Salvarsanized Serum in Syphilitic Nervous Disease

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C. EUGENE RIGGS, A.M., M.D.
ST. PAUL

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The clinical history of syphilis with its therapy is in the process of making, and is greatly in need of restating. Especially is this true of nervous syphilis. The reports of many investigators are so incomplete, so lacking in scientific accuracy, as to cloud their findings and give rise to great confusion and difference of opinion. Paucity of experience, the failure to follow lines of procedure marked out by previous well-known and competent investigators, substituting therefor personal and theoretical modifications, are all important factors in the production of this deplorable condition. There are but few Noguchis or Marinescos, few Swifts and Ellises.

There must be mutual endeavor; a cooperation of effort, so to speak, along definite lines among those interested in the therapy of syphilitic nervous diseases, if order is to come out of chaos and definite and reliable data be obtained.

Mattauschek found from the examination of 4,134 cases of syphilis that 3.19 per cent. of the patients infected suffered from cerebrospinal syphilis. If we believe with Robertson and Klaudner that syphilis is a septicemia, that the organism is invaded by the spirochetes within a day or so after infection, that the nervous system is involved from the beginning, and that the majority of syphilitics are essentially candidates for nervous syphilis from the very outset, the all-important thing in the treatment of this disease is the

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early recognition of the primary lesion. This is readily
effected by the means of dark-ground illumination or a
microscopic examination of the exudate of the sore,
be its resemblance to a hunterian chancr never so slight.
This is the psychologic moment in the treat-
ment of syphilis.

Gibbard and Harrison have observed that relapses
are more than doubled when medication is begun in
the secondary rather than the primary stage, and they
believe that by the employment of modern therapeutic
methods syphilis may be limited to its earliest mani-
festations and that eventually congenital syphilis will cease
to exist. A most valuable addition to our knowledge
of syphilis is the significant fact that the nervous
system is subject to an early spirochetal invasion.
Serology has enlightened us greatly on this point.
Ravaut has found an abnormal spinal fluid in 67 per
cent. of his cases of secondary syphilis; Dreyfus in
80 per cent.; Robertson and Klaudiner in 70 per cent.;
Gennerich in 90 per cent.; Mattacheck in 80 per cent.
Nonne and Mantoux in 40 per cent.; Wii and Stokes
in from 60 to 70 per cent., and the latter believe that
in every case of secondary syphilis there is more or
less involvement of the nervous system. Wechselmann
states that in the majority of cases of syphilis the
spinal fluid shows an increased protein content. An
examination of the spinal fluid of 221 patients in the
ey early stages of syphilis by Wechselmann, Wilhelm and
Dinkelacker, showed positive findings in 158, and of
these there were nervous symptoms in 98; in the 63
negative cases there were nervous symptoms in 32.

Similar investigations of the primary period have
elicted equally interesting results. A pathologic spinal
fluid is common; an increase in the albumin and glob-
ulin content, with or without pleocytosis, is often
observed. The Wassermann reaction is the least to
be relied on; a negative spinal fluid is of diagnostic
value only when all symptoms indicative of nervous
involvement are absolutely lacking. One of Krida's
patients, with a chancr on the lips of two weeks'
duration, showed a marked increased protein content
in the spinal fluid.

Certain neurologic findings, such as headache,
involvement of the second and eighth nerves (the lat-
ner, according to Benario, being more frequently
involved in early syphilis than any of the other cranial
nerves), modification of sensibility, changes in the
reflexes, positive Babinski, pupils unequal and differing
in their reaction, etc., are frequently demonstrable in
both stages.

"The way the central nervous system is involved in
early syphilis," says Coriat, "is certainly surprising,
and this is also borne out by the spinal fluid tests. I
am making complete neurologic examinations of all
cases of constitutional syphilis, in all of its stages,
without nervous complaints."

