XXVI.—RESULTS IN THE TREATMENT OF WASSERMANN-FAST SYPHILIS BY INTRAVENOUS MERCURIC CHLORID *

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The intravenous administration of mercuric chlorid is a comparatively recent method of treatment. Osler gives it passing mention in the eighth edition of "Principles and Practice of Medicine" (1914) under the subject "Treatment of Syphilis." Bavellie¹ of Rome began using it in 1917 and claimed to have had excellent results. Within more recent years mercurial salts have been advocated for intravenous injections by Spittel² of England, Sanz³ of Spain, Bastron⁴ of Lincoln, Neb., and Brocq.⁵ J. C. Klecan⁶ states that mercury can and should be given intravenously, his mode of administration being perfectly painless and safe. The results are prompt, from both the symptomatic and the serologic point of view. The patient is saved time and money, and the period of mental anguish is decidedly shortened.

By intravenous treatment Gutmann obtained 74 per cent. negative results; Zimmermann, 68 per cent.; Linser, 70 per cent., and Micheli and Quarelli, 86 per cent. Spiethoff states that he obtained negative results in a majority of his cases.

In these articles, none of the writers specifies whether his cases were routine or Wassermann-fast. The cases reported in this article are all Wassermann-fast.

The treatment was instituted on Wassermann-fast cases at the Washington University Clinic. A total of 1,679 patients were treated during the year 1920-1921, of which sixty-two did not respond to the usual routine treatment, their Wassermann reactions remaining positive in one or both antigens after receiving from one to thirteen courses of routine treatment as carried out in this clinic.

The standard course of treatment for early syphilis consisted of three arsphenamin injections one week apart, and twenty intramuscular

* Studies, observations and reports from the dermatological departments of the Barnard Free Skin and Cancer Hospital and the Washington University School of Medicine, St. Louis, Mo., U. S. A., service of Drs. M. F. Engman and W. H. Mook.

1. Bavellie: *Riforma med.* **34**:893, 1918.
2. Spittel: *Practitioner* **21**:212 (Oct.) 1918.
3. Sanz: *Medicina Ibero*, August, 1920, p. 187.
4. Bastron: *Am. J. M. Sc.* **159**:118, 1920.
5. Brocq: *Bull. méd.*, Paris **73**:574, 1914.
6. Klecan, J. C.: *Northwest J. M.* **22**:266, 1920.

injections of mercuric chlorid at two to three day intervals, between and following the arsphenamin injections. The course in late syphilis consisted of twenty intramuscular injections of mercuric chlorid followed by four weeks of mixed treatment. Patients were then given one injection of arsphenamin and returned in four weeks for a Wassermann test.

The intravenous treatment was carried out as follows:

1. A Wassermann test was made on all patients before the intravenous treatment was started.

2. All patients were started on 10 minims (0.6 c.c.) of a 1 per cent. solution of mercuric chlorid in physiologic sodium chlorid solution. This dosage was increased by 2 minims (0.1 c.c.) at each treatment until the patients were receiving 2 c.c. at a dose. They were then kept on this amount, if no signs of mercurial intoxication appeared. The injections were given twice a week. If at any time signs of toxicity appeared either by gastro-intestinal symptoms, or albumin or casts in the urine, the dosage was immediately reduced by one-half and then slowly increased to the maximum dose. A few of the patients received 2.5 c.c. of 1 per cent. mercuric chlorid solution, but as they showed no greater improvement than the other patients, the dose was decreased to 2 c.c. During the entire course no arsphenamin or other antisyphilitic therapy was employed.

The technic of injecting mercuric chlorid intravenously is very simple:

1. A 10 c.c. all-glass syringe and a fine platinum needle of twenty-one or twenty-two gage and $1\frac{1}{2}$ inches (3.7 cm.) long is used.

2. The mercury is drawn into the syringe, a tourniquet applied above the elbow, the skin over a prominent vein is cleansed, the needle is carefully introduced so that the point rests free in the lumen of the vein, and from 8 to 10 c.c. (2 to 3 fluidrams) of blood withdrawn. The tourniquet is now removed and about half of this amount is injected. Blood is then withdrawn again up to 8 c.c., and the full amount slowly injected. In some cases the mercury fails to mix with the blood; this is overcome by slowly revolving the syringe with the needle in the vein.

The patients in this series received twenty intravenous injections, and were then given a four weeks' rest. At the end of that time a Wassermann test was made and the treatment resumed. We encountered no trouble from embolus, and in only a few cases was there thrombosis. This was not caused by the injection of mercuric chlorid, but was the result of faulty technic.

