other causes. There is not a stomatologist who, in his medical life, has not met many surgeons who know nothing of the subject. I could cite 15 or 20 cases in which surgeons have operated on jaws for simple alveolar abscess. The essayist, from his experience, can discriminate between these conditions, which is important in treatment. Patients with osteomyelitis due to dead pulps can be sent to the stomatologist and successfully treated, thus avoiding unnecessary mutilation.

DR. GEORGE V. I. BROWN, Milwaukee: Every point of this paper has been proved by slides. The changes occurring in the bone structure in degeneration and regeneration, and the cases illustrated are exceedingly interesting. I was called the other day to see a little boy in Nashville with congenital ankylosis, his jaw was very much drawn to one side, even more than the one shown by the essayist. In another case, a little girl of six with an ankylosed mandible, I operated and gave relief and she can now open her mouth; but I do not really know what caused the ankylosis in either of these cases. I would be glad to have the doctor tell us more of his conclusions, because his radiograph pictures are much clearer than any I have been able to secure.

DR. STEWART I. MCCURDY, Pittsburg, Pa.: In no case, especially in the suppurative stage, will it be possible to tell whether the disease was primarily periostitis or osteomyelitis. In ankylosis we will find a history of suppurative middle-ear disease. The disease extends into the temporo-mandibular joint and results in its destruction and subsequent ankylosis. That is the condition I found in a great many of these cases. The treatment is the removal of the head of the bone.

In the treatment of these cases I have removed half of the bone in one case and nearly two-thirds in another case. In another, the bone was denuded from the angle throughout its extent of the ramus, and I could pass a probe along the entire surfaces of the rami on both sides. Fifty per cent. of these cases are specific, and repair will only take place under potassium iodid treatment. This was followed by readhesion of the periosteum to the bone and recovery under specific medication.

DR. H. H. GERMAIN, Boston: This man who had a fracture of the condyle had a double fracture of the lower jaw. The second one just below the region of the condyle was not discovered. The first fracture was treated, and he developed an apparent suppurative condition of the middle-ear. He had never had any middle-ear disease. This led me to believe that it was a condition following the fracture. I passed a probe down to the sinus anteriorly and felt sure that if I followed the sinus I would go down to the condyle. The condyle was found broken off and necrotic and was removed. He got a very good jaw, considering the fact that he had been suffering for four months. I do not think it is a fair statement that 50 per cent. of cases of osteomyelitis are due to syphilis. Very much less than this, if any, is more nearly true.

THE WASSERMANN REACTION IN ITS RELATION TO DISEASES OF THE CENTRAL NERVOUS SYSTEM *

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Neurologists will appreciate the importance of a method which will enable them to state positively whether or not a suspicion of syphilis is justified, or whether every thought of syphilitic disease may be eliminated from the consideration of a given case. Just such service as this the complement-fixation test of Wassermann has promised to render. It seemed well worth while to become thoroughly conversant with the method, the details of which will be described by others, and during a period of very nearly one year to submit to this test as many patients as possible suffering from nervous disease, so as to determine whether or not it

would be of service in the diagnosis and treatment of nervous and mental disorders. Shortly after the publication of the investigations of Wassermann, Plaut, Bruck, Neisser, Georg Meier, Porges, Taylor, Citron and others, the inference was drawn that the Wassermann reaction would be of great service in the diagnosis of locomotor ataxia and general paresis—the two diseases which have long since been held to be due to preceding syphilitic infection. Dr. Nonne,¹ of Hamburg, whom we are fortunate enough to have with us to-day, was among the first to make the attempt to determine the general value of the Wassermann reaction in neurologic practice. In this country Drs. Noguchi, Castelli, Gay, Butler, Swift, and Fox have taken up the Wassermann test. I have felt from the very beginning that, while it might be desirable to have further corroborative evidence in *tabes dorsalis* and *dementia paralytica*, such corroborative evidence is not often needed and that it would be much more important, as my own hospital experience has taught me, to possess a test which would help to establish the differential diagnosis between a number of other conditions. It seemed much more important, for instance, to be able to differentiate between disseminated sclerosis and cerebrospinal syphilis, between a central gliosis or a specific central myelitis; to decide whether the symptoms of intracranial pressure were due to malignant neoplasm or to a gummatous meningitis; and it was for the purpose of determining the value of the Wassermann test in this larger group of cases that liberal use has been made of the reaction in cases coming under my notice in my hospital² as well as in private practice.