The neurologic findings may, or may not, be associ-
ated with definite serologic changes. Either one of
these may exist independently of the other. Quincke
and Mayer consider that there is a parallelism between
pleocytosis and the neurologic symptoms; the former
is believed to bear a relation to the severe headaches
(Jeanselme and Barbe). If the serologic changes only
are present we have what Ravaut calls the "preclinical"
stage of nervous syphilis, which may last for months
or years before the first clinical sign makes its appear-
ance. I have now under observation two cases in
which fifteen years elapsed between infection and the
first manifestation of nervous symptoms. Serology
enables us to recognize this preclinical period in its
incipiency when treatment is most effective.

THE METHOD

As to the best method for the use of salvarsan in
nervous syphilis, the profession is hopelessly at vari-
ance. There have been too many contributions by
men whose training and acquaintance with the
more delicate methods of diagnosis were too faulty to
permit of their drawing reliable neurologic conclu-
sions. "The stage of temperate and critical criticis-
[1] Dr. Coriat's work along this line will appear when he and Dr.
Sankorn publish their results of the treatment of nervous syphilis
based on over 700 injections.
injection of salvarsan at the upper part of the nates, in the loose tissues between the subcutaneous fat and fascia (injections or injections of mercury being given in the intervals), may be harmless and practically painless, but in the light of the studies of Tinney and Woolsey in vital staining with solutions of trypan blue, is clearly inefficient. These investigators have shown that if solutions of this agent are injected subcutaneously or intra-arterially, the skin and thoracic and abdominal viscera stain readily while the central nervous system absolutely escapes. If the solution be injected intravenously, the stain reaches the dura and pia mater, but does not penetrate the nervous tissue. When the injection is given intraspinaly, the membranes are affected as before and the dye penetrates the nervous tissues through the walls of the veins and capillaries, affecting even the epitheilium of the latter. These experiments would indicate that intravenous injections of salvarsan are not sufficient in parenchymatous syphilis, however valuable they may be in luetic meningitis, endarteritis and gumma. It has also been demonstrated that diseases of the meninges and their adjacent nervous tissues are best therapeutically influenced by the employment of intraspinal methods. If, as Mott states, the cerebrospinal fluid is the lymph of the nervous system (and it has never been positively shown that it does not reach the most remote nervous tissues by way of the subarachnoid spaces and their communicating canalicular system), it is by this medium and through its channels that therapeutic agents can be conveyed to the lesions deeply situated in the cortex.

Since affections of the meninges, such as influenzal, pneumococcic, and epidemic cerebrospinal meningitis, are not responsive to any other than subarachnoid therapy, it would seem to follow that syphilitic affections of the membranes and their adjacent nervous tissues can be best treated by the intraspinal administration of spirochetal drugs.

Intraspinal medication is one of the most notable of the many notable achievements of modern medicine. The intraspinal method, like every new procedure, has suffered more at the hands of its overenthusiastic friends than from the most pitiless criticism of its enemies. The conclusions of partisanship are based on the illusions of hope, not on the solid foundations of clinical and biologic fact. I can best make clear the present status of intraspinal medication by a brief review of its literature and by a few excerpts from personal communications to me from representative American workers.

Ehrlich, in his address on chemotherapy before the International Medical Congress, August, 1913, referred to the intraspinal use of salvarsanized serum as practiced at the Rockefeller Institute, as being "not only novel but suitable in so far as it obviates all possible ill effect on the sensitive central nervous system, by employing a serum obtained from the patient himself, while at the same time it is possible to apply the curative agent in sufficient quantities."

Drs. Purves Stewart and Harry Campbell both advise the treatment of nervous syphilis by intraspinal injections. "It is too early to claim," says the former, "that we possess a cure for tabes or general paralysis, but we can, in suitable cases, do a good deal toward arresting both diseases; time alone can tell whether such arrests are permanent." "In parenchymatous syphilis," says the latter, "the intrathecal treatment is the only one yet devised which is capable of arresting the morbid process."

