SUMMARY AND CONCLUSIONS.

Negative bacteriological and agglutination tests for the dysentery bacillus in cases of infectious diarrhea of infancy are of comparatively little value, and in making the agglutination test a number of cultures must be used for the agglutinogens. In spite of these facts the dysentery bacillus was isolated from seventy-four and six-tenths percent. of the cases studied. Only fourteen of the nineteen bacteriologically negative cases were studied for agglutinins, and sixty-four and three-tenths per cent. of these, or twelve per cent. of the total number, gave a positive reaction, thus making a total of eighty-six and six-tenths per cent. of the seventy-five cases in which we have good evidence that the dysentery bacillus was present. We have been unable to obtain any evidence that *Bac. welchii* is ever the cause of infectious diarrhea and all of our results point to the dysentery bacillus as the etiological agent. In our cases all these bacilli belonged to the mannit-fermenting group.

In spite of the apparent scarcity of dysentery bacilli in the feces, we believe that they are the cause of infectious diarrhea of infancy for the following reasons: (1) their universal association with the condition; (2) the great numbers of these organisms in the mucosa of the cecum; (3) the sick individual produces immune bodies against them while such bodies, specific for the other assumed etiological agents, have not been demonstrated; (4) experimentally they are known to produce a diarrhea.

We wish to thank Dr. Henry I. Bowditch and the other members of the staff of the Boston Floating Hospital who did everything in their power to aid us in making this study.

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INTRA-SPINAL INJECTIONS OF BICHLORIDE OF MERCURY.

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At a recent meeting of the section on medicine of the New York Academy of Medicine, I reported forty cases of spinal syphilis which had been treated by the intra-spinal administration of mercurialized serum, and five cases which had been treated by the direct intra-spinal injection of bichloride of mercury. The forty cases

I was able to give fairly definite reports on, and recited some conclusions. Since then I have treated twelve additional cases by the direct administration of bichloride of mercury into the spinal fluid.

The method of administration was as follows: Weigh out one gram of Merck's bichloride of mercury; dissolve this in 770 c.c of distilled water; sterilize the whole. One cubic centimeter of this solution contains .0013 gram of bichloride of mercury, which is equal to 1/50 of a grain. Draw off 15 c.c of spinal fluid. Discard 5 c.c., and to the remaining 10 c.c. add 1 c.c. of the bichloride solution previously prepared. Then re-inject directly into the spinal canal, very slowly, the whole 15 c.c. The time consumed in performing this re-injection should be about four minutes. To minimize the handling of the solution and so decrease the chances of infection, it is best to draw the 1 c.c. of the bichloride solution directly into the syringe, and mix the two solutions there in the hypodermic. Then re-inject the entire 15 c.c. The patient should then be put back to bed, and for the first five or six hours, the foot of the bed should be elevated. This precaution is taken in order to diminish the tendency of the patient to acquire a headache.

The twelve treated all come under the head of syphilis of the nervous system. They consisted of cases of general paresis, tabes, taboparesis, hemiplegia, optic nerve atrophy, and one case of brain syphilis with complicating hemiplegia. These cases were given either 1/64 or 1/50 of a grain of bichloride of mercury, at each intra-spinal injection. The usual plan was to give 1/64 at the first dose, and then 1/50 at subsequent doses. In a few cases, however, the maximum dose of 1/50 was given at the beginning. The injections were approximately at intervals of two weeks; in a few instances it was not possible to give them exactly on the day, but an effort was made to have the dosage as nearly as possible every fifteen days. All of these patients were at the same time being given a mixed antisiphilitic treatment, that is to say, potassium iodide by mouth and on the alternate weeks hypodermic injections of the salicylate of mercury, of a grain or less. In a few of these patients it was not possible to obtain definite results, but in the large majority improvement was manifest. The reaction was nearly always present, of varying extent. In some, the pains became very severe, lasting two or three days, in others the shooting pains in the legs were moderately increased for a few hours. In a very few of the cases there was persistent after-vomiting. In one there was very marked involvement of the sphincters. This patient lost control of his bladder for three weeks, and of his intestinal tract for two weeks. He is, however, growing stronger and there is every indication that in time he will control both functions.

The first case, J. C., was one of tabo-paresis, who complained of pains in both legs and had been unable to walk for the past ten years. The laboratory reported a positive Wassermann on both the blood and the spinal fluid, a cell count of 23 and a ++ globulin. This patient was given five injections of bichloride of mercury, the first two 1/64 of a grain, and the last three 1/50 of a grain. After the second treatment the pains in the legs stopped and the patient felt distinctly better. At the end of the fifth injection, December 1, the Wassermann was still positive, the globulin ++, but the cell count had dropped to 11, and the patient considered that he had been very materially helped.