First, a few words as to the reaction. It has shared the fate of all new diagnostic methods in receiving either excessive praise or excessive condemnation. It is only by prolonged experience that we can arrive at the exact truth. The test is cumbersome, is not altogether easy to acquire (laboratory practice of a few months is demanded), and the performance of it calls for an unusual amount of patience and of time on the part of the investigator. It will, of course, be far easier to carry out the test in an established laboratory, but it is not altogether beyond the capacity of a private laboratory such as I have been able to arrange, in association with Dr. Castelli, to whose assistance and cooperation I am deeply indebted. The chief defect of the test is that it is altogether a relative one and that the question of the inhibition of hemolysis can be determined only by a comparison with control tubes in which the syphilitic extract or the specific serum is wanting. There are so many possibilities of error in the performance of the test that credit can be given to the results only if those working by it are known to be thoroughly conscientious and capable. It is entirely natural that attempts have already been made to modify the Wassermann technic so as to place the reaction within easy reach of every practitioner. Among those who have made the laudable attempt to simplify the original reaction has been Noguchi, and you will no doubt hear from him to-day to what extent we may substitute his modification for the original Wassermann method. It is very gratifying, however, to be able to state that in a series of forty-five cases examined by Dr. Castelli and myself, according to the original Wassermann method, and by Dr. Noguchi ac-

1. Deutsch. Ztschr. f. Nervenhe., 1908, xxxvi; Syphilis des Nervensystems, Ed. 2.

2. I am indebted to Dr. Gregory of Bellevue Hospital, and to the members of the house-staff at Mt. Sinai Hospital, Drs. Sopflan, Bass and Muncker, for much amiable assistance.

* Read in the Section on Nervous and Mental Diseases of the American Medical Association, at the Sixtieth Annual Session, held at Atlantic City, June, 1909.

cording to his recent modification, the reactions have tallied in all but four cases. Such discrepancies as have occurred will no doubt be accounted for by greater perfection in the technic of both methods. Noguchi's method appears to be unusually sensitive, and we trust that he will be able to satisfy all of us that a positive Noguchi reaction means active lues, as I am fully persuaded a positive Wassermann reaction does.

I must leave the determination of methods and the description of their imperfections, if there be such, to others. I am concerned in this paper with the relation of the Wassermann reaction to diseases of the central nervous system, and, in order to avoid criticism as to the method employed, Dr. Castelli and myself have adhered closely to the technic of the Wassermann school, as we acquired it in Berlin, and have not deviated from the original method in any particular, except that we have substituted the alcoholic extract of the syphilitic fetal liver for the aqueous extract. This is supposed by some to make the reaction less sensitive. Wassermann himself was opposed to the introduction of the alcoholic extract for a time, but this point, I believe, has now been yielded by him and his followers. At all events, using the alcoholic extract has given us most satisfactory results, as was proved by a large series of tests in which all precautions regarding the necessary controls were employed. It is well known, no doubt, by the majority of those present, that the theory on which the reaction was founded has received rather a serious blow, inasmuch as the inhibition of hemolysis was obtained not only when syphilitic liver extract was used, but also when the extract of normal liver was employed and when other lipid substances were used.³ Whatever the explanation of this may prove to be, the fact remains that in an unusually high percentage of cases of syphilitic and parasyphilitic diseases the blood serum, if examined according to Wassermann's directions, gives a very definite inhibition of hemolysis, whereas complete hemolysis ensues in the serum taken from patients who are not afflicted with any syphilitic taint.

The conditions of practice and even of my hospital service have made it necessary to restrict my examinations largely to the examination of the blood serum. No doubt Nonne is correct in insisting that the full truth can be obtained only after a consideration of the cellular elements in the spinal fluid, the globulin content, and the specific reaction of blood and serum and of the spinal fluid. In a small number of the cases (15) the spinal fluid has been examined, and in one case of a child, when it was impossible to obtain sufficient blood for the Wassermann test, a blister was drawn—following the suggestion of Dr. Kaplan to one of my assistants—and serum obtained in this fashion. I wish in this communication to give some of the more important results obtained in a series of about 250 cases. In many of these several tests were made.