Mott, in his address before the section of Neurology and Psychological Medicine of the British Medical Association at its last annual meeting, said that "the late degenerative forms of syphilis of the nervous system (and I refer especially to general paralysis) have not been cured nor even greatly benefited by any treatment with salvarsan or neo-salvarsan, whether administered intravenously or intrathecally." He admitted, however, that his personal experience did not warrant his speaking authoritatively. In the ensuing discussion McDonagh stated that he had observed some remarkable results from the intraspinal injection of salvarsanized serum in cerebrospinal syphilis, but no better than he had obtained from inunctions of mercury and intravenous injections.

Turner stated that it was too soon to express an opinion, but it seemed to him that as good results were obtainable from inunctions as from intraspinal injections. Grainger Stewart believed that in nondegenerative nervous syphilis, intraspinal injections undoubtedly accomplish good, while in paresis and tabes their value was not yet clear.
Eskuchen thinks that the Swift and Ellis method does not influence the objective tabetic symptoms, that the subjective symptoms can be benefited and in some instances the disease is apparently arrested. Myerson is hypercritical in his objections to the use of salvarsanized serum; he suggests, however, that further trials be made in selected groups of cases. Krida states that it is imperative to eradicate every manifestation of nervous early syphilis, from both the clinical and the laboratory standpoint, and that it is here, where the usual methods fail, that intraspinal therapy finds its largest field.

According to Cutting and Mack, the treatment of general paresis with salvarsanized serum “may not be a solution of the problem, but the work thus far shows that it deserves a thorough trial.”

“Personally,” says Dr. Coriat, “I highly favor the treatment of syphilitic and so-called parasypilitic diseases of the central nervous system with salvarsanized serum.”

Dr. Jelliffe says:

There is no doubt that the Swift and Ellis method is along the right lines. My opinion is that there is much to be done in the way of perfecting the technic and that at the present time a number of new avenues are opening up, and we cannot really tell what the future is going to be. Certainly there is very little danger, although some bad result have been met with. On the whole, it is a step forward and not backward.

Dr. Sanborn says:

I cannot state to you the attitude of the Boston men in general in regard to this treatment, but I believe those who have had any number of patients under observation think that the treatment is rational and is productive of much good and is more efficient than intravenous salvarsan alone. I have personally administered 372 intraspinal injections in private cases, and either I myself or my assistants have given a total of 720 of these injections. I have not been successful in rendering the spinal fluid negative in paresis; in tabes a negative Wassermann may be obtained in most cases if a sufficient number of treatments are given.

There are four kinds of intraspinal medication: first, the injection of mercurialized serum, as advocated by Byrnes; second, the procedure of Swift and Ellis—the in vivo method; third, the in vitro method, viz., the direct intradural injection of neosalvarsan as practiced by Wechselmann, Marinesco, Marie and Levaditi, and Ravaut and Wile; fourth, the employment of both the in vivo and in vitro methods as suggested by Cotton and Smith.

Following along the lines of investigation laid down by Horsley and Ravaut, Byrnes satisfied himself that the intraspinal injection of mercurial salts was to be preferred to the unstable, complex arsenical preparations, and he selected the albuminate of mercury as being the most suitable for this purpose. He has reported thirty-two cases of nervous syphilis treated in this manner, and he regards it as equal in efficiency, if not superior to, salvarsanized serum. Cotton says that caution should be observed in its administration.

