

TREATMENT OF PARESIS BY INOCULATION WITH MALARIA *

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Caricatur
malaria
syph.

Its increasing frequency and its inexorable advance constitute a reason for serious occupation on the part the specialist with the subject of paresis, or dementia paralytica. This is without doubt the form of syphilis the treatment of which has been pursued with a tenacity comparable only to the fruitlessness of the results. It has been accepted up to the present time as an incontrovertible postulate that with rare exceptions, it is a disease progressing to fatality, causing death in a period of from three to five years. It is of the greatest interest, therefore, to take into consideration a method of procedure fitted to modify, the alarming prognostic formula which Leredde, an authority on the subject, announced in this way at a meeting of the Society of Medicine

of Paris on the 23d of April of this year: "Paresis is the only form of nervous syphilis which opposes us *en bloc*".

A series of methods for the treatment of paresis has been tested in recent years, particularly in Germanic countries, the results of which are scarcely less discouraging than those obtained by the classic drugs, not excepting the sera and bolder methods. These recently tried methods are with silver arsenamina, collargol, methylene blue, trypan blue, etc. It is not the same with the procedure based on the production of fever and leucocytosis, by the nucleinate of soda, tuberculin, chronic abscesses, and the introduction of streptococci and dead staphylococci and inoculation with malarial and recurrent fevers.

The results obtained recently by the inoculation of malaria and recurrent fever are extremely encouraging. For this reason I decided to put into practice in my service in the Colonial Asylum "Larco Herrera" (Magdalena), the method of inoculation with malaria, the only one satisfactory to me and perhaps the better one. The good results I make public perhaps prematurely, but for the

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very reason that a knowledge of them may stimulate new applications of the method.

Before presenting my observations I will consider it of advantage to review the special indications and speculations which I gather particularly from the fundamental work of the discoverer of this therapeutic method of procedure, Prof. Wagner von Jauregg, *Ueber die Wirkung der Malaria auf die progressive Paralyse*, Psychiatrische-Neurologische Wochenschrift., Nrs. 21, 22, 1918, and from the more recent one of P. Muehlens, W. Weygandt and W. Kirschbaum, *Die Behandlung der Paralyse mit Malaria und Rekurrenzfieber*, Muen. med. Woch., 67, 1920. without neglecting the contents of other works which figure in the bibliographic report. Here are included as well the principal articles concerning the method of Rosenblum or that of the inoculation with recurrent fever.

The technic employed consists in inoculating the blood of the subjects to be made malarial with recognized germs of tertian fever or tropical malaria in quantity of half a cm. in the case of blood not previously defibrinated and as much as a cubic centimetre in case of defibrinated blood. The fever shows itself in the paretics inoculated at the end of a period from eight to thirteen days and yields easily to quinine, which is not administered before the seventh attack of fever. In some cases it has been permitted to produce as many as 16 attacks without any ill effects. After treatment with quinine neosalvarsan is used in increasing doses.

Wagner von Jauregg, through employment of this method, obtained the lasting cure of three cases of the first 9 inoculated, one case being observed for over three years. This does not include certain remissions or cures which he had seen before as a result of accidental intercurrent malarial infection.

Of the four paretics inoculated by R. Weichbrodt, two cases, the more recent, improved to the point of being able to leave the hospital. The other two more advanced suffered no modification in their progressive course.

Muehlens, Weygandt and Kirschbaum have inoculated 38 cases, 30 of them with positive result; 17 were inoculated with tertian fever, 12 with positive result, 12 with tropical malaria, 9 with positive result, and 9 with recurrent fever. They exclude 9 of the 30 in which positive results were obtained because they did not have sufficient time for observation. Of the remaining 21 cases, 7 were those receiving tertian fever, 8 tropical malaria and 6 recurrent fever. There were only 6 of the cases in which paresis was far advanced, the rest had developed it recently. Of the 21 mentioned four died from causes completely extraneous to the deliberate infection; 12 improved so far that their remission no longer left room for doubt, the subjects maintaining their ability to work, some with so much efficiency that they could obtain promotion in their professions; 4 improved somewhat, and 1 only, the remaining one, experienced no change.