The intravenous method used by us differs from that of the other writers on this subject in that the mercuric albuminate is formed in the syringe without withdrawing the needle from the vein, whereas they either injected the mercuric chlorid directly into the blood or

withdrew blood and separated the cells from the serum, mixing the latter with the mercury, heating it to 37 C., and then injecting it as mercuric albuminate. Some of the writers who injected the mercury direct report that they could use a vein only once, owing to thrombosis.

The intravenous injection of mercuric chlorid is a comparatively safe procedure, practically painless and free from alarming reactions, immediate or late—provided certain simple precautions are observed.

1. Be certain that the needle is free in the vein, and not in the walls of it.

2. Form the mercuric albuminate in the syringe before injection.

Violations of these simple precautions will cause considerable pain to the patient and thrombosis of the vein and possibly embolus.

The table shows the results of this treatment in the sixty-two cases referred to.

Our results show that forty of the sixty-two patients treated, or 64 per cent., had negative Wassermann reactions at the end of the treatment.

The minimum number of injections required to obtain a negative Wassermann reaction in this series was six, and the maximum was twenty-two.

In fourteen additional cases there was a decrease in the Wassermann reactions in one or both antigens; eight remained the same throughout the courses of treatment.

Distinct clinical improvement was noted in a number of cases in which the Wassermann reaction remained the same throughout the courses of treatment. Similar clinical improvement was also noted in a number of cases in which the Wassermann test did not become negative, but remained slightly positive in one or both antigens.

Case 12, for example, was one of tabes dorsalis. While the Wassermann reaction remained practically the same, the patient showed clinical improvement. Before intravenous treatment, he was unable to do any work; after receiving the injections, he was able to carry on his trade and walk very much better than he could before he was put on this treatment.

Case 36 is a fair example of the efficiency of the intravenous treatment in our series. This patient received six arsphenamin and 104 intramuscular injections of mercuric chlorid. At the end of the course, the Wassermann reaction was ++ in the cholesterin and + in the alcoholic antigen. She then received sixteen intravenous injections of mercury with an average of 1.7 c.c. to the dose, and was given a four weeks' rest—after which a Wassermann test proved to be negative.

Case 23 was that of a patient with late syphilis who had been unable to do any work for three years. After receiving twenty intravenous injections, he was able to return to his work. He is con-