All investigators are agreed as to the value of a positive Wassermann reaction. If it signifies anything at all, it indicates a more or less active luetic process somewhere in the system. A negative reaction by common consent does not preclude the presence of syphilis and yet a negative reaction, it seems to me, often gives valuable information. In the vast majority of cases in which the negative reaction is obtained, the thought of syphilis may be dismissed. In a large num-

ber of others, however, in which a positive reaction has been found present at the beginning of the disease, and in which a negative reaction has been obtained in the course of or after prolonged treatment, it is only fair to assume that the syphilitic virus has been neutralized as a result of the therapeutic measures employed.⁴ In this connection it is important to note that a positive Wassermann reaction may often be wanting in spite of the true syphilitic nature of the disease, if intense or prolonged antisiphilitic medication had been employed before the first test was made. As a matter of routine in my hospital practice the rule had been established that neither mercury nor iodids were to be administered to any patient until the Wassermann test had been done. Assuming, then, that a Wassermann reaction may furnish corroborative evidence as to the presence or absence of an active syphilitic virus, let me give in some detail the results obtained in various groups of cases.

I. IN TABES AND GENERAL PARESIS

As I have intimated before, the reaction is hardly needed as corroborative evidence in these two conditions, because in fully 95 per cent. of the cases the diagnosis can be safely made. The chief difficulties have been experienced in the differential diagnosis, in former years, between tabes dorsalis and syphilitic spinal disease simulating tabes, or between general paresis and specific pseudoparesis. But the Wassermann reaction will be expected to be positive in all of these conditions and can, therefore, throw little light on the exact nature of the morbid process. It may be of some value in those cases in which the differential diagnosis has to be made between general paresis and neurasthenia. The preponderance of opinion would seem to favor the idea that if a Wassermann reaction is positive, the disease is necessarily paresis and not neurasthenia. But if we suppose that the neurasthenic individual has had a preceding syphilitic infection, as well he might have, it would not be fair to infer general paresis merely because the patient gives a positive reaction. And this leads me to the first opinion which I wish to express, as a result of my experience, and that is that a positive Wassermann reaction implies an active luetic process somewhere in the system. Any inference beyond this point seems here hardly to be justifiable. I can in this way account for the discrepancy between the figures published abroad regarding tabes and general paresis and those which have been obtained by Dr. Castelli and myself. We have not found a positive reaction to be universally present in general paresis and almost universally present in tabes, as has been published by so many writers abroad. The presence or absence of the reaction, even in tabes and general paresis, depends more or less on the active luetic virus and less on the terminal cortical or spinal cord changes which are responsible for the symptoms of general paresis or of tabes dorsalis. Our own results in tabes and general paresis have been as shown in the accompanying table.

In this series of 28 cases of tabes, 18, or 64.3 per cent., were positive and 10, or 35.7 per cent., were negative. For the purpose of this table I have considered all weak positive cases of the same value as the more positive ones. This percentage is a little lower than that of some of the former investigators, though it is even a little higher than the statistics of Hoehne,

3. Professor Kopp (München med. Wehnschr., May 11, 1909) has endeavored (I think, in vain) to minimize the universal enthusiasm regarding the clinical value of this method. Since writing the above, Neisser has spoken frankly of its tremendous importance.

4. Since writing the above, corroboration of this view has come to me in the article of Hoehne (Berl. klin. Wehnschr., May 10, 1909) entitled: *Die Wassermann'sche Reaktion und ihre Beeinflussung durch die Therapie.*