I believe that the clinical and serologic results thus far obtained make good the claim of efficiency for the in vivo method, and I agree with Dr. Smith that the untoward results observed in intraspinal medication are due to “the so-called later improvements and simplifications of technic,” and the direct method of injection. Another year’s observation but confirms the assertion of Dr. Hammes and myself before this section last June that “the preference of this method [Ravaut’s] ... over the safer and equally effectual Swift and Ellis process is to us unjustifiable and inexplicable.” Sachs, Gordon and Weisenburg have during the past year reported deaths following the use of the Ravaut method. Corbus and also Fordyce advise that the Swift and Ellis procedure be the one of choice. Personally, I think the in vitro method is basically wrong; I cannot conceive it possible to inject intradurally any known arsenical compound in sufficient strength to become absolutely spirochetal without at the same time compromising the welfare of the patient. The arsenical preparation that will attach itself to the guest and not affect the host is yet to be discovered. Coriat believes that the good effects of salvarsanized serum are due not so much to the arsenic as to the antibodies it liberates. According to Stühmer, it is very difficult to determine whether antibodies play any additional therapeutic rôle; the good effects of the serum, he thinks, are due, not to free salvarsan, but rather to some oxidation products which by heating are separ-
rated from their loosely synthetic combination and again become active.

Cotton advocates a more strenuous therapy in the future than in the past. The small amount of salvarsan given intraspinally every two weeks he regards as effective only for a few days. It does kill some spirochetes; then in the intervening time the progress goes on and the remaining spirochetes continue to be active. During all this period the patient is deteriorating. When finally the biologic reactions become negative the subject is in a mildly demented state from which recovery does not appear probable. He advises a combination of the Swift and Ellis method and the Ogilvie modification, using the former one week and on alternate weeks the latter. Smith has recently reported twelve cases in which he had used the Swift and Ellis with a modified Ravaut method; the latter was followed by unfortunate complications after the second injection, and was discontinued. He now injects as high as 30 c.c. of undiluted serum weekly (Swift and Ellis) with a more speedy response and no ill results.

The true rôle of subdural therapy in nervous syphilis is one of prevention rather than cure. The frequent occurrence of changes in the nervous system and spinal fluid in early syphilis cannot be too strongly emphasized.

Hauptmann says that a positive Wassermann in the cerebrospinal fluid in secondary syphilis is an expression of a true syphilitic cerebrospinal disease. A neurologic and laboratory examination should be made in every case, for only by an early recognition of the nervous invasion with prompt and radical treatment can subsequent inflammatory and degenerative changes be guarded against.

THE DRUG

"Salvarsan," says Wassermann, "is in my opinion the mightiest weapon in medicine." Gibbard and Harrison state that when mercury alone was used there were 83 per cent. of clinical relapses, but with the use of salvarsan and mercury, only 3.9 per cent. had recurred. They prefer it to neosalvarsan, as they regard it as much more active in corresponding doses. According to Nelson and Haines, salvarsan has given them in nine months 64 per cent. of negative serums, whereas neosalvarsan gave 33.3 per cent., and they think salvarsan should always be used if one wishes to give his patients the best possible results in the shortest possible time. "Salvarsan is the most potent remedy," say Craig and Collins, "in our armamentarium in the treatment of syphilis of the nervous system." They believe it to be much more potent than neosalvarsan.

Wechselmann thinks that salvarsan alone should be used in the treatment of syphilis, and this conclusion is based on the observation of 45,000 injections of this drug. Ehrlich and Dreyfus prefer old salvarsan to neosalvarsan, but use the latter when a mild, nonirritating action is desired, although frequently the treatment is begun with neosalvarsan (Conzelman). Many medical men advise that mercury be administered in the intervals between the injections. Collins refers to potassium iodid as a “blighting delusion” and to the administration of mercury by the mouth as a “futility.”

The relative merits of mercurialized and salvarsanized serum, are still sub judice. The cases in which the! former have been tried have been too few and the time too short to warrant any expression of opinion. As to salvarsanized serum much can be said. According to Hough: "The researches of Ehrlich and others have shown that salvarsanized serum has a distinct spirochetacidal power, a power greater than that exercised by salvarsan itself" (Siebert). Swift and Ellis believe that "there is definite evidence that this form of treatment has a curative action on the syphilitic process."

In the light of all the evidence the diversity of opinion that still exists regarding the utility of salvarsan is most surprising. This seems to be almost as marked as when Ehrlich in 1909 first announced his discovery of this truly remarkable synthetic substance.