All experimenters are in agreement as to the time for instituting the treatment. It is the more efficacious the earlier in the beginning of the paresis it is given. It is also necessary to avoid subjects of advanced age, those who are weak and those in a bad physical condition, as with bed sores.

As regards the efficacious factor in this type of treatment, it would appear that leucocytosis ought to be excluded, because when caused by other agents it does not give results which can be compared with those obtained by means of the infections with the fevers mentioned. The majority of opinions inclines to favor the fever itself, the *elevated temperature*. The investigations of R. Weichbrodt and F. Jahnel give solid ground for this. They have obtained in effect the death of existing spirochetes in the chancres of rabbits inoculated with syphilis by means of exposure of these animals to a temperature of 42° C. to 43° C. in three intervals. They have also been able to bring about the elevation of the central temperature of these animals placed in a room heated to 41° C., bringing it up as far as 44° C. These authors are so convinced that the hyperthermia is the decisive factor that they advise the treatment of paretics should be tried in hot baths.

Plaut and Steiner, without denying the validity of the effect of high temperatures, believe in an influence of a biological order, for which reason they maintain the superiority of employing recurrent fever. According to them a closer biological relationship exists between the spirochete of recurrent fever, and that of syphilis (that between the hematozoa and this), the recurrent fever would give occasion for the production on the part of the organism of different substances, antibodies, which could have some injurious influence upon the *treponema pallidum*. Plaut and Steiner advocate this infection as preferable for this theoretic reason and because the fever due to recurrent fever is greater than that from the tertian organism, and also because it can be cured with neosalvarsan. The results of their first experiments are truly significant; of six advanced paretics, one was cured and two improved.

In continuation I submit my experiments in the matter, which have to do with five cases, four of paresis deliberately treated with malaria and one, probably of dementia precox, or of cerebral syphilis, infected accidentally with *plasmodium vivax*, who supplied the blood for the paretics. Four of these patients are in my service in the asylum for the mentally diseased "Larco Herrera". Besides these cases I have inoculated successfully four other cases of paresis in the free service of the same asylum through the kind permission of the chief of this service, Dr. Sebastian Lorente. Only one of these cases had malaria, that is Case IV.

Case I.—The subject in which the treatment gave favorable results is C. A., 40 years old, of mixed race, a lawyer. In the first days of March, 1920, a month after being married, he began to show grave irregularities in conduct, wasted his money, wandered about the city and the country, more than once losing his hat, and he manifested emotional exaltation and ideas of grandeur. The incident of a gross forgery of a check for a thousand libras "for fees" which he signed and attempted to collect at the bank determined his family to intern him. At his entry into the asylum on March 19, 1920, he manifested euphoria, megalomania, dysarthria, dysgraphia, insufficient perception, very mobile attention, incoherence of ideas, confabulation disorientation, loss of autocriticism, agitation; exaggerated reflexes, Romberg, Argyll-Robertson; Wassermann strongly positive in the blood and in the cerebrospinal fluid, lymphocytosis, albuminosis. The condition

of the patient progressed, delusional ideas of grandeur increased with irregular systematized elements. He was the descendant of the last Inca and of a great Spanish noble and possessed a fortune of several billions. He never ceased his financial and patriotic plans. His irritability and agitation showed periods of intense aggravation in which he destroyed all that he found within reach and attempted attacks upon everybody. The dysarthria grew rapidly worse.