who found a positive reaction in 60 per cent. of 45 cases of tabes, but he has in his list 12 cases of doubtful tabes in which there was a positive reaction in 41.7 per cent. In our list we have had no doubtful cases of tabes, and I take it that in every neurologic clinic there will surely not be 25 per cent. of doubtful cases of tabes dorsalis as there are in this list, which has been issued from a dermatologic and not a neurologic clinic. Wassermann and Plaut found a positive reaction in 70 per cent. of their tabic patients; others claim as high as 90 per cent., and Nonne apparently obtained a positive reaction in 90 per cent. of the blood examinations and 50 per cent. in the examinations of the spinal fluid. Our own figures are, therefore, in general agreement with those who place the percentage somewhere between 65 and 70 per cent. The character of the patients has much to do with the percentages of the reaction. Of the 28 cases of tabes referred to in this paper, 19 were observed in my private practice, and of these at least half were patients who had been under constant observation over a period varying between three and ten years and all of them had received much treatment. Even before the importance of the Wassermann reaction had been disclosed I had been in the habit of subjecting my tabic patients to a course of sublimate injections at least twice a year. This will account for the fact that of the nine negative cases of tabes in my series seven were cases of patients who had been subjected to this line of treatment. It can, therefore, be seen readily enough that if I were to tabulate only hospital cases and those seen for the first time during the past year the percentage of positive reactions would be very much higher. It is also worthy of note that all the female tabic patients, as well as all the female general paralytics, gave a positive reaction. A reaction which was positive in a number of tabic patients before treatment was begun gave a negative reaction after a course of several weeks' treatment had been persisted in.

TABLE SHOWING THE RESULTS OF THE WASSERMANN TEST IN TABES AND GENERAL PARESIS

Tabes Dorsalis.	Reaction.	General Paresis.	Reaction.	General Paresis.	Reaction.
2	—	7	+	36	—
3	—	8	+	37	—
4	—	9	+	77	—
17	+	10	—	105	—
18	—	12	+	135	—
24	+	14	+	161	+
27	—	15	+	206	weak
30	—	21	—		
33	—	22	+		
35	+	23	—		
38	+	42	—		
47	+	51	+		
55	+	71	—		
64	—	76	—		
87	+	78	+		
100	+	82	+		
101	—	83	—		
107	+	94	+		
110	—	95	+		
119	—	103	+		
126	+	104	+		
142	+	108	—		
145	+	117	+		
146	+	132	—		
164	+	133	—		
193	+	134	—		
194	—	151	—		
208	—	152	+		
		153	—		
		154	+		
		198*	—		

* Juvenile general paralysis

In spite of these high percentages we can not expect much help from the reaction in those cases of spinal or cerebrospinal lues in which the tabic type predominates, for in both these groups of cases a positive reaction might be obtained and yet no light whatever will be thrown on the spinal character of the morbid changes underlying the symptoms. In every case in which a

positive reaction was obtained, specific treatment was pushed with much more energy than would otherwise have been the case.

Among these cases of tabes I wish to single out two for special mention. They have both been under observation for many years, the one during a period of four, the other during a period of ten years at least, and both of these were puzzling for a long period because they presented no other symptom than a dissociation of sensation within the distribution of the fifth nerve, the affection in one case becoming bilateral, in the other remaining unilateral. Both these patients—the one a man of 35, the other of 38 years, the one a merchant and the other a machinist—presented positive reactions. The one patient was observed for years before any other symptoms of tabes were in evidence, but to the dissociated sensation of the trigeminal distribution has now been added a loss of knee-jerks and an ataxic gait, whereas the other still presents no other symptom except a difference in the knee-jerks and some vague and occasional lightning pains. After finding a positive reaction in these two cases, strenuous mercurial treatment was given, always by hypodermatic injections, and strangely enough in both these cases the trigeminal symptoms have been distinctly diminished since the hypodermatic injections were begun, and in both the tabic process seems for the present to have come to a standstill.

Of the 31 cases of general paresis, 32.3 per cent. gave a negative reaction and in 67.7 per cent. the reaction was positive. It will be seen that these percentages are almost identical with those obtained in tabes, whereas other observers have recorded higher percentages. The same explanation that I have given in the cases of tabes will hold to a certain degree for general paresis. All of the cases of general paresis were progressive in their symptoms in spite of the mercurial treatment to which the patients had been subjected. Among the list of cases are several that have lasted a period of two years or more, and all of these cases of old standing gave a negative reaction. Another possible explanation for the low percentages of positive reactions in my cases may be the fact that a number of these cases were in the psychopathic ward of Bellevue Hospital, where patients are retained only over a period of four or five days and where the diagnosis often has to be made hastily, so that there is a bare possibility that some of those which have been classed as cases of general paresis might possibly have belonged to the category of doubtful cases. I have placed in a separate series 7 cases which were unquestionably doubtful ones and of these 7, 5 gave a negative reaction and 2 a positive reaction, one of these 2 positive reactions being weak positive. The contrast between these doubtful cases and undoubtedly genuine cases is striking enough to make us appreciate the value of a positive reaction when it is found, but in the case of general paresis again the finding of a positive reaction does not help us materially in making a differential diagnosis between typical general paresis and syphilitic pseudoparesis. A most interesting example of this character was that of a patient (No. 24) who had had tabes for many years and in addition to these symptoms of tabes had passed through attacks which would ordinarily be classified as manic or manic-depressive attacks, with occasional speech disturbances that were a little like those of general paresis and with occasional delusions of an expansive character. The diagnosis of general paresis was made offhand by a num-