THE LANGE COLLOIDAL GOLD REACTION

Dr. Hammes and I have studied the colloidal gold reaction in sixty cases. Eleven paretics gave the typical paretic curve, namely, a complete decolorization in the first three or four tubes with some changes in the next four—5555443200. In one paretic with an acute maniacal onset the colloidal gold solution decolorized completely in every dilution up to the tenth tube.

3. I am greatly indebted to Dr. Archibald Leitch for his pains-taking care in the investigation of the Lange colloidal gold reaction.
In one case of clinical paresis with negative blood and spinal fluid, the colloidal gold reaction was negative; one case of taboparesis gave the curve for paresis. In ten cases of tabes the curve was somewhat variable, seeming to bear a distinct relation to the intensity of the Wassermann reaction.

In two cases of typical clinical tabes all reactions, biologic and colloidal gold, were negative. Five (50 per cent. of our tabetics) with positive blood and spinal fluid gave what might be called a tabetic curve, namely, 3444432000, with slight variations in the intensity. An atypical case, in which the symptoms were most suggestive of an incipient tabes or paresis, reacted in the syphilitic zone. Three tabetics gave the characteristic paretic curve.

The curve in our cerebrospinal syphilis cases, six in number, was such as occurs in the syphilitic zone. In one case of clinical cerebrospinal syphilis with a positive Wassermann in the blood and spinal fluid, the gold solution reacted negatively; in another similar case the serobiologic findings were all negative, while the gold solution reacted in the syphilitic zone. In two cases of tubeculous meningitis and one case of pneumococcic meningitis the curves were similar, namely 012343210. In one case of pneumococcic meningitis associated with spinal syphilis of three months' duration, the curve was similar to that observed in our cases of acute meningitis.

Two cases of syphilitic endarteritis and apoplexy with positive blood and spinal fluid gave a typical paretic curve. A case of tabes associated with cerebrospinal syphilis gave an atypical curve suggestive of both. Two cases of spinal cord tumor, one a fibromyxoma in the cervical region, one a cyst in the lumbar region, gave similar curves: 0000001233. We have found in the following conditions no reaction: a case of transverse myelitis, three of multiple sclerosis, five cases of essential epilepsy, one of involutional melancholia, three normal spinal fluids, two cases of Sydenham's chorea, one subacute degeneration of the posterior columns with primary anemia, one Friedreich's ataxia, one progressive muscular dystrophy (Erb), and two alcoholics.

Treatment has produced no change worth recording on the colloidal gold curve except in three cases of tabes.

The recent statements of Schwab that "clinical improvement in paresis as a result of this treatment [Swift and Ellis method] is a thing that no one of recognized standing has as yet asserted," and of Ravine that salvansanized serum administered intraspinally (Swift and Ellis) gives only laboratory improvement; that its chief asset is the original intravenous injection; that clinical recoveries are not reported; that patients have been made decidedly worse, and that fatalities have occurred are in the light of the following facts most amazing.

In speaking of intraspinal therapy (Swift and Ellis) as used in nine cases, Barrett says:

"Enough time has not elapsed to warrant passing final judgment: ... but the improvement, or at least the increase in the proportionate number and length of remissions, has been encouraging and justifies the undertaking of this treatment in all early cases."

Dr. Blumer states that "thirteen cases of general paresis, taboparesis and tabes have been treated with salvansanized serum with encouraging results."

Hough, according to Wardner, sums up the work of Swift and Ellis at the Rockefeller Institute, Myerson of the Psychopathic Hospital, Boston, and Asper of Baltimore, as follows:

"There has been marked improvement in the syphilitic inflammatory processes and in many cases the patients with tabes especially have shown pronounced clinical improvement."

