structure, as I have here noted its presence in most attacks.

Defecation.

The involuntary passage of feces is an act, of very rare occurrence, during the epileptic fit, as I have only once noted it in the many hundreds which I have witnessed. In this case, the copious evacuation which resulted, lead me to believe that the mere tonic contraction of the body muscles, as a whole, determined the expulsion of the contents of the rectum, apart from any special contraction of the intestinal tract, or inhibition of the sphincter muscle.

Salivation.

A copious flow of saliva, is a frequent accompaniment of the epileptic paroxysm, and is most commonly noted in the fits which are preceded by a distinct epigastic aura. As a
rule, the reaction is thin and watery, character evidenced by that produced by excitation of the third tympanic nerve, or associated with a distinct feeling of nausea. In several cases, the saliva has literally poured out of the mouth, its downward flow into the stomach being prevented by the resistance of the large esophagus, to which, I shall presently draw attention. If the tongue has been bitten, the saliva may be tinged with blood. In a few rare instances, I have witnessed a markedly turgid and blood-red coloration of the secretion, and yet have been unable to detect any laceration of the tongue. Under such circumstances the blood is probably the result of a transudation from a direct rupture of the blood-vessels situated somewhere in the pharynx. The reaction of saliva, during the epileptic fit, appears to be a purely nervous character, and wholly independent of any direct alteration of the blood supply to the glands. Increased blood supply is, ever, a necessary concomitant of augmented functional activity.
but what I mean to infer is, that, the alteration in the vascular state of the gland, is not the initial cause of the hypertrophy, but merely an essential association. The irritation is probably purely central or central, and not truly reflex, and is apparently unconnected with motor disturbance even of the jaw. I have remarked it in back alike during the existence of a distinct path as well as marked flushing of the face.

Vomiting. I have never witnessed, during the epileptic seizure, although I have, in a few rare cases, noted its occurrence before and after the fit. The symptom is ever a most dangerous one, as food is apt to pass into the glottis, and bring about a fatal result. When we remember that calciation is a frequent concomitant of the paroxysm, it is surprising that vomiting never occurs. In order that the contents of the stomach may be expelled, the cardiac orifice must remain patent, and this, probably, never happens during a fit.
Contraction of the gullet and cardiac end of the stomach, is, apparently, produced before the gastric organ itself becomes invaded, or affected by the superincumbent pressure of the diaphragm, and abdominal walls. In a few rare instances, patients who during a meal, have felt the usual epigastric aura, common to them before a fit, have informed me that they have then occasionally experienced some difficulty in swallowing, a fact strongly in favor of early spasm of the gullet.

Abortion.

In a few rare instances, I have noted perfect immunity from epileptic attacks in female during gestation, as a rule, however, this physiological state interferes in no way with the recurrence or character of the paroxysms. Women who suffer from epilepsy are invariably more prolific, and it is somewhat astonishing, that although the whole body structure appears to be more or less invaded by a severe paroxysm, the uterus then in a state of gestation, is seldom so involved, as to expel its
contents. The epileptic fit itself, I have never known to be the initial factor in producing abortion. The accident however occasionally happens, and is then commonly the result of some direct injury sustained during the fall.

The state of eyelids.

During the fit, the eyelids are usually open, on several occasions however, I have observed a closure of one eye, not only during the state of tonic contraction, but also during the existence of clonic spasm. The eye closed is invariably that towards which the eye and head are primarily deviated, the other eye remaining open throughout the attack. In a few cases, I have seen both eyes firmly closed by spasm. During violent exercise, screaming, sneezing, and so forth it has been suggested that closure of the eyelids then, produced by contraction of the muscle, is for the purpose of protection; a wise provision of nature to prevent rupture of the overstretched blood vessels. Rupture of the blood vessels of the eye, deep or superficial, is however an accident of so frequent occurence...
current during the fit. When the eyelids are, as a rule, open, it is as if I question their alleged protective efficiency when closed. Closure of the eyelids is effected more especially by a descent of the upper lid and I am inclined to think that during the epileptic fit closure is prevented by a dominating, and early, contraction of the levator palpebrae.

The state of the pupils

During the actual fit itself, the pupils are as a rule widely dilated; on two separate occasions only, have I witnessed marked contraction, a condition which must be considered a very rare. In a lad, aged eight, the subject of minor as well as severe and general epileptic attacks, I had the opportunity of witnessing several paroxysms. During and after the minor fits in this case, it was difficult, nay utterly impossible, to elicit with certainty whether consciousness was complete or but partial. I believe there was more intellectual disturbance, the result of irritation of the epileptic discharge to the left cerebral lobe, affecting the higher centres of this hemisphere alone. In the
minor attacks, he was totally unable to speak, yet appeared not wholly unconscious, but seemed to comprehend, although somewhat imperfectly, what was said to him. The role muscle manifestation of the paresysm was a twitching of the orbicularis of the right eye, associated with a dilation of the pupil of the same eye, whilst that of the left eye was unaffected throughout the attack. In this case the dilated pupil was on the side, towards which the head would probably have been primarily deviated, and away from that hemisphere the seat of initial discharge. Associated activity of the two hemispheres of the brain is the rule, yet it is possible, and the above case serves as form the acceptance of the theory that dual and independent action is probable. In this case the dilatation of the pupil (right) in the minor attacks may be considered as comparable with the dilatation which normally results when an individual is directed to look into space. The pupillary change in this case suggested the possibility of being able to derive some valuable
information from the pupil states so constantly associated with epilepsy and to which I shall presently refer in determining approximately the seat of initial cerebral disturbance.