Soon after his entrance general trembling commenced, vertigo and motor incoördination which at times interrupted his walking and even caused him to fall to the floor. Finally at the end of the same year nocturnal incontinence appeared, both urinary and fecal, the former being constant, the latter occasional. All this existed in spite of neosalvarsan, of mercury, of iodides, and of urotropin. In such a state, the 24th of February of this year, after having obtained the permission of his family, the same as was done in the other cases, he was injected subcutaneously with 1 cc. of malarial blood from Case V. Eleven days afterward, the 7th of March, he had his first attack of malaria, the *plasmodium vivax* being found in the blood. The temperature scarcely reached 38° C., although the subject felt very badly, complaining also of chills, severe pains in his bones and inability frequently to move his legs. On the 8th the temperature was 37.8° C., with the same symptoms and aggravated dysarthria. On the 9th it reached 38.5° C., with profound prostration, difficult respiration, urinary and fecal incontinence. On the 10th the temperature rose to 39.2° C., with the same symptoms, perhaps more intense, and besides heavy sweating, vomiting, tachycardia, 144 pulsations a minute, and arterial hypotension. We injected 10 cc. camphored oil. At the same time we administered digitalis. The following day the temperature was only 37.9° C., with the condition generally improved. On the 11th the temperature did not exceed 37° C., with the general condition satisfactorily better, there being merely a moment of agitation with hallucinations when the patient leaped from his bed and attempted to run. Afterward his mental and physical states were somewhat better than before the inoculation.

Through the natural reaction of the organism, and perhaps under the influence of the oil which was injected daily in the dose indicated, the fever did not show itself again for several days. In homage to Wagner von Jauregg, I will mention the hypnagogic hallucination which the patient had on the 16th day, which he related to me, as it was impressed upon him, in the following terms: *"The inventor of the injection which was applied to me because of my illness presented himself to me. He was seated in his office in a chair profusely decorated. He was correctly dressed in a frock coat. . . He had a gold watch chain, very fine. He was a German with a reddish mustache, without whiskers. He said to me, 'I have invented the injection which they have given you'. When I started to get up to show my gratitude the wise man disappeared"*.

On the 28th of March the temperature rose again (38.4° C.), without other symptoms than chills and general discomfort. Again on the 29th 37.3° C. and the 30th 39.2° C. At this time the delusional ideas increased notably, also the disorientation and in a lesser degree the irritability and the dysarthria. The incontinence had disappeared. In April he had four distinct attacks of fever, the 1st 37.8° C., the 5th 37.4° C., the 17th 38° C. and the 19th 37.6° C. The 11th of May 2 cc. of blood were injected also from Case V. The 20th of the same month a new injection was made because the fever had not appeared. On June 1 there was an elevation of temperature 37.4° C., again on the 2d 37.5° C., and the 3d 40° C., with violent chills and excessively copious perspiration. With this attack the malaria spontaneously retreated to return no more.

The remainder of the state of this patient June 16 of the present year is

as follows: His general physical state has improved notably, having increased in weight more than 2 kilos. He weighed 59 kilos before the inoculation and 61.3 at the time indicated. His movements are perfectly coördinated, since he can walk, run and dance without difficulty. Romberg is absent, patellar reflex is normal, pupillary reflex to light is scarcely perceptible, insignificant; there is mydriasis. Speech is normal even when the subject is very emotional. The writing is normal. As regards the mental state the facts are even more flattering. The subject not only has actually perfectly normal perception of reality, but, furthermore, he can give a clear account of his own errors in the period passed through. He recognizes how false have been his delusional ideas. His capacity for mental work, determined by respective "tests", corresponds to normal mentality, being superior to the average in the velocity with which he makes arithmetical calculations. The serological data disagree sufficiently with the psychological; cerebrospinal fluid, Wassermann + + + +, lymphocytes 8 in 3 mm., albumin 0.520.

C. A. left the asylum in this condition July 21 after having been injected with a complete series of neosalvarsan and 21 injections of biyoduro of mercury. From that time to the present he has conducted himself perfectly normally at home and on the street. His trophic condition has improved even more, he has become sufficiently fat. The only thing of which he complains is copious sweating. An analysis of the cerebrospinal fluid, made September 3, showed the following surprising result: Wassermann + + + + and in the the blood Wassermann + + +.

