On epilepsy as a result of malarious infection / by A. J. Payne.

ON EPILEPSY AS A RESULT OF MALARIOUS INFECTION.

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If the operation of the paludal poison on the nervous system, or rather if the many and various symptoms of low nervous vitality, which are produced in the system as secondary results of the influence which we call malarious, were watched and their history written, it would recal more perplexing passages in the experience of Indian physicians, elucidate more "anomalous" cases of disease, and furnish the key to more erroneous predictions than almost any contribution that could be made to the medical literature of the east. It may, at first sight, appear surprising that, with the quantity of materials at hand in nearly every part of India, no attempt at such a history should hitherto have been made; but it is not surprising; the pursuit of special subjects in Indian medicine has not prevailed as it has in Europe, and the difficulty and obscurity of nervous diseases have probably here, as there, operated as a check at attempts to investigate their causes and mode of origin. It is rather matter of surprise that there should have been any advance in this branch of pathology, as chemistry and the microscope with the great impulse they have given to the minute study of other organs, have thrown little or no light on the morbid changes of the nervous centres.

There is, perhaps, no form of nervous disorder, from the most trivial to the most severe, that is not occasionally simulated by the action of miasmata on this portion of the system. The possibility of such action has been obscurely hinted at by several Indian writers, and facts, in no scanty quantity, bearing on the question have been placed on record in this country as well as in Europe, but the connexion has been enveloped in obscurity, merely intimated, not traced or described or sufficiently defined to render it available in diagnosis; and the facts have in several instances, been introduced as exceptional

phenomena in the course of disorders to which they stand in no sort of pathological relation.

This frequent operation of miasmata on the nervous system renders it antecedently probable that convulsive disorders should have a place among the results; and the object of the following observations is to shew that they occur in several forms, and contribute in no small degree to swell the list of a class of affections which are very prevalent in India, and of which class some components such as local anasthesia, neuralgia, spasmodictic are sufficiently recognized. In doing this, I desire more especially to draw attention to one particular form of convulsive affection, which, from its mode of origin and the character of the symptoms attending it, may be best designated *malarious epilepsy*. I wish to distinguish this from the acute convulsive paroxysms which occasionally shew themselves at the onset of fever in children, and are now and then seen in the adult as the precursors of death in more chronic cases of ague, and to which the name *eclampsia* seems better suited. The disorder of which I am about to speak has characters which claim for it separate consideration, and which associate it in symptoms with epilepsy only. It is often attended by no febrile disturbance. It follows, but sometimes after a considerable interval of time, on malarious infection; which may not have shewn itself in paroxysms of ague at any period of the case; so that the convulsive seizures may become the only active symptoms of disease. The seizures stand in fact, in various relations in different instances to febrile disease, and may, I have little doubt, be traced to the alteration which has taken place in the blood as a consequence of the infection.

There are facts on record scattered through medical works and periodicals, especially those of recent date, which, if collected and combined, will be found to arrange themselves at once in groups of symptoms of sufficient definiteness and uniformity to establish the existence of this form of disease on irrefutable evidence. Cases appear from time to time under diverse names and in obscure connexions, from which it is necessary to free them in order to understand their real nature; but, once cleared of all obscurity, there remains no room to doubt their character. These misinterpreted cases are particularly abundant in English works, a result probably of the great attention paid in England to drainage and other sanitary measures, whereby malarious disorders are rapidly under-

going banishment from the large towns, and are therefore but little studied and understood.

On the continent of Europe, on the other hand, there is by no means this great exemption from paludal miasmata, and accordingly we obtain in the works of continental writers more ample information on the subject, and a minuteness of detail to which our countrymen in England are strangers.

It may be said, and with reason, that to give a specific name such as malarious or miasmatic to convulsive paroxysms, for the sole reason that they sometimes occur and prove fatal in the course of intermittent fevers, is unscientific as well as unnecessary. Such seizures are recognized as a consequence of a disordered condition of the blood, which is producible by a variety of causes; and in their relation to this proximate cause there is nothing specific in the cases under consideration. But this cannot be said of the epileptic cases. These are sometimes entirely independent of any febrile affection, and seem to be the only active manifestation of disorder. They are generally more or less periodic, and malarious infection is traceable in their antecedents; but in the phenomena of the paroxysm, the mode of its invasion, the occasional presence of an *aura*, the often chronic course, the accidents and risks to which the sufferer is exposed in the fits, and the consecutive mental derangement to which the neglected disorder leads, they resemble epilepsy and epilepsy alone. They are not, as far as I have ascertained, connected with any previously proved constitutional tendency, nor can they be identified with those convulsive attacks, resulting from extremes of temperature or other causes, which are frequent about the equator and in arctic latitudes. Thus, while the symptoms of the affection, and its tendencies, if unchecked, would assign it the name of epilepsy; its special origin, and its course and termination under appropriate management, render it most desirable that it be known by some distinctive appellation, that its victims may be guarded from the cheerless prospect which the unqualified name of epilepsy carries with it.

This form of epilepsy has not, to the best of my belief, been treated by any authors, in such a manner as to shew, that they regarded it as a distinct affection, occurring apart from acute malarious diseases. Wood, in his "Practice of Medicine,"* thus notices the subject. "Among cases of masked ague may be "enumerated neuralgia, rheumatism, epilepsy, hysteria, &c, all

* Vol. 1 p. 257.

