where one should place the diastolic pressure, because of interference of the respiratory oscillations, the same doubt existed in deciding on the end of the fourth phase of Korotkoff. For, at times, one or two of the muffled sounds of the fourth phase are followed by one or two sounds that are again quite loud. The tracing records this faithfully.

By projecting the point of systolic and of diastolic change in the pulse tracing (*B*) down on the manometer curve (*A*), and by connecting the corresponding points on succeeding manometer curves, a good picture of the blood-pressure changes from minute to minute can be obtained. These changes are comparatively slight under normal conditions, though waves, probably corresponding to the Traube-Herring waves, are easily discernible. By means of this apparatus, I have obtained satisfactory records of the influence on blood pressure of emotion, of attention as well as of muscular movement, and of the effects of a general electric light bath, of amyl nitrite inhalation, and of nitroglycerin administration.

CONCLUSION

An apparatus having been devised whereby it is possible to obtain graphic records of human blood pressure for considerable periods of time, it will probably be found useful not only in physiologic, pharmacologic research, but also in clinical medicine, in diagnosis as well as in treatment. For instance, it might be of diagnostic as well as of therapeutic importance to differentiate between those cases of high blood pressure that respond, in a typical manner, to nitrite and those that do not. In critical operative cases, the continuous recording of blood pressure during the anesthesia might be of help to the surgeon.

Fig. 1.—Mastic reactions: *A*, negative; *B*, positive; in both *A* and *B*, potassium carbonate has been used in making up the salt solution; *C* and *D*, the same cases in the absence of the potassium carbonate. (Note the confusion in *C*, in which Tubes 4 and 5 show a precipitate.)

Blood Changes in Trinitrotoluene Poisoning.—Capt. Matthew J. Stewart of the Royal Army Medical Corps has recently summed up his observations in fourteen clinical cases of trinitrotoluene poisoning with reference to the blood as follows: In the early stages blood changes are extremely slight, but pronounced deviations occur later. A polymorphonuclear leukopenia, often of extreme degree, with no corresponding failure of the lymphatic function, was observed in nine out of the fourteen cases. An anemia of "pernicious" type, but lacking certain notable characteristics of idiopathic anemia, especially poikilocytosis and punctate basophilia, occurred in three cases. The tentative conclusion arrived at is that the occurrence of either of these changes in any marked degree in a case of trinitrotoluene poisoning is to be regarded as a serious prognostic indication, but this is a point on which further observation should throw much light. An absolute but variable lymphocytosis was found in nine cases. It did not appear to bear any relationship to either of the foregoing conditions. A pronounced and progressive neutrophil leukocytosis occurred in one case which ended fatally. Qualitative changes in the red cells were present in a marked degree in one case only, and punctate basophilia was never observed. —*Proceedings of the Royal Society of Medicine*, March, 1917.

A NEW MASTIC TEST FOR THE SPINAL FLUID *

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Recently much work has been done in order to find a serologic test which will be positive in all cases of syphilis of the nervous system. Collins¹ estimates that 15 per cent. of paretics and 70 per cent. of cerebrospinal syphilitics fail to give a positive Wassermann reaction in the spinal fluid. While these figures are perhaps higher than the average, the fact still remains that a definite percentage do fail to give a positive Wassermann. Collins¹ also estimates that 97 per cent. of these cases give a positive colloidal gold reaction. Any one, however, who has prepared the gold solution and has carried out the test cannot but be impressed with the many difficulties it entails.

While working with the colloidal gold solution, Emanuel² endeavored to find a substitute which could be more easily prepared and in which the reaction could be carried out with less possibility of error. For this purpose it seemed that an emulsion of mastic was best adapted. Neisser and Friedman, among others, had already demonstrated the similarity in action on albumin of this substance and colloidal gold.

In brief, Emanuel's procedure was as follows: Five test tubes were used containing, respectively, 0.25, 0.125, 0.062 and 0.031 c.c. of spinal fluid mixed with 1 c.c. of a 1.25 per cent. salt solution. The fifth tube contained no spinal fluid, and was used as a control. Lastly, 1 c.c. of an emulsion of mastic was added to each tube. In this manner he tested out the spinal fluids of thirty psychiatric patients. In paresis, tabes and cerebrospinal syphilis there occurred a precipitation of the mastic in all the tubes, whereas in the normal fluid no flaking occurred except in the control. The mastic solution had to be made up fresh each time and quickly used.