To resume, there is here a complete remission, except for the signs of syphilis, in this case of paresis which had developed rapidly in the course of a year with very grave organic and mental symptoms. The remission has occurred after 15 malarial attacks of which in three alone the temperature exceeded 39° where indeed a great organic reaction was evident.

Case II.—A. L., male, 34 years old, white race, married, occupation commercial, of moderate economic and social condition. In 1914 the family noticed a marked change in his character which persisted. From being docile and affectionate he became violent. He went so far as to attempt to assault his mother. Furthermore he believed himself very rich refusing on this account to work. There were not wanting other strange ideas. At this same time he had an "attack" which deprived him of the use of speech. The family tell also of other later attacks of the nature and the time of which they give nothing definite except that they indeed recall that these attacks were preceded by certain "fevers" equally ill defined. In spite of all this A. L. was working fairly well up to the end of 1919. At that time the heads of his office began to complain of his serious instances of carelessness and his errors. In the early months of 1920 his mental state was abnormally exaggerated, becoming gradually worse until his entrance into the asylum, which was October 26 of the same year. He passed to my service a week later His condition at that time was one of complete disorientation endo and allopsychic, psychomotor agitation, delusional ideas of grandeur, illusions and visual and auditory hallucinations, euphoria, incessant verbigeration, incongruous mimicry, dysarthria, insecurity and trembling of the limbs to such a degree that he could neither walk nor lift his food to his mouth. There were present dysgraphia, mechanical and psychic, much accentuated, urinary and fecal incontinence, inequality of pupils, miosis, Argyll-Robertson, cerebrospinal fluid, Wassermann + + + +, slight hyperalbuminosis, slight lymphocytosis. In spite of the intense antisiphilitic treatment the condition of the patient, prostrate in bed, up

to the time when he was inoculated with malaria, was unchanged in its severity except that the delusional ideas and the verbigeration became accentuated. The former became systematized about the ideas of possession of fabulous riches and of having whatever he wanted by murdering and of the infidelity of his wife. The verbigeration was incessant and in a high pitched voice so that he became the roughest patient in the pavilion. The urinary incontinence persisted, the fecal was episodic.

February 24 of the present year he was inoculated with a cubic centimeter of malarial blood according to the same procedure as that in Case I. From the 28th of the same month to the 4th of the following month very slight elevations of temperature occurred, reaching at the highest, 37.5° C. without having found any hematozoa in the blood. March 10 the temperature did mount up to 39.1° C. but without chills and the patient did not complain of feeling badly. The same thing was observed in the successive attacks. After eleven attacks, in the majority more than 39° C. one of 40° C. and the other of 40.2° C. the patient gave evidence of weakness, paleness, prostration, diminution of appetite. He who before had eaten everything with the greed of an animal began to be particular. There appeared also the beginning of a scar on the right buttock. There appeared on the other hand favorable changes in the mental state, diminution of the verbigeration, of the agitation and of the incontinence. The weakness made it necessary to inject 10 cc. of the camphored oil which had the same effect as in Case I, it arrested the malarial attacks. April 7 the incontinence disappeared and the 13th of the same month the patient already had sufficient ability for concentration to read reviews. Marked dysarthria still was noted. The state of delirium had diminished considerably and although the ideas of grandeur still persisted they expressed themselves less emphatically and with a discreet mimicry. The patient appeared improved however in this respect in the last days of April after new but moderate elevations of temperature. When he got up he could not stand on his feet. His nights were good, he slept without interruption. From May 5 he was able to get up every day without showing any resistance. From the 7th of the month he walked unsteadily but without having to have assistance when he started off.

His condition however left much to be desired, since he was disoriented in all his sense perceptions, talkative delirium, yet in a low voice and not continually, had difficulty in walking with trembling. He was inoculated therefore with fresh malarial blood May 11 in the proportion of 2 cubic centimeters. No rise of temperature occurred up to the 29th of this month so he was inoculated once more with malarial blood. The following day he had fever 40.2° C. and there were chills and incontinence of urine. From this time to June 9 there appeared every afternoon an attack of fever with a temperature generally greater than 40° C. reaching one day 40.6° C. and with the same lesser symptoms, chills and incontinence, without unfavorable effect upon the general state of the patient, as the fact showed that his strength was sufficient to pass through these attacks without going to bed. The fever continued to appear every day, although less intense, until June 14, at which time a slight edema showed itself in the legs for which 1 gr. of bichloride of quinine was injected. The last attack appeared two hours after the injection in which the temperature reached 40.8° C. with an insignificant amount of perspiration and without chills.