Taylor of Boston, in referring to the results obtained by the Swift and Ellis method in the Neurological Department of the Massachusetts General Hospital and in a limited number of private cases, says:

"In otherwise obstinate cases of tabes the results have been encouraging. It is believed that a certain modification in the course of general paralysis may result if taken early. At times it appears that cerebrospinal syphilis yields more promptly to this than to other forms of treatment; several cases suggest the possibility of complete cure; no permanent ill effects thus far have been experienced."
Dr. Hammes and I have administered over 200 injections of salvarsanized serum (the Swift and Ellis procedure). There have been no ill effects, aside from one case of aseptic chemical meningitis in which there was speedy recovery. Our results are very similar to those of Dr. Taylor. Remissions occurred in three out of eight paretics. One patient relapsed after four months; the other two are apparently perfectly normal. The blood serum and cytochemical reactions were practically normal; the spinal fluid only remained mildly positive. Like Dr. Sanborn we have thus far been unable to get a negative spinal fluid in paresis. In 75 per cent. of our paretics the spinal fluid has become negative and all but two out of twenty-two cases have been bettered clinically. The gait has improved, the lightning pains have lessened or disappeared, the bladder symptoms have cleared up, while at the same time there has been a decided change physically for the better.

All of our cases of cerebrospinal syphilis have improved clinically, cytochemically and biologically, with one exception in which treatment seemed to have no beneficial effects.

Dr. Cotton says that his statistics show that 50 per cent. (paretics) make tremendous improvement and that includes all cases treated, many of them in the last stages. Of the favorable cases, and by that he means the new cases, at least 75 per cent. have shown very marked remissions. About sixty patients are living outside of the hospital. There have been several relapses in cases which were fairly advanced and seemed to improve wonderfully at first. He has had no untoward symptoms, but he reports several cases of meningitis, such as I described a year ago before the American Neurological Association. The patients quickly recovered.

Of the three following cases, one is paresis in which the mental condition became normal after the fifth injection; the other two are tabetic cases in which the improvement clinically and serologically is notable.

**Case 1.**—B. was first seen Aug. 19, 1914. Insurance agent, 34 years old, family history negative. Personal history: Uses tobacco and alcohol moderately; gonorrhea in 1904; denies syphilis. Present complaint began about June 1, 1914, with lack of mental concentration and inability to handle his business. Gradually became disoriented and confused, had delusions of grandeur, thought he was the best agent in the country, etc.; at times became greatly excited and had to be put in restraint. Physical examination negative. Neurologic examination: Pupils respond sluggishly to light and accommodation; marked increase of knee jerks; otherwise negative. The blood serum and spinal fluid gave a positive Wassermann; the latter showed increased pressure with globulin excess and 12 lymphocytes to the cubic millimeter. The colloidal gold reaction was typical of paresis. He was given eleven injections of salvarsanized serum (Swift and Ellis); his mental condition became normal after the fifth; after the eighth the Wassermann in the blood became negative. When he left us the spinal fluid still reacted positively; its pressure was normal; there were seven lymphocytes to the cubic millimeter and the Noguchi was mildly positive.

I have under my care at present a paretic who was acutely maniacal; after the second injection of salvarsanized serum the excitement disappeared and now he appears perfectly normal, his elation and grandiose ideas have also disappeared.

**Case 2.**—C. was seen first June 12, 1914: 29 years old, news agent; family history negative. Personal history negative, with the exception of gonorrhea in 1914; denies syphilis. Present trouble began about one year ago with occasional attacks of shooting pains; for the past three months there has been a tottering gait with difficulty in starting the flow of urine. After a strong laxative the bowels and bladder evacuated involuntarily. For the past three months sexual power has been markedly impaired. During April, 1914, he noticed a feeling of tightness around the waist which has gradually disappeared; he also felt numbness in both feet. Physical examination negative. Neurologic examination: Pupils respond to light and accommodation, but are irregular, the right being larger than the left; marked Romberg; ataxia of both upper extremities; loss of knee and Achilles jerks; impaired muscle sense of both lower extremities; blood and urine normal; blood serum and spinal fluid gave a positive Wassermann. There was increased pressure of the spinal fluid with a positive globulin and 42 lymphocytes to the cubic millimeter. After the third intraspinal injection his blood became negative, and the spinal fluid after the seventh; cytochemically it was also normal. His gait greatly improved, as did also his bladder functioning; the lightning pains have disappeared and he has gained 16 pounds in weight. When I last saw him he was walking without a cane.