In order to try out the reaction, in the last nine months I have made mastic tests on the spinal fluids of 200 different patients at the Agnews State Hospital. In each case I have made a cell count, in 100 cases the butyric acid test, and in thirty cases the colloidal gold reaction. In every case a Wassermann examination has been made.

The mastic reaction I found to be a very delicate one. If the salt solution and the emulsion of mastic were made with distilled water and promptly used, a rapid precipitation of the mastic occurred in the control tube which contained no spinal fluid. If, how-

* Read before the Agnews Psychiatric Society, Feb. 9, 1917.

1. Collins, Joseph: Pathognomonic Alterations of the Cerebrospinal Fluid in Syphilis of the Nervous System, *Am. Jour. Med. Sc.*, 1916, 151, 222.

2. Emanuel, G.: Eine neue Reaktion zur Untersuchung des Liquor cerebrospinalis, *Berl. klin. Wchnschr.*, 1915, 52, 781-804; abstr., *THE JOURNAL A. M. A.*, Sept. 4, 1915, p. 908.

ever, tap water was employed, no precipitate appeared. Even washing the test tubes with tap water prevented the reaction. The older the mastic emulsion the stronger was it necessary for the solution of sodium chlorid to be in order to cause a precipitate.

Also, I found that when newly prepared solutions were made with freshly distilled water there was a tendency for the precipitations to occur, not only in the fifth tube but also in the fourth, even in negative cases. This led to some confusion in interpreting the results. It was useless to employ more than four tubes, as further dilution left so little spinal fluid in the mixture that the salt automatically caused a precipitation of the mastic, whether the case was a positive or a negative one.

I found, however, that when the control showed no precipitation, as when the solutions were made with tap water, pathologic spinal fluid still caused the mastic to come down. I then endeavored to find a reagent which could be used with distilled water to hold the salt and mastic in solution and which would be of universal adaptability, since tap water varies so greatly in different localities. After trying many substances, such as potassium hydroxid and lime water, I at length found that a very dilute solution of potassium carbonate answered this purpose perfectly. When 1 c.c. of a 0.5 per cent. solution of the potassium carbonate was put in each 99 c.c. of the 1.25 per cent. salt solution, the mastic was held in suspension and was precipitated only when the pathologic fluid was added. This allowed me to run the dilution out as far as I liked, and the control tube, instead of showing a precipitation, showed none.

The advantage of this is readily seen in the following experiment: After mixing 1 drop of a parietic's spinal fluid with 7 drops of normal fluid I was able to get a mixture with a low syphilitic content. By using these proportions I ran a mixture through two series of five tubes each (*a*) in which no potassium carbonate was used and (*b*) in which the carbonate was employed. In *a* the result was a precipitation of the mastic in the first two and the last tubes. In *b* a precipitation showed only in the first two tubes. When 2 drops of syphilitic fluid were used in the mixture, the first four tubes in *a* came down together with the control. In *b* only the first four tubes were precipitated. This ended the experiment in the group containing no potassium carbonate, as all the tubes were now precipitated. In the series, however, containing the potassium carbonate, in which it was possible to increase the number of tubes in the group without automatically causing a precipitation of the mastic, the undiluted syphilitic fluid caused six tubes to come down. In other words, the greater the percentage of pathologic fluid present, the greater the number of tubes precipitated in the series. This clearly demonstrates, it seems to me, that the degree of positiveness in a given case can be more accurately

measured when the potassium carbonate is employed to hold the mastic in suspension.

The following I have found best adapted as a routine for doing the test:

A stock mastic solution is made by dissolving 10 gm. of gum mastic in 100 c.c. of absolute alcohol, and then filtering. This stock solution keeps indefinitely if well corked. To 2 c.c. of this solution 18 c.c. of absolute alcohol are added, and insufflated rapidly into 80 c.c. of distilled water. This makes an emulsion of mastic which is opalescent when held to the light. This solution can be used immediately or after several days; indeed, the reactions seem to be more easily read when a solution is employed which has stood for at least a few hours.