The further condition of the subject, June 16, was as follows. His movements were well coördinated, he being able to walk with relative ease. He became unsteady only when he was emotionally excited which is rare with him.

The pupils did not react to light and there was miosis and trembling in the face when he spoke. There was slight dysarthria on rare occasions. He retained his ideas of grandeur but did not now express them spontaneously. It was necessary to excite him deliberately before he would speak of his riches and he did it with tranquility and without raising the tone of his voice. He continued disoriented but at times he had marked critical ability. Thus, for example, when he was asked to take the attitude necessary for verifying the sign of Romberg and when he was asked to walk rapidly and to turn in the middle he said he was not a marionette. He performed simple arithmetical operations without committing an error in the majority of the cases. A scarcely perceptible dysgraphia was present but not constantly. His affective state is more quiet so that he can be called the most quiet patient on the pavilion. The biological reactions are as follows. Wassermann in the blood + + +, Wassermann in the cerebrospinal fluid + + + +, lymphocytes 4 in 3 mm.; albumin 0.310.

His condition has not varied from that time, June 16, to the present, except the anemia which has disappeared and the weight which has notably increased. A series of intravenous injections have been given of neosalvarsan and mercury with the administration also of iodides and urotropin.

In resuming this case it is to be noted that its beginning was in 1914 and its condition was sufficiently grave and well established at the time of entrance into the asylum, October, 1920. From this time the patient was prostrated in bed and suffering incontinence, and he was the most violent patient in the pavilion. After 32 attacks of malaria with very high temperature and with little reaction upon his general condition, the remission of the gravest symptoms was observed, intense and lasting psychomotor agitation, verbigeration, incapacity for coordinated movements, absolute indocility, involuntary discharges. He changed from being the most difficult patient of the pavilion to the most quiet.

Case III.—L. G., male, 41 years old, married, white race, wealthy merchant. From the beginning of 1920, without being able to define the exact time, he began to commit extravagant acts to such a degree that the pathological nature of these acts became evident to his family. They had recourse to the services of a professional man in August of that year. The patient showed at that time at examination very slight pupillary reaction to light, marked ataxia, static and kinetic, dysarthria, very marked trembling of the hands, ideas of grandeur. Cerebrospinal fluid showed Wassermann strongly positive, hyperlymphocytosis, hyperglobulinosis. After being treated with biniodide of mercury the subject experienced improvement. The treatment did not continue since the patient passed into the hands of another physician who treated him as if he were merely a victim of a lesion in the prostate. He grew worse under that to such a degree that in February of the present year, after having attempted aggressive attacks in the house and on the street, he suffered an apoplectic attack which according to the family's statement was very serious with great elevation of temperature. He entered the asylum a few days after the attack in a state of coma, with arrhythmic pulse but with fever 38° C. His physical condition was lamentable; in his whole body could be seen traces of negligence and violent struggle, ecchymoses, excoriations and scars. When he came out of his comatose state and his previous phase of confusion, trembling on the right side of the body a delusional stage developed of terrifying content, with great verbigeration culminating in a grand psychomotor agitation with but little rest. There were hallucinations and illusions of vision and of hearing, dysarthria and at times anarthria, scanning speech, inability to

hold himself upon his feet, fecal and urinary incontinence, inequality of the pupils, difficulty in swallowing.