Dilation of the pupils, as is well known, occurs during violent muscular effort: it is however a noteworthy fact that this state of pupil is a concomitant of the brain attack, as well as the severe epileptic paroxysm. Pupillary dilation was at one time consi3dered to be dependent on a contraction of the blood vessels of the iris. How will the old theory disappear, that contraction of the blood vessels of the brain, as manifested by a pallor of the face, is the initial change in the epileptic fit, dilation of the pupils, as a consequence of contraction of the blood vessels of the iris, might be feasibly maintained. During ordinary blushing, the vessels of the retina and the brain, have been seen to dilate; it is therefore more than problematical that the vessels of the iris are similarly affected. If however the pupillary state were the
result of alteration in the calibre of the blood vessels circulating in the Iris, we should expect to find dilatation of the pupil associated with epileptic pallor, and diminution in the size of the pupil, consistent with initial flushing. Although contraction of the pupil has been noted during the fit, the condition is extremely rare, and makes dilatation to the rule whether there be manifested an initial pallor or flushing of the face. The pupil state in epilepsy appears to be wholly independent of the sympathetic influence, also totally unconnected with any cord change whatever, and is most probably of a purely central origin.

In many cases of epilepsy, I have frequently remarked, during the period of immunity from attacks, the existence of a permanent inequality of the pupils. I have also it is true occasionally observed an inequality of the pupils in individuals of apparently good health, but the common association of this phenomenon in epileptics, makes it somewhat problematical, that it may be a direct result of the
Proneness to this chronic functional disorder. In some cases, I have noted, that the pupils, apart from any attack are ex widely dilated, and little do not react at all to light, or, but feebly, the nature of the contraction or the same time being wavy and uncertain. The pupil under such circumstance, plays a marked proneness to dilate again, the contraction produced, being most fleeting and transient, which otherwise in good health would continue so long as the exciting cause lasts. When the pupils are unequal, the least effort of accommodation may determine equality, the inequality only reappearing with the state of comparative rest. In testing the reaction to light, I have frequently remarked, that, whilst the pupils may in conjunctiva react well to this excitation, separately, the more dilated will be found to contract less materially, and with less certainty than the smaller and at the same time manifest a great tendency to return forthwith to its pre-existing state of dilation. The iris itself is a highly organized structure, and as the epileptic may be considered an epileptic
even to the finger tips, it is quite probable that this photoplastic veil in
the eye participates in the general structural instability. So far as
my observation goes, a careful scrutiny of these cases with inequality of pupils,
reveals no constant information regarding the seat of initial cerebral dis-
turbance, as manifested by the primary deviation of the eyes and head.
The dilation of the pupil, during the actual fit, results probably from
a withdrawal of the usual nerve toning influence, whilst the permanem
wavy and uncertain state of the pupil, so constantly observed in epileptics, is the
result of some occult change in the iris itself.

Vascular Changes

Palpitation is often a precursor of the epileptic regime, (mild as well as
deleterious) and in some cases in even constitutes the distinct aura or warning
of an approaching paroxysm. During many fits, in the male and female
alike, I have detected a marked increase in the frequency of the pulse,
reaching through rarely as high as 120 or 140 per minute. After the cessation
If the attack is gradually lessens in frequency and returns to its normal rate. Augmentation of the pulse rate is more commonly observed than diminution in a few rare instances however, I have found a pulse averaging as a rule 76 per minute reduced during the actual fit itself to 48. In many cases, I have remarked an apparent or rather appreciable change elsewhere. While on one occasion, my did I note, in the miss in a pulse, which at other times was perfectly regular.

In some cases, there is either a marked pallor or distinct flushing of the face, indicative respectively of contraction and dilation of the blood vessels; occasionally, however, during the same attack I have observed an alternation of these two vascular states. During a severe paroxysm, the face, irrespective of its initial color, is invariably livid, because of the interference, from muscle spasm, with the pulmonary circulation. The cyanosis gradually lessens, and the face re-assumes its normal color as the convulsions subside.
Spearm becomes more completely interrupted.

During severe fits haemorrhages, more or less extensive may result. In the skin, these usually present of the character of petechiae, and are most commonly detected in the neck, the eyelids, and external ears, especially the lobes. On one occasion I witnessed a instance and comparatively speaking, profuse haemorrhage from both internal ears. Not infrequently I have noted extensive subconjunctival haemorrhage, in one or both eyes, which unde was during the process of absorption, the usual changes heeded to such. Occasionally as I have already remarked, rupture of blood vessels occurs in the pharynx or oesophagus.

Respiration.

In minor epileptic attacks, with mere loss of consciousness and slight flushing of the face, I have frequently observed d marked acceleration of the respiration. As a rule however in the typical attacks there is interference with the respiratory movements, and signs more or less distinct of asphyxia results from a fixation of the respiratory trunks.
and spasm of the plottis. In many cases
the asphyxiated state becomes so mark-
ed, that death seems inevitable.

Finger snapping.

Finger snapping is an odd gesture,
yet in my case I constantly witnes-
sed its manifestation during the epilep-
tic unconsciousness. It is supposed to
be a sign indicative of contumely, whether
there was even such idea in the mind
of my patient prior to the exhibition of
this peculiar phenomenon I failed to
elicit.

The state of the reflexes
during the epileptic fit there is
total abolition of all reflexes, the
pupils fail to respond in the usual
manner when exposed to a strong
light, the conjunctiva when touched
fails to elicit a reflex contraction
of the orbicularis, and when firmly
touched, the plantar surface of the foot
fails when tickled to produce the
usual muscular contraction.