"of which occasionally appear in the intermittent form, oc-
"curring daily or every other day at the same hour, with
"intervals of apparent health. But it appears to me that
"they have as little claim to be considered intermittent fever,
"as the same affection in their continued form would have
"to be considered continued fever," and having disposed of the question of their identity with ague, he makes no attempt to trace the true relation in which the affections stand to each other. Epileptoid seizures are incidentally mentioned by other writers on the Marsh Poison, and in treatises on epilepsy, cases appear here and there in which residence in a malarious climate is casually mentioned. It is possible that, regarding the attacks as merely a consequence of the disordered condition of blood produced by the poison, and as falling therefore within the operation of a recognized cause, European and American writers have considered that there is nothing to call for separate notice, but, however this may be in Europe, the frequency and severity of the disorder, its consequent interest and the importance of a clear understanding on the subject, demand for it special consideration in India.

I should premise that in using the words *malaria, miasm paludal poison* &c, as I must of necessity do rather frequently, in the course of my remarks, I do not intend to imply the direct operation of any special and peculiar agent, nor to affirm that the nervous phenomena have any specific characters ascribable to the mode of their origin, or differ in any way from the symptoms producible by the same state of system when it arises from other causes. I have already intimated a conviction that the phenomena are secondary to and symptomatic of an affection of the blood; and the point which I wish to establish is, that this affection of the blood, while it has other causes, is produced with great facility in certain situations by atmospheric or telluric influences called malarious, and when so produced is very liable to be attended with convulsive seizures. If this be so, the appropriateness of the name *malarious epilepsy* will scarcely be denied.

I proceed to extract from the works of several writers passages and cases in proof that, notwithstanding the absence of special descriptions, the connection between convulsive affections and marsh miasmata has not been altogether overlooked by observers, whose opportunities of witnessing them have been considerable. Romberg, speaking of 'epileptic conditions,'*

* Nervous Disease of Man, II. 192.

narrates the following case. "A boy, aged 5, who was brought "to the Policlinik on 10th Nov. 1846, and whose mother "had suffered from eclampsia during pregnancy, had for eight "days previously been subject to attacks of eclampsia which "recurred daily between four and five o'clock in the morning "and were preceded by headache. As there was a large accu- "mulation of ascarides, purgatives of calomel and jalap were "ordered, the effect of which was that no regular paroxysms "occurred up to the sixteenth, but that every day, at the "same time, headache and giddiness, and an occasional distor- "tion of the right ala nasi and angle of the mouth, super- "vened. On the 24th of the month, the paroxysms having "returned at the usual hour, one grain of the sulphate quina "was ordered four times daily; upon this they gradually "abated, at last passed into a slight rigor, and on the 15th "December ceased altogether.

"The disease ran a similar course in a boy of twelve years, "who, when first seen, had been attacked with eclampsia every "evening for eight successive days; the fit was preceded by "vertigo, and no appreciable cause could be shewn to exist. "In this instance, the intervals being quite free from disease, "quinine was exhibited in doses of five grains daily; the con- "vulsions gradually disappeared, and in their place there was "merely headache, vertigo, and sickness. Two scruples of "quinine sufficed to restore the patient entirely."

Here are two cases of which evidence from the previous history is wanting. Although in the first, the transmission of a convulsive tendency from the mother is intimated, the sequel of the case in the entire removal of the fits by quinine has probably another signification: and the second case is ascribed to 'no appreciable cause' but the nature of it seems to follow also from its periodic character and the manner of its cure. I say *seems to follow*, but the cases are inserted here merely as shewing similarity of character to malarious affections. They are not, in the absence of a detailed history, so conclusively to the point as some that I am about to adduce; for it is a question whether periodicity itself, which is regarded almost as a distinguishing feature of malarious affections be, in its true nature, anything more than an evidence that the nervous system is engaged in producing the symptoms; and that a low state of nervous vitality has arisen, whereby the resistance of the system to external influences is

impaired, and it is acted upon morbidly by recurring diurnal changes in the atmosphere or other medium. Many such changes undoubtedly take place which are inappreciable by any means yet at our command. The gravity, elasticity, temperature, humidity, and roughly the electrical state and chemical composition of the atmosphere are within our reach; but we know little of its vital properties, and the manner in which its influence is exercised on organic life. We do not doubt that a certain proportion of the several elements, is necessary to healthy life; but this proportion is not shewn, by any tests or instruments of ours, to be deranged in regions which are manifestly deadly; and there must, therefore, be qualities or conditions of the elements, or disturbing causes from the earth, which we cannot yet estimate, but which have nevertheless a potent action on our bodies. Observers, however, are on the track. Chemists are talking of allotropic conditions of gaseous elements, and bringing their speculations into very close relation with human disease; so there is hope of light upon this very obscure subject at no great distance of time, a time when the analysis of a body shall signify not merely that its constituent elements have been named and weighed but also that the condition and quality of each have been gauged and its fitness for any special purpose determined.

A third case narrated by Romberg* will follow not inaptly upon these reflections.

"Stahl and Mead are in favour of the doctrine (of planetary "influence in the production of epilepsy). The latter men- "tions the case of an epileptic girl aged 5 years, whose attacks "came on daily with high water and ceased at low water; and "this occurred with such punctuality, that the loud scream, "with which the patient invariably recovered from her fit, was "the signal which awoke the father, a waterman living at the "Thames' side, and told him that it was time for the com- "mencement of his business.'

The planetary influence alluded to in this case was, of course, that of the moon; and although the author wrote in 1748, when residence at the "Thames' side" was calculated to produce, by direct telluric action, a tendency to disease of this nature; the determination of the period of recurrence by the tidal ebb and flow, was no mean evidence in support of his position; as these periods, not corresponding with the hours of

* Page 205.

the solar day, were to this extent at variance with the received* rule of malarious affection; and thus in this, and similar instances of alleged planetary influence, we may not be far wrong in concluding that periodicity is determined by external agencies on a nervous system weakened by impaired nutrition from disordered blood, and so brought within the range of influences which in health are not perceptible.