The state of the patient continued thus, with little alteration after having been the object of an intense antisyphilitic treatment, This was successful in curing the cutaneous lesions except a scar of a growth that could not be removed. On May 11 2 cc. of malarial blood were injected after having obtained the sanction of the family, having informed them of the desperate condition of the patient. On the 21st of the same month he experienced his first attack of fever, discreet 37.6° C. It repeated itself 38° C. on the 22d and so on the 23d 37.6° C. There was no noteworthy organic reaction in any of these attacks. There was fever again on the 26th after two days of absence, and it was now high 40.2° C. with violent chills. There were two daily elevations in temperature from this time until June 4, the date when the attacks spontaneously ceased. The majority of these exceeded 39° C. and some 40° C. Improvement in the mental condition was noted after the first attacks. The patient grew quiet enough; the verbigeration, less tenacious, was in a low voice. The ideas of persecution and the aggressive attacks disappeared. Antimalarial treatment was instituted, as well as a tonic regimen, June 7, in spite of the fact that the attacks had spontaneously receded, in view of the subject's anemia and of the fact that the infected sore had made rapid progress. Notwithstanding this the organic condition grew so much worse that on the 12th of the same month the patient died.

To review, improvement of the mental state could be observed after the first attacks in this case in which malaria was inoculated into a paretic with a sore, contrary to the expressed indication of the German authors. It is very possible that the malaria, weakening the organism, hastened the death of the patient which by every likelihood would have taken place in a short time.

Case IV.—E. V. male, 27 years old, mixed race, single, of moderate education, collector of fares on an urban railway in Lima. Jovial in character and of ready intelligence. He had a chancre in August, 1918, which was cured locally without treatment for syphilis. In November, 1919, he experienced a severe vertigo, fallig to the floor and having to remain several minutes on the couch because he could not stand on his feet. A notable change revealed itself in his character starting from this time. He became very irritable. In 1920 a deficiency in his intelligence was noticed also; his chiefs and his companions said that he had "become a simpleton". His ability had so far deteriorated that in November, 1920, his chiefs dismissed him for his incapacity in the discharge of his simple duties as colector of fares. The subject could not give account of his decline; on the contrary he believed that the reproaches of which he was the object on account of his carelessness and stupidity were unjust and he was irritated by the indications of his companions and the admonitions of his chiefs. He gave himself over to vagrancy and to drink on being discharged from the railway company, consuming large quantities of alcoholic drinks. There was evident even at this very same time a marked trembling of the hands, unsteadiness in walking, which appeared periodically, difficulty in speech and deterioration in the handwriting. He already believed himself rich, possessor of many houses.

He entered the asylum January 18, 1921, in a state of great malnutrition quiet, indifferent and badly adapted to everything about him, in a semiconfusalional state, manifesting in his conduct clear traits of a mental infantilism, egotism, euphoria, confabulation, well-defined ideas of grandeur, hypermimesis at times, agripnia, amnesia, dysarthria, dysgraphia, insecurity in walking, fibrillary trembling in the extremities, fatigable visual perception, Argyll-Robertson. The

Wassermann was strongly positive in the cerebrospinal fluid and negative in the blood. Shortly after his entrance he fell into a stuporous condition which lasted a short time, recurring for brief periods.

An active treatment with enesol, neosalvarsan and iodides continued from his entrance to the month of May, improved his condition. His symptoms at this time were as follows: The reflexes were slightly augmented, there was inequality of the pupils, Argyll-Robertson, slight dysarthria, dysgraphia, hypermimia, dullness of perception, dispropresia, impairment of judgment and critical ability, affective indifference, abulia, irritability. These were the symptoms present May 29, 1921, at the time when 2 cc. of malarial blood, *plasmodium vivax*, were inoculated into him. The first attack of malaria appeared June 16 (39.5° C.), repeating itself daily until the 28th of that month, when the attacks ceased with an injection of neosalvarsan. There were thirteen attacks, two of 41° C., one of 40.4° C., one of 40° C., a fourth of 39° C. and over; the rest were between 38° C. and 39° C. The attacks were accompanied by abundant sweating, being preceded by chills of moderate intensity. A depression of strength in the subject and a marked anemia were noted after the first attacks. The mental condition improved parallel with the attacks except the dysarthria, which diminished only with the last attacks, and the neurological signs, some of which have persisted.