ber of men who had seen the patient and his early death has been freely predicted in each one of the attacks; but, confident of the luctic character of his symptoms and being willing to make a diagnosis of pseudoparesis only and not of the genuine kind, I had predicted his recovery, and he is at present enjoying excellent health, his tabic symptoms being stationary and his mental symptoms for the present being absolutely in abeyance. In this patient the blood examination taken early in January of this year was most positive, and very soon thereafter a violent outbreak occurred. We have not been able to take another reaction since, but the improvement set in as soon as he had been brought under the influence of mercurial treatment. Incidentally it is well to note that there are psychic conditions in tabic patients, and surely in those who have had constitutional syphilis which need not necessarily take the form of general paresis, and this seems to me to be a fact which is often overlooked.

The Wassermann reaction in tabes and in general paresis is of special use only in so far as it tends to corroborate the theory of the specific origin of the two diseases, and also in so far as it gives one good reason to adopt rigid antisyphilitic measures until the character of the reaction has been altered as a result of treatment.

But to pass from tabes and general paresis to other forms of central nervous disease, I will detail briefly some of the experiences of the past year. And here I will refer first to cases in which the diagnosis between disseminated sclerosis and multiple cerebrospinal syphilis was difficult to establish and to another in which it was a question whether the patient was suffering from spinal lues or from amyotrophic lateral sclerosis.

MULTIPLE SCLEROSIS AND MULTIPLE CEREBROSPINAL SYPHILIS

Two patients, both women, one in private practice and the other at the hospital, were under my care. One patient (No. 49) was a woman, 28 years of age, who had been under my treatment a few years ago for a spastic paraplegia with very slight disturbance of the bladder and rectum and slight sensory disturbances involving both lower extremities. There was no involvement of the cranial nerves, her speech was occasionally a little halting, and on extreme moving of the eyes there was a slight nystagmus. There was also a slight ataxic tremor of the upper extremities which might have been interpreted as an intention tremor. At that time a differential diagnosis between multiple sclerosis and multiple cerebrospinal syphilis was not definitely made, although I was inclined to adhere to the suspicion of syphilis in spite of the pupils, which were entirely normal in their reactions. After treatment for a number of months by mercurials chiefly, and some iodids, the patient made a good recovery, and about one year after her dismissal from treatment gave birth to a normal child. In December, 1908, she visited me again complaining of a gradually developing stiffness of the legs; she was able, however, to walk to and from my office and otherwise presented no symptoms. The Wassermann test was made and the reaction was a very positive one. A week later the lower extremities were not only stiff, but distinctly weakened, and from this time on for the following four weeks she experienced great difficulty in getting around. It was not practicable to have her return regularly for injections; she was given large doses of mercury by innunction. After two months distinct improvement set in, she was able to get about again, both the rigidity and the paralysis disappearing. The only thing that was

left was a slight unsteadiness in her walk and easy fatigue on exertion. She also complained of numbness in the left hand.

While the recurrence of attacks would have favored the diagnosis of spinal syphilis, it is well known that even in multiple sclerosis such remissions occur, and in this case a positive Wassermann reaction was a great aid in diagnosis.

The other patient (No. 29) is the wife of a physician, whom I have had under treatment off and on for a number of years. She has at various times had transitory attacks of paraplegia, with marked scanning speech and with great increase of the deep reflexes and marked rigidities. The husband is entirely ignorant of any specific infection and was much more inclined to the belief of a disseminated sclerosis than of a specific spinal disease. This patient had been sent to the hospital last year when she had an attack of spastic paraplegia, and after twenty-three injections there was marked improvement, so that she had practically been feeling well during the greater period of the winter. On December 3 of last year, at a time when she had ceased all treatment for a number of months, the Wassermann test was made and the reaction was found to be positive. Following this she was subjected to another course of injections and remained in a tolerable state of health until about a month ago, when she again suddenly became paraplegic, with considerable pains radiating down the limbs, and had again to be sent to the hospital for another course of treatment. Of the specific character of her trouble there can be no doubt.