In the Medical Times and Gazette for 1856,† Dr. Robert Hunt, in an endeavour to shew that a tendency to spasm and convulsion is created by abnormal excess of alkali in the blood, narrates the following.

"Mr. B. aged 18 passed the summer of 1851 in a mala-
"rious district. Towards the autumn he perceived a change
"gradually coming over him; he became languid and incapable
"of exertion, and his intellectual faculties so dull, that he was
"unable to prosecute his studies. Intermittent neuralgia fol-
"lowed, which was quickly cured by quinine; and he was sent
"into the country to recover his strength. Malaise remained
"for several weeks, after which, attacks of insensibility occur-
"red, and observed a quotidian period." The accession of the nervous affection, after removal from the malarious climate, corresponds with the history of many aguish affections, and the same peculiarity has fallen frequently under my own observation in India. I do not doubt that this insensibility would have been rightly called epileptic; as I have known the same phenomena alternate, in the course of a single case, with paroxysms of convulsion. It was in fact the *petit mal* of French authors, the *epilepsia mitior* of Dr. Marshall Hall.

Frerichs, in his valuable work on diseases of the liver,‡ gives the following example of 'Intermittent Fever with con-
'vulsions, and loss of consciousness.

Carl Grund, aged 28, was admitted on the 27th of October
"1854. His illness commenced fourteen days before, and was
"characterised by persistent headache, accompanied by noises in
"the ears, nausea, and great weakness and delirium; there was
"no evidence however of rigor, or of any of the other symptoms
"of intermittent fever. On the 27th October, soon after admis-

* The term "received" in this place has reference to English opinion. The influence of tidal flux and reflux has frequently been noticed as determining the period of intermittent disorders in Lower Bengal and is fully believed in the sea port towns of France.

† Feb. 9. p. 155.—March 1. p. 206 and March 22. p. 279.

‡ Vol. I. p. 340.

"sion, the patient was seized with an attack of convulsions, ac-
"companied by loss of consciousness, which lasted about half an
"hour, and returned once more during the night. On the
"morning of the 28th, a considerable enlargement of the
"spleen was detected; pulse 78, great headache but conscious-
"ness clear; the skin secreting actively; the urine throwing
"down a slight deposit, but containing no albumen; stools
"normal.

"The increased frequency of the pulse and elevation of the
"temperature appeared at irregular intervals, at one time daily,
"and at another time every second day, and were accom-
"panied by giddiness and severe headaches, passing into
"delirium; those symptoms gradually subsided with sweating.
"They were never ushered in by a rigor. During the inter-
"missions the patient's condition was but little deranged. On
"the 8th November he was ordered three grains of quinine every
"two hours; under the use of this, headache, giddiness, and ex-
"citement of the vascular system ceased; but on the 16th, they
"returned in a severe and regular tertian form, though still
"without any rigor stage. Bark was administered for a long
"time, and under its use the symptoms gradually disappeared."

The physiological relation between rigor and general convulsion scarcely needs allusion.

Again says Frerichs (p. 329) "I have met with convulsion
"in eight cases (of intermittent fever). At one time they
"appeared as slight spasmodic movements of individual mus-
"cles of the trunk and extremities, at another time as rapid
"rotating or tossing movement of the extremities and head,
"and again as general convulsions similar to those of epilepsy,
"which usually lasted from five to ten minutes, and returned
"after a shorter or longer interval."

Dr. Handfield Jones* in speaking of the condition to which he has given the name of *Neurolysis* says, "Sometimes
"there are attacks of epileptoid character, but yielding to the
"usual tonic treatment in a way that true epilepsy does not."
And immediately afterwards he writes. "The causes which
"give rise to neurolysis are often very obscure. Two however
"can be distinctly recognized, viz. the influenzal poison and
"malarioid miasms." And, in the course of his pamphlet, several cases are given of intermittent convulsive attacks removed by quinine, nux vomicà &c.

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* "Tract on Neurolytic and Aguish Disorders." Lond. 1859.

In the Lancet for March 3, 1860, the following well marked case appears, under the title of 'obscure brain disease.' The patient was under the care of Dr. Brinton in the Royal Free Hospital, who remarks; "She was admitted into Hospital "about three weeks ago, in what seemed to be an epileptic fit. "She was convulsed and insensible, foaming slightly at the "mouth and breathing somewhat stertorously. In the course "of about half an hour, this state gradually passed into a deep "sleep; the drowsiness left by which had not quite disappear-"ed when I saw her on the following day. She had been weak "and exhausted for some months past; a condition she attri-"buted to the anxiety and unrest of one or two arduous atten-"dances upon sick persons. About three weeks before admis-"sion, she was seized with violent abdominal pain; soon attend-"ed by a severe dull pain and feeling of weight in the head. "These were all the symptoms, she stated, prior to the fit; "of which, it need hardly be said, she only knew from those "who chanced to be around her, when it happened. Her "bowels had been sluggish, but had yielded to full doses of "ordinary aperients. Her face was sallow and cachectic in "hue, though perhaps not more so than fatigue and unrest, "with close confinement in sick rooms would have accounted "for. Moderately dilated pupils. Limbs perfect as to sen-"sation and motion, but threatening almost to give way "under her as though from debility. A slow measured pulse "40 to 45 per minute; a trace and only a trace of sugar in the "otherwise healthy urine.

"To questions suggested by the periodicity of the pain, she "answered that, until the last few months, she had been "residing for many years in a very aguish district of the "Western counties; but without ever experiencing anything "more than malaise. These symptoms, which remained abso-"lutely unchanged for several days without any return of the "epileptic fit, were all the materials for diagnosis."