RESULTS OF INJECTIONS OF MERCURIC CHLORID

Case Number	First Wassermann Test*	Type†	Number of Intra-muscular Injections	Number of Arsphe-namin Injections	Wassermann Reaction at End of Intra-muscular Injections	Number of Intra-venous Injections	Average Dose, C.c.	Present Wassermann Test*
1	4 4	Late.....	49	4	3 1	4	1.6	3 1
2	4 4	Late.....	0	0	4 4	10	2.4	4 4
3	4 4	Latent.....	4	0	4 0	8	1.7	0 0
4	4 4	Latent.....	11	0	4 4	14	1.7	0 0
5	4 4	Latent.....	259	13	3 0	27	2.2	3 0
6	4 4	Late.....	10	3	4 0	21	2.4	0 0
7‡								
8	4 4	Latent.....	132	10	4 0	40	0.8	2 0
9	4 4	Late.....	0	0	4 4	27	2.3	4 4
10	4 4	Early.....	2	0	4 4	13	1.8	4 0
11	4 4	Late.....	1	0	4 4	13	1.6	0 0
12	4 4	Late.....	2	0	4 4	5	1.5	4 4
13	4 4	Cerebral neuro-syphilis, tabes	17	2	4 4	35	1.7	2 0
14	4 4	Cerebral neuro-syphilis	0	3	4 0	24	1.6	1 0
15	4 4	Late.....	3	0	4 4	4	1.9	4 2
16	4 4	Late.....	20	8	4 4	12	1.1	0 0
17	4 4	Late.....	20	2	4 4	13	2.5	0 0
18	4 4	Late.....	16	4	3 3	20	1.8	0 0
19	4 4	Late.....	81	5	4 4	16	1.9	0 0
20	0 0	Tabes.....	15	6	0 0	22	2.6	0 0
21	0 0	Tabes.....	2	3	0 0	6	1.4	0 0
22	4 4	Late.....	30	3	4 4	14	2.0	4 4
23	4 4	Late.....	70	6	4 4	44	1.4	3 0
24	4 4	Late.....	20	2	4 4	57	2.0	2 0
25	4 4	Late.....	0	0	4 4	33	1.5	4 4
26	4 4	Late.....	49	4	4 1	14	1.06	0 0
27	4 4	Late.....	0	0	4 4	20	2.0	0 0
28	4 4	Late visceral.....	33	3	4 3	29	1.7	0 0
29	4 4	Cerebral neuro-syphilis	52	3	4 0	22	1.6	3 0
30	4 4	Latent.....	22	3	4 0	18	1.9	0 0
31	4 4	Latent.....	10	1	4 0	6	1.02	0 0
32	4 4	Late.....	145	8	4 4	23	2.0	4 4
33	4 4	Late.....	150	6	4 4	22	1.6	0 0
34	4 4	Late.....	41	6	4 4	16	2.0	0 0
35	4 4	Late.....	71	6	4 4	11	1.7	0 0
36	4 4	Late.....	104	6	4 1	16	1.7	0 0
37	4 4	Late.....	50	6	4 0	39	1.5	0 0
38	4 4	Late.....	47	6	4 4	16	2.1	4 4
39	4 4	Latent.....	181	13	4 3	62	1.8	2 0
40	4 4	Late.....	74	7	4 0	24	2.0	0 0
41	4 4	Latent.....	13	0	4 4	13	2.0	4 4
42	4 4	Latent.....	32	4	4 4	20	1.6	0 0
43	4 4	Late.....	48	5	4 4	17	1.4	0 0
44	4 4	Late.....	49	6	4 4	18	1.6	0 0
45	4 4	Latent.....	0	0	4 4	22	1.7	0 0
46	4 4	Late.....	132	10	4 4	22	1.8	0 0
47	4 4	Syphilis (latent?)	16	2	4 4	10	1.4	0 0
48	4 4	Late.....	50	3	4 0	18	1.5	0 0
49	4 4	Late.....	20	2	4 4	17	1.6	4 0
50	4 4	Early.....	40	3	4 4	10	1.2	3 0
51	4 4	Late.....	141	12	4 0	10	1.7	4 3§
52	4 4	Late visceral.....	4	0	4 4	30	2.0	0 0
53	4 4	Latent.....	4	0	4 0	8	1.7	0 0
54	4 4	Latent.....	11	0	4 4	14	1.7	0 0
55	4 4	Late.....	15	3	4 0	21	2.1	0 0
56	4 4	Late.....	10	4	4 0	22	0.83	0 0¶
57	4 4	Late.....	1	0	4 4	13	1.6	0 0
58	4 4	Latent.....	20	8	4 4	12	1.1	0 0
59	4 4	Late visceral.....	20	2	4 4	57	2.0	2 0
60		Tabes dorsalis...	15	6	0 0	22	2.0	0 0
61	4 4	Late.....	20	2	4 4	13	1.8	0 0
62	4 4	Latent.....	16	4	3 3	20	1.6	0 0

* The figures at the left in these columns represent the Wassermann test, using the cholesterin antigen; the figures at the right represent the result, using the alcoholic antigen; 0 = negative.

† Classification of syphilis according to Engman and described by Weiss and Conrad, Am. J. Syphilis 4: No. 2 (April) 1920.

‡ Incomplete record; hospital case.

§ Irregular treatment.

¶ Dose low owing to albumin.

tinuing the treatment and says that he feels better now than he has at any time during the past ten years.

In Case 48, at the time intravenous treatment was started, the patient could hardly walk; after the sixth injection he showed marked clinical improvement, and is now able to walk without any trouble. After the tenth injection, his Wassermann reaction was negative.

Case 47 was that of a woman who had practically lost her eyesight and showed other clinical signs of syphilis. Both her serum and spinal fluid Wassermann reaction were negative. At the time of her first visit, she was unable to see the letters on a signboard at a distance of 8 feet; the largest letters were about 2 feet high, and the smallest about 6 inches. After she received six intravenous injections of mercury, she was able to read the entire sign from across the width of the street.

Results obtained in the patients whom we have treated, although the number is at present small, lead us to believe that in those cases in which the routine treatment has failed to reduce the Wassermann reaction or improve the clinical symptoms, mercury administered intravenously should be given a fair trial.

Advantages claimed for this method over other modes of mercuric injections are that quicker results in treatment are obtained, a more accurate grading of dosage is made possible; the course of the disease can be more carefully observed, and a practically painless injection is assured the patient. As to the permanence of the serologic result, we are, of course, not able to report.