The second case, S. V., was a man of 49, who admitted a specific history twenty years ago. His chief complaint was nervousness, weakness, and inability to use his hands as a result of a very marked tremor. His pupils were Argyll-Robertson, his knee jerks were present, and there was a marked facial tremor. The laboratory reported on the third of September, the blood Wassermann negative, the spinal fluid Wassermann positive, a ++ globulin, and 130 cells. He was at once started on bichloride of mercury, 1/50 of a grain, given in his own serum. A marked reaction followed with pains in the legs and vomiting. Two weeks later he was given 1/64 of a grain of bichloride of mercury directly in the spinal fluid, and two weeks after, a third injection of 1/50 of a grain in the spinal fluid direct. Following the third dose, there was some headache, pain and marked shooting pains. On November 19, he was given the fourth dose of bichloride of mercury in the spinal fluid, from which he had a slight reaction. At that time the laboratory reported ++ globulin, positive Wassermann and only 9 cells. The reaction in this patient was more marked after the administration of the bichloride of mercury directly into the spinal fluid than in the one dose administered from the mercurialized serum. The character of the reaction in his case was wholly one of headache, nausea and pain. There was no interference with the urine or bladder. On the twenty-third of November this patient said the tremor was much less marked, so that now he could button his coat, whereas formerly he was unable to do so. He had no pains in his legs and considered that he was very much benefited.

The third case, that of F. S., was a man of 22, who admitted a specific history three years ago, and who, three months ago, sustained a hemiplegia of the left side. He complained of very severe boring pains in the back of the head, and gave the appearance of a man who was sick and suffering. The laboratory reported a weakly positive blood Wassermann, a moderately positive Wassermann of the spinal fluid, a ++ globulin, and 330 cells. He was given two intra-spinous treatments of 1/50 of a grain each. As a result there was no improvement in the paralysis, but the headache completely disappeared. His spinal fluid remained positive, but the cell count dropped to 160. The reaction in this patient was more marked than in any of the others, as he had terrific pains in both legs.

The fourth case, M. L., a man of 42, admitted a specific history twenty years ago, and for the past four years had complained of shooting pains in the legs and difficulty in walking. He has pupillary

changes, optic nerve atrophy, absent knee jerks, and a Romberg. A few months ago, when he began to lose his eyesight, he was given "606"; the loss of eyesight became much worse. He was given 1/50 of a grain of bichloride of mercury intra-spinously twice, and at the end of a month his cell count dropped from 37 to 13, the Wassermann remained positive and the globulin +. He had a fairly severe reaction after each dose, but no sphincter involvement. At the end of a month he was of the opinion that the treatments had helped the pains in the legs, but felt that the reaction was so great that he was not willing to have any further treatment.

CONCLUSIONS.

The conclusions which I have reached in the twelve cases reported here are neither final nor conclusive. They are, however, worthy of consideration. I fully realize that the number of cases is not sufficient, and that the time in which they were followed is not long, nor were a sufficient number of intra-spinous injections administered. However, the conclusions drawn were as follows:

1. The spinal fluid Wassermann remained unchanged even after three or four treatments.
2. The globulin did not undergo much, if any, change; occasionally a ++ became a +.
3. The reaction after the treatment was usually not severe, and generally amounted to shooting pains in the legs of marked severity.
4. There was always a possibility of getting a considerable degree of rectal or bladder sphincter disturbance which was, however, temporary.
5. The cell count was almost always lowered.
6. The shooting pains in the legs were almost invariably relieved.

In other words, the administration of bichloride of mercury directly into the spinal fluid gives practically the same results as the administration of mercurialized serum. It has the advantage over the latter of simpler technic, shorter methods, and easier administration, with less opportunity of infection. The great advantage, to my mind, lies in the fact that the operation is simpler, and there is less involvement on the part of the laboratory. Both methods, that of the mercurialized serum and that of the bichloride directly injected into the spinal fluid, can be considered as valuable substitutes for the administration of salvarsan. Whether the results will be as permanent as the latter remains to be seen.

It is certainly fair to say that no ill results can accrue from the direct intra-spinous injection of 1/50 of a grain of bichloride of mercury in syphilis of the nervous system.

It is well to make the initial dose small; it is therefore better to begin with a dosage of 1/64 of a grain and later increase it to 1/50.