"Cerebral disease, involving the surface of the brain, and "located at its base; probably extending to the fourth ventri-"cle. So far I found myself at once inclined to push my con-"jectures respecting the malady. Or rather it was not the "malady that I was conjecturing, but what might very likely "be only its separable accidents—its situation in width and "depth. Did the patient's aguish residence, her cachectic look, "her periodic exacerbation of pain, indicate an aguish disorder? "To this it could only be answered that the spleen and liver

" were of normal size, the heart sounds healthy, the menses " unaffected. She had, however, once or twice, lost from one " to two drachms of blood *per anum;* and apparently not from " hæmorrhoids."

Dr. Brinton, acting upon such evidence as he could trace of " aguish origin, resolved to " make it the basis of a very " careful tentative treatment. Beginning then with purga- " tives, and finding that these had absolutely no effect, and " that counter-irritation was equally useless, I proceeded in " a day or two to administer iodide of potassium, with the " same negative result. Quinine was then ordered in two " grain doses. The effect of the remedy was, every way, most " remarkable and satisfactory;" and a description follows of the " details up to a certain point. " She walked about the ward, " and talked quickly and cheerfully enough. Still, however, " the pain (in the vertex) remained, much less intense, and " with scarce any evening exacerbation; but dull fixed and " suspicious: nor did her face, at any time, permit the hope of " speedy recovery. Indeed, after about a fortnight of a pro- " gress continually becoming slower and less apparent, I could " not assure myself that she was really improving at all;— " one or two days afterwards she died suddenly after an epilep- " tic fit."

" The examination shewed a dark firm clot of blood with a " harder and paler uncleus of coagulum near its centre, dis- " tending the fourth ventricle, from the upper and anterior end " of which cavity it passed along the *iter* leading to the third " ventricle. &c. These appearances," continues Dr. Brinton, " suggest at least two hæmorrhages of different dates, proba- " bly corresponding to the two epileptic fits. The whole case " suggests no very satisfactory reflections. The triumphs of " mere diagnosis are barren enough. But here, despite the ap- " parent neatness with which the locality of the brain affected " was fixed upon during life, we are still left in some doubt " as to what was the precise nature of the disease causing the " hæmorrhage."

There is, I think, little room for doubt, that the opinion put forward so cautiously by Dr. Brinton, as to the aguish character of this disease was well founded. The case in its origin, features, and progress, resembles very closely some that have occurred within my own experience in India. Intracranial extravasation, as an immediate result of general convulsion, is by no means uncommon; and when the con-

vulsion arises from a disordered state of the blood, the chance of the accident is increased. The appearance of a trace of sugar in the urine has an independent interest in connection with the seat of the injury, the fourth ventricle.

I am not acquainted with any work on Indian disease which contains direct mention of epileptic seizures as a result of malarious infection; but several cases, under the name of 'cephalic disease producing epilepsy,' and probably of this nature, are recorded by Dr. Wm. Geddes,* who remarks also on the great liability of European troops in India to epileptic attacks. No fewer than fifty nine cases, in one regiment, were reported within the space of four years. Dr. Geddes' experience was obtained in Masulipatam, the troops under his charge being quartered in the fort, which is completely surrounded by a salt marsh, and extended over a short period of time after the regiment quitted the station, during which the infection contracted there would in many cases have continued in operation; so that it is much to be regretted that, with such ample opportunities of tracing the history of the epileptic tendency, the author should have left us almost without information on the subject.

The first case of the kind which came under my own observation, occurred ten years ago, in the Goruckpore district, in the person of a planter. I do not remember now whether he had suffered from ague previously, but marsh fevers of every kind abounded in the vicinity of his residence, and he had himself suffered for some little time with symptoms which I should now, at once, recognize as *neurolytic*, although at the time I was quite unable even to conjecture their significance. These symptoms, some of which afterwards appeared in the character of an epileptic *aura*, soon culminated in convulsive attacks. One of these I witnessed, and its phenomena were precisely those of an epileptic seizure. It commenced with slight muscular twitching at the left corner of the mouth, and rapidly passed into general convulsion, with loss of consciousness, lividity of countenance, suspension of respiration, foaming at the mouth, &c. In a few minutes it subsided, and left no trace in the appearance or consciousness of the patient.

From this time the nature of the seizures was clear; although I was as much as ever in the dark as to their origin.

* Clinical Illustrations of diseases of India: by W. Geddes, M. D., London 1846.

I did not guess at any connexion between an illness of this kind and a marshy residence. He had not been subject to epilepsy in earlier life, bnt it came out on close enquiry, that he had once been affected in a somewhat similar manner on ship board, when crossing the line, and once in Goruckpore had, without warning of any kind, been seen to rush suddenly from his house, and, seizing whatever he could lay his hand on, commit a series of violent assaults upon every one who came in his way. Both these paroxysms had passed off, leaving no more trace of their occurrence than the fits I had witnessed, either in his sensation or recollection.

I tried a number of remedies in this case. Some appeared to have temporary value, and others to be altogether inert. Shortly after he came under my care he left India for Australia, and I have since heard that he has never had a return of the disease. It is worthy of remark that the first convulsive seizure took place in the station of Goruckpore, where my patient had come for treatment; that is, at a distance of of about forty miles from his residence, and in a comparatively healthy neighbourhood: and the fit on *ship board, when crossing the line,* has also been mentioned to me more than once, among the antecedents of these cases.