As a companion-piece to these two patients I might mention another, a young woman, 25 years of age (No. 41), who had while in the hospital a transitory attack of hemiplegia, who presents marked nystagmus, slow, hardly scanning speech, ataxia of the upper extremities, and occasional weakness of the lower extremities, although never so marked that she is compelled to remain in bed or on a chair; but her disease, which I have been able to follow for at least six years, has been characterized by most marked remissions, and, inasmuch as she was a young married woman who had never given birth to children, the differential diagnosis between multiple sclerosis and multiple syphilis was not an easy one to establish. In her case the several tests which were made at varying periods have been negative, and I feel certain that the case will prove to be one of multiple sclerosis and not of syphilis.

The difficulties in diagnosis were quickly cleared up in a hospital case of a woman about 40 years of age who presented marked atrophy of the thenar and hypothenar muscles of both hands, with increase of the reflexes both in the upper and lower extremities, and with some slight involvement of the sphincters and a complete spastic paraplegia of the lower extremities. The disease came on much more suddenly than we are accustomed to see it come on in amyotrophic lateral sclerosis, so that there was some doubt as to whether the case was one of this character or whether it might possibly be a form of cerebrospinal lues. In this case the blood reaction was found positive and the cerebrospinal fluid sent to Dr. Noguchi for examination was reported by him very strongly positive. On the strength of these findings the patient was subjected to marked antiluetic treatment, but she became completely paraplegic, lost control over her bladder and rectum, developed a huge bed-sore and died of the disease within a few weeks. The autopsy revealed a most

marked cerebrospinal meningomyelitis specifica. As this was the first one of my series of cases to be examined, it can readily be seen that I was much impressed with the Wassermann test as an aid to diagnosis in doubtful cases.

In addition to these cases, there have been a number of ordinary spastic paraplegias (Nos. 13, 19 and 109). In the first two the reaction was negative and there was no special reason to think that there was any specific element in the case. In the third (No. 109) there were all the ear-marks of syphilitic disease, and an infection years ago was conceded. In this case the blood reaction was positive, and the cerebrospinal fluid also gave a very positive reaction. I make mention of this positive reaction of the cerebrospinal fluid as Nonne and others have failed to get a positive reaction in many of these conditions. Several tests were made of this man; all of them were positive, so that there can hardly be a doubt as to the correctness of the observation. It is well worth adding that in this case lumbar puncture was done at least five times, three times while in the hospital under our own observation, and twice while the patient was at another institution. He experienced so much relief—whether it was subjective or not—from the withdrawal of about 15 c.c. that he asked for repeated lumbar puncture. As no ill effects were observed from this, his wish was granted and he left the hospital very much improved and was ready to resume his work as a motorman.

Let me refer here also to another very remarkable case of cerebrospinal lues (No. 32) that had been under my own care in private practice as well as in the private pavilion in the hospital, with several attacks of hemiplegia and of paraplegia, from each of which the patient—now a man about 33 years of age—had recovered. Last summer this patient was sent to Aix-la-Chapelle and was subjected there to a thorough course of mercurial treatment. He reported to me on October 5, after his return from Aix, when I found him practically well, but for safety's sake continued him on small doses of protiodid of mercury—a drug, by the way, in which my confidence is steadily diminishing. On November 20 of last year he reported at my office, stating that the vision of the right eye appeared blurred. On examination I found a distinct swelling of the nerve and some atrophy. I referred him to Dr. Wiener, who reported that the patient exhibited a distinct specific retinitis and evidences of a retrobulbar neuritis. It was not practicable to give him injections, so he was put on inunctions of mercury. The blood was taken for examination and the reaction was found most positive. After twenty inunctions another test was taken and the reaction was weak positive. After thirty inunctions the reaction was negative and has remained negative since.