In no instance was any change manifest in the reflexes, but change was evident in tremors, in the pains, in the spinal fluid content, and especially in the general condition of the pa-

tient. There is no doubt that any of these injections, salvarsan, mercurialized serum, or bichloride of mercury, have a very good moral effect on these patients, and for that reason alone, should be encouraged.

Clinical Department.

LOSS OF SIGHT FROM RETROBULBAR NEURITIS DUE TO ACCESSORY SINUS DISEASE, WITH REPORT OF TWO CASES.*

BY LEON E. WHITE, M.D., BOSTON.

RETROBULBAR NEURITIS is, as the name indicates, an inflammation of the optic nerve behind the eye. The optic nerves, after mingling and crossing in their peculiar manner at the chiasm, pass through a bony canal, the canalis opticus, to the eye. This canal varies greatly in position, being, in some cases, separated from the sphenoidal sinus or the posterior ethmoid cell by only a tissue paper thickness of bone. The relations of this canal to these sinuses are vital to a clear comprehension of the way infection reaches the nerve. The body of the sphenoid bone is usually hollowed out by the two sphenoidal sinuses, but in some cases these sinuses are rudimentary and only fill the lower anterior portion of the body while the posterior ethmoid cells extend externally and occupy a large portion of the body of the sphenoid.

Onodi, of Budapest, has written on and studied this relationship most painstakingly and efficiently. In 1908 he said, "For ten years I have been investigating the more delicate construction of the accessory cavities and the relation of the optic nerve to them." His results furnish the anatomic foundation for the theory of blindness from accessory sinus disease. He published an atlas in 1911 with natural size plates made from photographs showing 38 different morphologic findings on the relations of the optic nerve to the sphenoidal sinus and ethmoid cells.

Normally the canal for the optic nerve is separated from the sphenoidal sinus and posterior ethmoid cell by a thin but dense layer of bone; otherwise disturbances in vision would be much more frequent, as we all see cases with marked disease of these sinuses yet with perfectly normal vision. The unusual cases, those with very slight, or, possibly through some dehiscence, no protection to the nerve, are the ones where visual disturbances may be expected.

To quote Onodi again, "Our observations have shown that the wall between the last eth-

moid cell and the canalis opticus is nearly always as thin as tissue paper; dehiscences in the walls of the accessory cavities have been found, there the diseased mucosa may come into direct contact either with the dura mater or the optic nerve sheath."

In 1886 Berger and Tyrman reported their findings in the examination of the differences in the partition wall between the optic nerve and the sphenoidal sinus. Thus, in one section the partition on both sides was of tissue paper thickness; another section showed both sides with very thick walls, while a third section showed one side with tissue paper thickness while on the other side there was a thickness of 7 mm. In looking at many illustrations shown by the various writers on the subject since that time, one sees again and again this lack of uniformity.

Now given an optic nerve with only this slight protection one readily sees how an inflammatory process in an adjacent sinus may be directly transmitted to the nerve, or the pressure from the swelling in such a process may cause its constriction with temporary, if not permanent, blindness. Should this pressure be long continued, optic atrophy must result. According to Onodi's findings, transmission of the inflammation from the posterior ethmoid cells as well as from the sphenoidal sinus to the optic nerve is possible, as well as the pressure from circulatory disturbances. A periostitis in a sinus may lead directly to a perineuritis.

In an article read before the ophthalmological section of the American Medical Association at San Francisco last summer by Dr. H. H. Stack, 88 cases from the literature on this subject are tabulated, so the condition does not seem to be a very common, or at least not an easily discoverable, cause of blindness. Of the cases reported many show bilateral visual disturbances from unilateral accessory sinus disease.

For the origin and explanation of this contralateral and double-sided blindness with one-sided sinus disease Onodi gives the following 11 anatomic findings:—

1. The left posterior ethmoid cell constitutes the medial wall of the right canalis opticus.
2. The right posterior ethmoid cell constitutes the inferior and medial wall of the canalis opticus on both sides, and the wall of the entire sulcus opticus.
3. The right posterior ethmoid cell constitutes the wall of the entire sulcus opticus.
4. The right posterior ethmoid cell constitutes the wall of the right third and the middle third of the sulcus opticus.
5. The left sphenoidal sinus constitutes the inferior wall of the right canalis opticus.
6. The right sphenoidal sinus borders medially only the left optic nerve.
7. The left sphenoidal sinus constitutes the inferior wall of the right canalis opticus, and the wall of the right third and the middle third of the sulcus opticus.

* Read before the New England Otolological and Laryngological Society at Boston, January 18, 1916.