With regard to the latter point, it seems probable that the *neurolytic* condition is brought about by the great heat, to which the patient is exposed for the first time, when he crosses the line on his voyage to India; and that the opposite extreme of temperature is capable of producing the same effect in certain constitutions, is seen in the frequency with which epilepsy attacks sailors in the polar seas; a fact which is mentioned in the writings of arctic voyagers. Both classes of cases occur under the newly found influence, without any trace of previous liability, but, notwithstanding this, the existence of *idiosyncrasies* cannot yet be denied. This vague and evasive term must still be adopted, if we are to speculate on the causes which determine the production of convulsion in one person, ague in a second, paralysis in a third and cholera in a fourth by one and the same apparent proximate cause. It is something to comprehend in one view, by looking at the nervous condition producing them, a variety of hitherto isolated affections; and to apply to them a more efficacious mode of treatment based on this view, as is done in the study of *neurolysis*: but even thus regarded, they only serve to exemplify the varied workings of a law; they do not explain its variations, or the

operation of the cognate law, under which a person liable to the convulsive form of neurolysis at the equator, suffers from the same form in a malarious district at a distance from it.

During the years 1858 and 1859, when European detachments were distributed over the marshy districts of lower Bengal, several cases of epilepsy came under my notice in the Presidency General Hospital. I proceed to describe the leading features of the most characteristic among them.

On 18th November 1858, E. H. an Engineer was admitted, and his condition thus noted; "of pale anœmic aspect although "he states that he has been ill only a few days; does not give "a very clear account of himself. Thinks his liver is out of "order, though expresses no decided symptoms. Is weak and "low and confused in his mind. Answers questions slowly, and "with some difficulty." On the 19th it is stated, "Has had "several epileptic fits since admission. Urine is scanty, sparing-"ly albuminous, and gives dark red pigment; lies in a lethargic "state between the fits, which recur at intervals of less than "half an hour."

Was ordered a Nitric Acid bath and Nitro Muriatic Acid internally, and on the following day it is noted "Fits almost "incessant during the night; lies in deep lethargy; not coma-"tose as he can be roused; passes urine under him in bed (pro-"bably in the fits). Took one dose of the Acid mixture last "evening, but was too weak for the bath. Body to be sponged "as he lies in bed, with the acidulated water. A small quantity "of high colored urine removed by catheter; slightly albuminous "and very highly pigmented.* Pupils active and equal now. "The appearance of the man is suggestive of mixed anœmia "and jaundice, a colour presented by many patients recently "admitted, and apparently due to intense malarious infection. "Treatment continued, and a brisk purge to be administered "in the evening."

During this day he had three fits only; slept a good deal and conversed when awakened. On the 21st he had no return of the fits, but his face had a wild expression, and his left eye was much suffused. On the 23rd no return of the fits, but he has been in a state of cheerful delirium since yesterday morning. Bowels sluggish; still passes urine in bed. Pupil of right eye somewhat dilated. On the 24th he lay quiet and lethargic. All his efforts to speak or act were

* As shewn by deep color with heat and nitric acid.

delirious. Fœces and urine passed under him. Pupils equal. Treatment with purgatives continued perseveringly. On the 27th he is reported, "Better—no delirium, complains of want of sleep;" and on 5th Dec. "no return of active symptoms, either delirium or convulsion, but remains very prostrate. Muscular weakness extreme."

From this time he convalesced, and on 20th Feb. "was discharged strong and active, slight weakness of one hand "only remaining."

This case, at its commencement, might easily have been taken for one of urœmic eclampsia. Albuminuria is common in malarious affections.

On 10th Dec. 1858, Joseph Brown was admitted; he was 27 years old, and described as a florid healthy man on his first admission, which was made in consequence of Gonorrhœa. In hospital he had slight fever, but no other symptom worthy of remark until the night of 27th January following, when he had a violent and long continued epileptic fit. On 28th, was free. On 29th had several fits. On 30th, was ordered a Nitric Acid bath. On 31st it is noted: "Had no "fit at the usual hour; felt greatly better after the bath; "describes himself as feeling alive again when he came "out of it, having previously felt dead for some time." On February 1st, "one fit last night of a quarter of an hour's "duration; feels heavy and confused this morning." On the 3rd and 5th fits are noted, but none on the intermediate days. On the 7th the period was marked by a slight sense of weakness only; and from that date no symptom of any kind recurred. The entire acid bath was given daily up to the 3rd; on alternate days to the 7th; and on that date was discontinued. No other measures were adopted.

A third case, which it is not necessary to transcribe in detail, showed fits of unconsciousness intervening in the course of ague, and occupying the periods at which an ague fit was expected. The bath was used in this case, and when all attacks had ceased for some days, was abandoned. Its suspension, however, was immediately followed by a return of the ague. In the following case change of air appears to have removed the disorder.

A. F. Trooper, 1st Lt. Cavy, admitted 8th Feb. 1860. Recently arrived from the N. W. Provinces to appear before the invaliding committee, and ordered by them to the Gen. Hospital for further treatment. Landed in India two years

ago, before which he had always enjoyed good health; neither himself nor any of his relatives having been subject to fits of any kind. First illness consisted of an attack of ague in June 1858. He was in Allahabad at the time when many others were similarly affected. Beds were scarce, and his regiment had to lie for sometime on the ground in a damp situation. Ague recurred every second or third day. Medical treatment was at hand, and the illness ended in about ten days. Was free for a week; had a relapse; and continued convalescing and relapsing, but without visceral enlargement, until February 1859, when he was sent to Nynee Tal. By the change the intervals between the ague fits were lengthened; but, on any return of damp or foggy weather, he was 'sure of a return.' In June 1859, (is not a drinker, and had taken no liquor on this occasion) had his first epileptic seizure. It commenced with 'creeping sensations all over' him, and culminated in total loss of consciousness, clenching of teeth, general convulsion and foaming at the mouth; and subsided in headache. The fits recurred sometimes daily, at others after two or three days. Occasionally one fit was followed rapidly by two or three others, which he describes as a single attack. Was never free for a week. Says that before the fit he used to feel chilly and aguish, and that this was followed, instead of the usual heat and sweating, by epileptic symptoms; that "the ague used "to bring on the fit." The fits continued during his stay at Nynee Tal which he left about the end of October. From this time his health began to mend. He had only one fit on his way down country, and that was at Shahjehanpore, soon after he left the hills, and one, five days after his arrival in Calcutta.