After the malaria had ceased the condition of E. V. was one of almost complete cure, particularly from the point of view of his mental state. The condition of the pupil had not changed, pupillary irregularity, Argyll-Robertson remained. There was slight hyperreflectivity in the limbs, though he walked securely, and the same thing with all his movements even when he made them rapidly. He could express himself well in writing as well as phonetically. His expression in writing is good as it is in speech except at certain rare occasions when he is submitted to difficult tests which increase his emotion at the same time. Imitation is normal, so is his perception. Attention shows slight inclination to fatigue. Mental elaboration alone presents some defect, a very slight carelessness in construction just as there is also a little diminution in the critical capacity. The sensation have revived with complete normality. The will leaves nothing to be desired, as also the capacity for work both mental and physical as far as his education and his previous training go. Wassermann strongly positive + + + + in the cerebrospinal fluid and weakly positive + in the blood.

The subject worked in the asylum from June with perfect efficiency and without any loss in his mental condition and with improvement in his physical state, gaining some kilos in weight. He complained only of copious sweating as did Case I. The subject, who left the asylum September 5, has actually been reinstated in his position of collecting fares in the railway company of Lima.

A review of Case IV shows an illness of more than a year with grave symptoms at the time of the inoculation, although an improvement in some of them had been previously experienced. After thirteen attacks of malaria, the greater part of them with high temperature and moderate biological reaction, he finds himself cured of paresis, which has left slight traces of defect in the mental sphere and some of little practical importance in the physical, Argyll-Robertson, slight hyperreflectivity. He is fitted to work at the same occupation which he had before becoming ill.

Case V.—This case is that of a subject who was a victim of a psychosis separate from paresis who accidentally contracted malaria and who furnished the necessary blood for the inoculation of the cases previously reported. We include him

in the present article because in his cure no other apparent agent intervened than the malaria which he had contracted at his entrance to the asylum.

J. A., male, 35 years old, married, of mixed race, carpenter. Quiet in character, affectionate, modest and industrious, of moderate intelligence and moral in conduct. He had no hereditary antecedent worthy of mention. He had one or more chancres in 1914, the nature of which was not precisely known, and which he himself treated by empirical means. There were no traces on examination. The beginning of his mental illness could not be well discovered, because it had been insidious and escaped the observation of the family, who were very ignorant. It appears that at the end of 1920 his manner of life changed and in the first months of the present year his conduct became openly pathological. The few confused data which could be obtained permit one merely to know that in March of this year his lack of adaptation to reality was so great that not only was he unable to work, but his family could not tolerate him.

He entered the asylum April 14. He showed at that time in the pavilion of admission the following symptoms: complete disorientation in respect to time, place and persons, indifference, depression, disprosexia, bradylalia, amnesia, agrypnia and incontinence. He remained almost stationary in this condition until May 1 when he had an attack of malaria with 40° C. temperature, another on the third (39° C.). He was treated with quinine after the first attack. May 4 he passed into my service showing the symptoms before mentioned, except the incontinence and the agrypnia, which had disappeared. He manifested a desire to go walking and demanded his hat. Nothing particular was noted until the 7th day, when chills appeared and he complained of pain in his bones and his head. Perhaps the 5th day there was an attack of malaria which was not recognized, because the data had not yet been sent in from admission pavilion. He showed a temperature of 40° C. After this attack a great mental improvement was noted. He who up to the moment of the attack had been completely incoherent showed lucidity. His improvement increased from this time. The following day he explained his slowness in walking. It appeared that the entire left side felt as if asleep. On the 9th the temperature rose again (40° C.), with chills and very pronounced discomfort. In view of the improvement in the patient from his entrance into my service no treatment was employed and the fever appeared unexpectedly. Its agent, *plasmodium vivax*, was at once determined at the diagnostic clinic. The appearance of the fever led me to hope for its curative power and kept me from using quinine. There was no more fever in spite of this after the attack on May 9 until the 23d of the same month. The patient's condition at that time was one of perfect mental adaptation with clear understanding of the transformation which he had undergone. Only his speech and his walking continued slow, although less so than before. The last two attacks were the one of May 25 and that of June 10. After the first mentioned he was given an injection of camphored oil (*aceite alcanforado*) for testing afresh, with success, if this agent is able to interrupt the malarial attacks.