There was a further interest in this case, inasmuch as with the improvement in the Wassermann reaction there was also a marked improvement in vision, so that on March 9 I could enter on my records the statement that the patient "reads perfectly with the right eye and all trouble with vision seems to have disappeared." On April 12, however, he developed a weakness in the right leg, reminding him of the condition of the leg during his attack of hemiplegia some years ago. He was at once given another course of treatment, and on May 19 of this year, when he was again seen at my office, he had recovered from the attack of transitory paralysis of the leg, his vision was good, he was able to attend to his work and had practically recovered from this renewed attack of paralysis.

Of all the cases of central syphilitic disease that I have seen this has been the most stubborn, at least of those that showed any tendency to recovery. The Wassermann reaction has been of much aid in the treatment of this patient, and I am so much impressed with its value as an indication of active or inactive lues that I have advised the patient to present himself at least twice a year for a blood examination so as to determine whether or not he needs active antisyphilitic treatment even in the absence of all clinical phenomena.

A case somewhat similar to this (No. 116) was under observation during the winter at the hospital. The patient's chief symptom was a blindness which was suddenly developed, and it was a question whether the blindness was due to a specific disease or possibly to poisoning by wood alcohol. In this case both the blood and the cerebrospinal fluid gave a positive reaction. Under mercurial injections the patient was improved and was finally discharged from the hospital, although his vision had not been completely restored, but he had regained sufficient vision to return to his home. In this case we were well aware that wood alcohol might possibly have caused the condition in a man who had previously been infected with syphilis, but without the positive reaction we would not have had the courage to persist as we did in a prolonged course of mercurial treatment.

IN TUMOR OF THE BRAIN, HEMIPLEGIA AND EPILEPSY

I have no desire to multiply details, but I must refer to the aid rendered by the Wassermann reaction in cases of tumor of the brain or of cerebral conditions in which tumor was suspected. An interesting observation was that on a hospital patient (No. 73) who had had considerable nasal trouble, had been treated by a number of nose specialists in an operative way, and shortly after such a course of treatment developed intense frontal headaches, exquisite tenderness over the frontal bone, slight optic neuritis, without running any considerable fever, except such as might have been accounted for by a slight intercurrent complication. In view of the previous history of nasal trouble and operative interference, it was natural to think of abscess or of a possible intracranial neoplasm or else cerebral lues—a condition which one should never overlook. The patient was under treatment at the time when we were most interested in the Wassermann reaction. The test of blood was taken after he had been in the hospital for a number of weeks, but without specific treatment and a positive reaction was recorded. In view of this—and this was an important matter—every thought of operative interference was abandoned; the man was put on sublimite injections. All his symptoms cleared up and he was discharged, cured, from the hospital after a further stay of about four weeks.

It has become a matter of routine treatment in my service at the hospital to take the Wassermann reaction in all cases of brain tumor before operation is decided on, with a view of eliminating specific cases. I have a record of five such tumor cases in all of which the reactions were negative, and in one of them the reaction of the cerebrospinal fluid was also negative. In a sixth case a positive Wassermann reaction helped us out of a serious diagnostic dilemma. The patient is still in my hospital wards. He is a young man about 25 years of age whose chief symptoms were of a bulbar character; typical bulbar speech, constant drooling from the mouth, rigidity of the neck, intense vertigo, so that the patient had to hold his head inclined to the right, and on any

attempt to move it forcibly to the left suffered from intense vertigo. He also exhibited, on looking to the left, a most marked lateral and vertical nystagmus. There was strong suspicion of a tumor either of the cerebellum or in the vicinity of the medulla oblongata, but the only fact that was not in concurrence with this view was the entire absence of optic neuritis; and yet we have all known of the occurrence of cerebellar tumors and of tumors in the vicinity of the foramen magnum, where this growth would have had to be, which are not attended by optic neuritis. The man's condition was becoming rather desperate; he could be fed only by the stomach-tube and seemed to be in great danger of respiratory paralysis, and as a last resort—although I did not think a specific condition probable—a blood test was made which gave a distinctly positive reaction. In view of its proximity to the cerebellum I did not venture to withdraw spinal fluid. As soon as the positive reaction was made out, sublimate injections were given to the patient, and within a week a most astonishing improvement occurred; the patient began to swallow food, the nystagmus was lessened, the vertigo diminished, and he seems now to be on a fair road to recovery; another case in which the Wassermann reaction has proved to be of incalculable value.