On admission the pupils were dilated but active. He suffered from a little diarrhœa during the short time he remained, which was readily removed. His strength increased rapidly, the pupils returned to a natural size, and he rejoined his corps quite well.

I noticed without surprise the alteration in this disease after the man's arrival at Nynee Tal; having observed, during a two years residence there, the great tendency to periodic neuralgia which prevails, notwithstanding an elevation of 6400 feet above the sea.

I have since met with many cases of this kind in Calcutta, and within the last year have had them constantly under observation in the native Insane Asylum. They have shewn

the closest resemblance to malarious disorders, both in general course and history, and in the peculiar phenomena exhibited by exceptional cases. One of the latter is so striking as to be worthy of mention. It occurred in a soldier, who chanced to pass several times through a portion of the Delhi district, and on every occasion had an epileptic fit, though in all other places he was a stranger to the affection.

The affection has some characteristic points to which I wish to draw attention, as they are, if duly regarded, valuable in the diagnosis of it. Extremes of complexion are noticeable. The color is sometimes florid, at others pallid and anœmiated. One or the other of these two characters has existed in all the severe cases that I have witnessed; a fact which may be attributable to the action of disordered blood on the ganglionic centres. Another and almost a constant feature is great muscular weakness. The sufferers seem sometimes, after the convulsive tendency abates, to feel nothing the matter with them but the utter in capacity for exertion; the slightest muscular effort is followed by painful fatigue, and an attempt to stand sometimes by a sudden fall to the ground. There is no syncope, no sensation or warning, but muscular action is suddenly suspended and the body drops. This sudden falling is not uncommon among natives of Bengal, who have suffered from climatic fevers. They regard it, and speak of it as epilepsy; but it is attended by none of the characters of the latter, and is only so far related to one form of epilepsy as the foregoing observations imply. It is the action of neurolysis on the muscular system; and the evidence of malnutrition of the central portions of the brain: and is allied closely with the operation of the same cause on the cerebral hemispheres, the result of which we have so often to regret, when it follows on excess of mental labour and anxiety in the persons of high officers of the state, especially in India, and passes current under the name of *softening of the brain*. It must be remembered that there are other sources of neurolysis besides miasms, and mental toil is one of them.

So great sometimes is the muscular debility, whether it proceed from malarious infection or overtaxed mental energies, that a patient of the most active habits will, under its influence, lie day after day on his back, perfectly conscious and easy and cheerful as long as he is undisturbed; but resisting even the offer of food, if its reception is to involve the smallest muscular effort, and protesting that he wishes for nothing but

to be left alone. The same, after a plate of soup and a glass of wine have been forced upon him, will get up, eat and drink heartily and enjoy himself till midnight. This can only happen, of course, when the severer neurolytic symptoms have been subdued, and the patient is convalescing; or as sometimes happens, when the muscular debility precedes all other definite signs, and constitutes the only complaint, to the perplexity alike of patient and physician.

Before quitting the clinical portion of my subject, I propose to offer a few remarks on a form of infantile convulsion which is frequently seen in Calcutta, and which stands in very close relation to malarious epilepsy. The great importance of recognizing it will justify this slight digression.

In the year 1856, shortly after my arrival in this city, and before I had time to acquire any practical acquaintance with the forms of disease prevalent here, I received a sudden summons to a child who had been seized with convulsion. The child was 2½ years old, had been weak and subject to feverish attacks for some time. The parents appeared to be careless and negligent people; they lived in one of the ravelins of Fort William, a low damp unhealthy looking place. The mother was in great alarm, as she had lost two other children, some little time before, with precisely the same symptoms. In the course of a few hours the tendency to spasms subsided. The treatment was according to the *most approved* plan, and had probably little or nothing to do with the issue. Heat of skin and sweating followed the attack, the child was very drowsy for some time, but the next day was free from symptoms. A laxative had brought away a quantity of undigested gram, which had probably been taken from the trough of a horse, which, I learnt, had been feeding outside the door on the morning of the attack; and this, in a child weakened by fever and teething, I concluded had brought about the convulsion. On the third day, however, and at the same hour as before, although the parents had been keenly on the alert in the interval; I was summoned to witness a second convulsive attack, and, guided by the period, I directed my attention to the evidence of malarious infection. This I had no difficulty in gathering; but, convulsions as a consequence of such agency alone being new to me, I hesitated about ordering quinine; and advised immediate removal of the child to Dum Dum, as an opportunity had presented itself. The

convulsion did not return, but the little patient suffered greatly while there from tertian intermittent fever.

A similar case occurring shortly afterwards, I gave quinine fearlessly, as soon as the first paroxysm had subsided, and there was no return of the symptoms.

I have since, notwithstanding very small opportunities of observing children's diseases in Calcutta, met with several cases of the kind, and have heard of many others. So common, indeed, does the affection appear to be, or rather so large is the proportion of cases of infantile convulsion having this origin, that on being called upon to prescribe in a sudden attack in Calcutta, the first questions should be directed to this point.

Quinine has not failed in a single instance that I have seen, to prevent recurrence of disorder, and to do this is, in all probability, to save life, for I have heard of several cases, apparently of this nature, proving fatal under other method of treatment.