He was already completely sound mentally, so he was treated with strychnine and massage, by means of which the numbness of the left side and the slowness in walking disappeared, the last residue of his illness. He left on the 17th of August completely well, having worked for several weeks at the asylum.

We must not neglect to point out that this patient, April 30, showed a weakly positive Wasserman reaction in the cerebrospinal fluid ++ 20 lymphocytes to the cubic millimeter and 0.420 of albumin. But on July 2 the analysis of the cerebrospinal fluid disclosed the following facts: Wassermann negative

—, lymphocytes 9 to the cubic millimeter, albumin 0.220, urea 0.257, glucose 0.700 and in the blood Wassermann negative —. Later, when the reaction was again tested, the Wassermann continued negative in the blood and in the cerebrospinal fluid.

To review, here is a case of psychosis of uncertain diagnosis, the cause of which could not be precisely determined, having developed for several months, which begins to remit remarkably after the first malarial attacks without any other treatment. The cure is completed after seven attacks, more or less, accompanied by regular organic reaction.

The remission of paresis by the inoculation of malaria constitutes practical proof that the possibility of mental rehabilitation even in advanced cases is in no way excluded. This is the same as the cerebral restitution, or compensation, according to Spielmayer and Weichbrodt, on anatomical grounds. Theoretically and practically, then, there is foundation for an optimistic position upon the subject of the prognosis of paresis.

On the other hand, we know that the clinical remission of paresis is not accompanied by remission of the serological signs of syphilis. This does not prohibit the very favorable character of the prognosis and it is not impossible to obtain an attenuation of these same residual symptoms as Schmelcher, in *Muenchener medizinische Wochenschrift*, Mar. 11, 1921, has been able to do with the employment of repeated and intensive doses of silver salvarsan.

I will terminate this article, which has perhaps been too much extended, in bringing forward some of my observations. I believe they may have some value, even if there is repetition in the greater number of cases, for the understanding of the vicissitudes in the treatment and for the possible discrimination of the factors which intervene during the cure. I will mention finally a curative method analogous to that of Wagner von Jauregg, employed since ancient times in a locality in Perú. I refer to the treatment of the "uta" [leishmaniosis of the skin and the mucous membranes] by malaria at a place called "Tembladera." It is called so, without doubt, because there malaria is endemic and general. The patients with uta come together at Tembladera from various villages of the department of Cajamarca, especially from the capital, from which periodically veritable caravans start out. There is a tradition, apparently well founded, according to which after a number of malarial attacks the leishmaniosis lesion cicatrizes and is cured. It suggests the fact of the zoölogical relationship between leishmania and the spirochete of syphilis. In leishmaniosis salvarsan is a curative agent as efficacious as in syphilis.

Condition of Patients on January 9, 1922.

Case I remains completely well; is about to be appointed a public official; continues entire antisiphilitic treatment. It has not been possible to make new serological tests.

Case II has again spontaneously developed megalomania and verbigeration, but in moderate degree. He has been again inoculated with malaria and has had four attacks.

Case IV remains in good condition and continues at work. Serological tests made on October 29, 1921, gave the following very encouraging result:

Blood, Wassermann—negative; cerebrospinal fluid, Wassermann—negative; albumin. 0.200 gram per liter; lymphocytes, 3 per cubic mm.

Case V. No news, which would indicate that he is still in good condition.

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Lima, September 9, 1921.

Dr. Delgado's paper is accompanied by a series of fever charts. As the movement of the temperature has been described in the body of the paper these have been omitted.