In the hemiplegias much assistance was given by the Wassermann test. We neurologists know how much at sea we often have been regarding the nature of an apoplectic attack, and if the onset was such as to give rise to the suspicion of thrombosis, unless the patient were well advanced in years, we have always had to fall back on the theory of a specific endarteritis. I feel that we can depend on the Wassermann reaction to corroborate such a suspicion or to diminish its probability. In the paper which I read before the Association of American Physicians, together with Dr. Collins, on "The Value of the Wassermann Reaction in Cardiac Disease" I reported the case of a hospital patient whose condition was most puzzling. He had a distinct endocarditis affecting both the aortic and the mitral valves. Shortly before entering the hospital he sustained an attack of hemiplegia which was very slow in its mode of onset, entirely without loss of consciousness, and in which the arm and leg were not simultaneously paralyzed. The onset of this did not at all correspond with the theory of embolism due to heart disease. A Wassermann reaction was positive in this patient, and I inferred from this that, although the patient had heart disease, he also had specific endarteritis, and that his attack of hemiplegia was due to thrombosis and not to embolism; another instance, it seems to me, in which the evidence furnished by the Wassermann reaction may be of great diagnostic value.

The Wassermann reaction has been of the greatest help to me in a number of cases of epilepsy in which syphilis was suspected as the only possible cause. Case 128 was one of hereditary lues with epilepsy in which the reaction was positive; and in one case (No. 89), a young man who had acquired syphilis a number of years ago and who gave a positive reaction, had also developed epileptic attacks, the meaning of which was supposed to be in doubt, but with the positive Wassermann reaction I think we need not hesitate to ascribe these spells to brain syphilis.

I have mentioned the cases in which positive reactions have been of great help, but a negative reaction has often been just as instructive, particularly in the case of tumor of the brain, in cases of headaches, and in condi-

tions of disease of the peripheral arteries, more or less resembling Raynaud's disease and erythromelalgia, in which a negative reaction has led me to believe that the suspicion which I once entertained, that these conditions might be of specific origin, can not be defended.

In view of such experiences as I have recorded, I do not hesitate to speak enthusiastically of the value of the Wassermann reaction in neurologic diagnosis. I am certain that within recent years no aid to diagnosis has been given us which can at all equal it in value and in its importance. It should, however, be interpreted merely as a finding corroborating or disproving the suspicion of syphilis, and I would urge that every neurologist acquaint himself personally with the method so that he may learn to employ it and may help to determine by further investigations what the limitations to its usefulness may be, for limitations will surely be found.

I was soon convinced that the Wassermann test was valuable in determining our therapeutic procedures. As a result of my own experiences I would urge that a positive Wassermann reaction is an indication for anti-syphilitic treatment; and as regards diseases of the central nervous system, I mean treatment by mercury and preferably by mercurial injections, I have placed reliance on the soluble salts, but I will not differ from those who have a predilection for the insoluble mercurial salts, or who still pin their faith to the iodids. It may be as well, however, to state my conviction that, while I have seen specific headaches and milder specific conditions improve under the administration of iodids, specific myelitis or any serious specific invasion of the cord or brain has, in my opinion, been benefited only by systematic mercurial treatment. These views, which I have held for some time, are, it seems to me, corroborated in the recent interesting statistics of Hoehne, who shows that calomel and sublimate injections appear to be the most efficient. This writer finds that the Wassermann reaction is changed from positive to negative more often after the administration of these two mercurial preparations than after other forms of treatment. If we remember in what haphazard and vague way anti-syphilitic treatment has been given for years, both in nervous and in other diseases supposed to be of syphilitic origin, we must welcome a method which gives us some sort of rational basis for our therapeutic procedures. I maintain, therefore, that the Wassermann reaction has a positive value not only as an aid to diagnosis, but also as an aid to treatment.

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THE SERODIAGNOSIS OF SYPHILIS *

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It is my essential purpose to present the results of the analysis of 2,406 blood serums by the complement fixation test, using either Wassermann's or my own method of doing the test. Herewith are given six tables, giving in detail the results of the analysis and of a comparative study of 244 cases of known syphilitic or parasymphilitic conditions in which the Wassermann method and mine are contrasted. I shall also point out briefly the main differences between the Wassermann method and my own, referring to the various other modifica-

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