This form of attack is not confined to any particular age or country. It has been seen wherever malarious fevers abound. Some very well marked cases, for the perusal of which I am indebted to my friend Dr. Norman Chevers, are recorded in the autobiography of Sir Simonds D' Ewes, as having occurred in England in the year 1632, one of which is thus narrated. "Monday, March 5th, having been searching almost "all the day in the Pell office, I was suddenly sent for by "my wife in the afternoon, who had been much affrighted "by our little daughter Anne's twice sounding (swooning) "away, which it seems were fits of convulsion. Before I got "home in my coach she was pretty well, but had after this "so long an ague, being not yet two years old, as we much "feared we should have lost her, which would have been the "greater trouble unto us, because she was at this time our only "child." Others of the same family are mentioned in an earlier part of the volume as having died of convulsion, and, subsequently, the author's eldest son fell a victim to the disease, after suffering for the space of a whole year from "epileptic fits." It is not stated that these had any connection with ague, but they occurred in the same family and situation.

Pathology. As already intimated, there is little room to doubt, that the pathological changes which produce these convulsive attacks, are to be looked for in the blood. In many examples there is other evidence of an undeniable kind of the

existence of blood disorder, in the extreme pallor, tendency to œdema, and all the usual symptoms of *hydræmia;* which condition is well known to be fully capable of producing convulsions; but these cases and this condition appear only occasionally in the extreme sequel of malarious disorder; they do not constitute the mass, nor do they illustrate the specific character of the cases to which I am drawing attention. The form of blood disease which, belonging more peculiarly to malarious infection, causes convulsive affections, is apparently a result of defective oxidation, whereby a venous character is imparted to the whole circulating fluid.

During the year 1859, a large number of Europeans were admitted into the General Hospital suffering under malarious fevers, and hepatic and splenic diseases consequent upon them. A favorable opportunity thus offered for investigating the liability of persons so affected to true leucocythemia, and with this view I examined daily the blood of several patients. The result, as far as the special object of pursuit was concerned, was entirely negative, for I did not succeed in obtaining a single well-marked example of white-cell blood; nor, to my surprise, (for the examples were selected from patients whose extreme pallor shewed that some such deterioration was to be expected) was *hydræmia* at all common among them; but a condition of blood presented itself, in nearly all of them, for which I was not at all prepared.

On making a small puncture with the point of a lancet the blood exuded slowly and with difficulty, and was of a peculiarly dark venous colour. It did not present any notable character in the microscope, except the singular rapidity with which the red globules became shrivelled and spotted by evaporation; and none but microscopic examination could be made of the minute quantities which alone it was justifiable to take.

It did not seem probable that so many developed cases of melanœmia could occur together, nor could I discover in the blood any of the pigment granules found in this condition; and I came to the conclusion, which I have since had reason to regard as correct, that this was a venalised condition of blood, an early stage which might issue either in hydrœmia on the one hand, or melanœmia, with accumulation of pigment in the capillaries of the spleen and liver on the other.

How, it will be asked, could such a state of blood coexist with extreme pallor of the surface; and would not a livid cyanotic hue be more natural. The solution of this question

is most probably to be found in the action of disordered blood on the ganglionic centres, producing, by a vasomotor process, contraction or dilatation of capillaries and ultimate arterial radicles. Such a supposition at once associates itself with a recently propounded theory of epilepsy,* which ascribes convulsion to contraction of minute cerebral actions. But, if this view be accepted in explanation of those cases which are attended with pallor, an opposite action on the sympathetic ganglia must be supposed for those in which a florid complexion is observed; and here we seem to meet Van der Kolk's view, who has, in cases of chronic epilepsy, found considerable dilatation of the capillaries about the medulla oblongata. Both these results receive much elucidation from recent experiment on the ganglionic nerves.

The experiments of kussmaul and Tenner† clearly establish the fact, that when convulsions result from hœmorrhage or occlusion of the cerebral arteries, the result is due to impaired nutrition, and not to any mechanical effect of the withdrawal of blood. They shew that the pressure of venous blood in the brain,—although the bulk of the organ, and consequently the pressure on it are complete, does not remove the convulsion which has followed on suspension of arterial supply; in as much, as it is incapable of nourishing the tissue: and they further, by adducing the effect of strangulation and closure of the glottis or trachea in producing convulsion, point out that these agree with the results of hœmorrhage in the absence of red blood; which in the one case is abstracted from the body or kept away from the brain by occlusion, and in the other has undergone transformation into black blood.

The views of Marshall Hall on this subject are fresh in the memory of every one, so that if the foregoing remarks are sufficient to establish the existence of two kinds or stages of disordered blood,—one a highly carbonized venous condition, the other complete hydrœmia,—as results of malarious infection, the liablity of the infected to eclampsia and epilepsy may be accepted.

There is another pathological change, however, which springs from the same source, and which having its seat in the brain, should not pass unnoticed here. I allude to the occlusion of

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* Kussmaul and Tenner.

† On convulsions after hœmorrhage.

the capillaries of the convolutions by dark pigment grains, which has been observed by Frerichs, Planer, and others, to accompany deposits of this kind in the liver and spleen commonly found after protracted ague. This would seem calculated to exercise a very decided influence in the production of convulsion; or at least, if the deposit were discovered *post mortem* in a number of cases, it would be difficult to suppose it altogether unconnected with the symptoms. But such is not the case. Frerichs (*) noticed the alleged connection, but failed to verify it, and in fact shewed that the opinion could not be maintained, since fatal cases of convulsion occurred without pigment being discoverable in the brain, and the converse. His conclusions would seem to apply no less in Bengal than in Berlin, for, although within the last four years I have seen a considerable number of cases of malarious epilepsy and have examined a very large number of pigmented livers, finding pigment grains in profusion in the capillaries of this organ, of the spleen, of the kidneys, and even of the villi of the duodenum, I have never yet succeeded in finding them in the brain. I am, moreover, perfectly satisfied that occlusion of the channels does not take place from these deposits; but that they merely adhere to the capillary walls. This is seen in the readiness with which a colored fine injection is made to permeate the vessels, without disturbing or being obstructed by the granules. And indeed, under any other circumstances, the pigment liver, which is, in other respects, sound and entire in structure, would be destroyed by extravasations of blood, before any considerable portion of its mass could be the seat of deposit.