**Case 3.**—A., 43 years old, married; family history negative; seen first Jan. 11, 1915. Personal history: No alcohol...
but tobacco in excess. Denies venereal disease, but admits exposure; one child living and well; wife has had no miscarriages. Illness began about twelve years ago with pain and stiffness in joints of the feet and both heels, relieved by potassium iodid and inunctions of mercury. These conditions would recur every year or so and were relieved by this treatment. Almost two years ago he noticed that the feet were numb and were awkward and clumsy; about six months ago numbness developed in both hands and up to the elbows, also around the scrotum. Bladder and sexual functions normal. Occasional lancinating pains. Physical examination negative. Neurologic examination: Light response sluggish in both eyes, accommodation normal, left pupil larger than right; marked Romberg, no ataxia of upper extremities and deep reflexes normal. Lower extremities: knee and ankle jerks lost, superficial reflexes normal, impaired tactile sense extending from feet to knees with loss of muscle sense. Blood and urine normal. The blood serum and spinal fluid gave a positive Wassermann, with increased pressure in the spinal fluid, Noguchi positive, 18 lymphocytes per cubic millimeter. After the second injection the Wassermann in the blood became negative; after the fourth injection the Wassermann in the spinal fluid became negative in 0.7 c.c.; Noguchi mildly positive, four lymphocytes per cubic millimeter. He has received five injections of salvarsanized serum intraspinaly. There has been a decided improvement in the lightning pains and in the gait; the numbness has left the upper extremities and is very much better in the lower; there is a great improvement in the general health.

Treatment is usually regarded as contraindicated in cases of clinical tabes in which the biologic and cytotoxic reactions are negative. Recently Dr. Hammes and I have each had such a case in which the intraspinal use of salvarsanized serum produced very decided improvement. The spinal fluid in my patient reacted positively after the first injection.

While in some patients there is a definite periodicity in the pains following an injection, in others their occurrence is most erratic; sometimes, but rarely, there will be no pain at all, at others they will vary in their manifestation from fifteen minutes to five hours. The cessation of tabetic pain Craig and Collins regard as the single greatest benefit following the use of salvarsan.

CONCLUSIONS

1. Every patient with constitutional syphilis, especially in the early stages, should be examined neuro- logically and serologically, and if there be found any symptoms of nervous involvement or an abnormality of the spinal fluid, intraspinal injections of salvarsanized serum should be given until a clinical and laboratory cure is effected. Bernstein advises this procedure as a prophylactic measure in all cases of syphilis, particularly in the primary and secondary stage.

2. Lange’s colloidal gold solution is a valuable aid in diagnosis, possessing a marked corroborative value. Paralysis gives a characteristic curve (in over 90 per cent. of our cases) so constant, say Grulee and Moody, that “one may venture a diagnosis without other findings, either clinical or laboratory.” There is a distinctive tabetic curve which was present in 50 per cent. of our cases. The colloidal gold reaction differentiates clearly between paralytic and cerebrospinal syphilis. In tuberculous meningitis the colloidal gold solution reacts markedly. Nonsyphilitic cases sometimes give a vague discoloration which may or may not invade the syphilitic zone, but which has no special significance.

3. Intraspinal medication (Swift and Ellis method) is a sane and safe form of therapy, and in the hands of competent men is practically devoid of danger. In cerebrospinal syphilis and tabes, results obtained by conservative workers are most encouraging, and in some cases little less than marvelous. When paralytic can be treated in the early, the toxic, stage, before serious degeneration of nervous tissue has ensued, an arrest of the disease may reasonably be expected. Is it too much to hope for a cure?

1019 Lowry Building.