A third explanation of the cause of curable epilepsy was suggested by Dr. Robert Hunt, in his paper published in the "Medical Times and Gazette" in the early part of 1856, from which I have already extracted a case. The author contends that an abnormal excess of alkali in the blood predisposes the nervous system to disease; that it causes various chemical changes in the blood, which result in the generation or retention of noxious matters, and these excite a tendency to spasm and convulsion. A series of compositions and decompositions are supposed to take place in the system, and a very hypothetical and hyperchemical theory is built upon them. But the theory, whatever may be said of its root, bore very valuable fruit; for it suggested to Dr. Hunt the use of the nitric acid

* Op. cit.

bath, the effect of which, in lessening and finally arresting the tendency to convulsion, is very remarkable. Its curative power, however, is more naturally, because more simply accounted for, by regarding it as a strong oxidising agent contributing to the decarbonization of venous blood; than by constructing for it so elaborate a scheme of operation, as that which Dr. Hunt has proposed.

Therapeutics. It will doubtless be expected that after assigning a malarious origin to a class of cases, the remedies known as antiperiodics will have a prominent place among curative means; and certainly their value is considerable; but they appear to act as toners of the nervous system only, and are directed, therefore, to the symptoms, which are the remote consequence of the disorder; and though competent to restrain as many of these as indicate only a lesser degree or an earlier stage of infection, their action is transient and uncertain when the blood has undergone perceptible change. We find them accordingly, in the treatment of convulsive affections, mere palliatives and auxiliaries.

It need scarcely be said, that when it has been clearly proved that a certain climate has produced a tendency to epilepsy, the removal of the patient is of vital importance; as, even after apparent cure, the return of the symptoms is to be apprehended as long as the cause is at hand; but if removal be not immediately practicable, or even during the time necessary for preparation no effort should be spared to prevent a recurrence of the fits, as these are capable of producing, and prone to produce, all the mischief which is known to follow general convulsions; clots called apoplectic, serous effusions, and all the other recognised consequences of venous engorgement within the head and an ill nourished atonic state of the vessels.

For this purpose recourse should at once be had to the remedy mentioned above, for the proposal of which the profession is indebted to Dr. Robert Hunt.

The cases which I have transcribed from my own Hospital record, show the use of the bath, and the manner in which a species of sponge bath may be substituted for it in case of extreme prostration. I have not felt satisfied that any assistance was derived from the internal administration of nitromuriatic acid; indeed, with the view which I have taken of the mode of action of the acid, the hydrochloric element must be valueless, and so rapid and effectual

has the bath proved to be, that no other measures have hitherto been called for.

In Dr. Hunt's paper there is nothing to suggest an idea on his part of a malarious origin for epilepsy, but residence in an aguish district is incidentally mentioned in the history of one of his patients; and in connection with the therapeutical portion of my subject, I may observe that I have found nitric acid of the highest value in the treatment of blood disease having this origin, which has exhibited itself only in extreme pallor and prostration. Most Indian practitioners must be familiar with this condition, and have had to deplore the great want of success attending the ordinary method of treatment, and the downward tendency and proneness to fatal diarrhœa which characterize the advance of the disease.

Since the above was written, I have been greatly interested by the perusal of the following remarks, which appear in the American Journal of Medical Science for April 1861 "Prof. "W. A. Hammond has published (Maryland and Virginia "Medical Journal Feb. 1861) a table shewing the results "obtained in the treatment of forty one cases of intermittent "fever at Fort Riley Kansas territory, in a period of six weeks "in summer. Of these forty one cases, ten were quotidian and "thirty one tertian. Thirty two cases were treated with "nitric acid and nine with the sulphate of quinine. Of the "cases cured by nitric acid, three had previously used quinine "without effect; and of those in which quinine had proved "successful nitric acid had been employed without benefit in "two, and in one other had to be omitted on account of caus-"ing nausea, heart burn &c.

"The average period of treatment before the disease was "permanently arrested, was the same with each remedy, three "days. The nitric acid was uniformly given in doses of ten "drops properly diluted with water three times a day.

"Besides the fact that the nitric acid was equally success-"ful with quinine in arresting the disease, the difference in "the cost of the two articles is so greatly in favor of the for-"mer, as to render it an object of importance to make its "curative properties more widely known. Nitric acid was "first used as an antiperiodic by Dr. E. G. Baily of Indiana; "Its peculiar properties were brought to the notice of the "profession by Dr. George Mendenhall in the 'Western Lancet' "for August 1854. A notice of the discovery is also

" contained in the 'American Journal of Medical Science' for " October 1854.

" Dr. Hammond further states that he has since very fre- " quently employed nitric acid in the treatment of intermit- " tent fever, and has rarely been disappointed in his expecta- " tions of its curative action. In fact in simple uncomplicat- " ed intermittents, he seldom has occasion to use anything " else. In cases of enlargement of the spleen, consequent up- " on frequent attacks of ague, the remedy in question has in " his hands proved very advantageous."

From the above it would seem that nitric acid is deserving of widely extended use in agues and cognate disorders; that in reaching the more advanced stages and remote consequences of malarious infection, it bids fair to leave the boasted and costly quinine behind it; while for the more ordinary and tractable affections, it is no less efficacious than the latter, and it is among the cheapest of drugs.

Such superiority is not surprising, if it be shewn that the therapeutical action of quinine, arsenic, strychnia, &c, is on the nervous elements or the circulation with and about them, and that these, although immediately engaged in the production of periodic phenomena, are so engaged as a secondary consequence of a blood disorder; while the blood disorder is itself directly attacked and removed by the acid remedy.