Next, a 1.25 per cent. sodium chlorid solution is made with distilled water, and to each 99 c.c. of this salt solution is added 1 c.c. of a 0.5 per cent. solution of potassium carbonate made up with distilled water.

Then six small test tubes, such as are regularly used in the Wassermann tests, or more if desired, are placed in a rack. These tubes should have been washed thoroughly in tap water, then in denatured alcohol, to remove any old mastic adhering to the sides of the tubes, rinsed in distilled water and dried—conveniently in a hot air oven. To the first tube 1.5 c.c. of the combined salt and potassium carbonate solutions are added, and to the other 1 c.c. each. Then 0.5 c.c. of spinal fluid is added to the first, and after thorough mixing 1 c.c. is transferred from the first to the second, 1 c.c.

from the second to the third, and so on, the last cubic centimeter that remains over from the next to the last tube being thrown out, and no spinal fluid being put in the control. Now to each tube 1 c.c. of the mastic solution is added and stirred thoroughly with a glass rod, care being taken to wash the rod with distilled water before going to the next series. It is best to finish each group before beginning another.

The racks are set away, and in from twelve to twenty-four hours the end-results can be read. If the racks are placed in an incubator at 37.5 C., the precipitation is complete in from six to twelve hours. A yet more

rapid method, I find, is to incubate for two hours and then centrifugalize, in which event the mastic will be precipitated in the positive tubes.

In positive cases the mastic will be precipitated in the first one, two, three or four tubes, and up even as high as the eighth in some. The reaction is simple to read and very convincing. The solutions are easily made; they are extremely inexpensive, and the end-results are much more easily read than in the colloidal gold tests. Indeed, were one to compare the colloidal gold and mastic tests side by side, the mastic is found to be the more convincing. In the fluid of one parietic with 133 cells per cubic millimeter, the colloidal gold showed after twenty-four hours only a 3332100000, whereas the mastic came down in eight of the ten tubes used. It was only after allowing the gold solution to stand for three days that a more complete curve resulted. Three parietic fluids showed irregularities with the gold test, which if taken alone would have been hard to interpret, whereas in all three the mastic showed a typical reaction. The accompanying table shows the classification, the number, and the results

Fig. 2.—Mastic reactions: *A*, in an old parietic; *B*, in an early case of paresis; *C*, negative reaction in a case of dementia praecox; *D*, reaction in a case of paresis under salvarsanized serum treatment. (Before treatment, Tubes 1, 2, 3, 4 and 5 showed a precipitation.)

obtained by the mastic and Wassermann reactions on the 200 cases.

In fourteen cases there was a positive mastic and a negative Wassermann reaction. Eleven of these had increased cell counts together with all the clinical signs of paresis and were so diagnosed. Two were diagnosed as cerebrospinal syphilis. The other case giving a positive mastic and a negative Wassermann reaction was that of a man of 50, who two and a half years before entering the hospital had had a "stroke," leaving him with a right-sided paralysis. On entering the hospital he had a mitral insufficiency with casts and albumin in the urine, and died one month later as a result of the heart and kidney complication. He gave a definite history of alcohol with an indefinite history of syphilis. The spinal fluid examination showed a cell count of 10 with an increase of globulin. In no case was there a positive Wassermann and a negative mastic reaction. In two cases in which the mastic test was always positive, the Wassermann test was at first negative, but later became positive.

Of the seven cases of epilepsy, two showed a very slight precipitation in the first tube. Two of the fifty cases of dementia praecox showed the same reaction,

TABULATION OF TWO HUNDRED MASTIC EXAMINATIONS

Classification	Number of Cases	Mastic	Wassermann
Paresis	68	+	+
Paresis	11	+	+
Cerebrospinal syphilis	2	+	+
Cerebrospinal syphilis	2	+	+
Tabes	1	+	+
Dementia praecox	50	—	—
Manic-depressive psychosis	31	—	—
Arteriosclerotic brain disease	6	—	—
Alcoholic psychosis	6	—	—
Senile psychosis	5	—	—
Involution melancholia	2	—	—
Paranoia	3	—	—
Mental defective	2	—	—
Autointoxication	1	—	—
Epilepsy	7	—	—
Traumatic psychosis	1	—	—
Alcoholism	1	—	—
Cerebral hemorrhage	1	±	—

but these were not to be compared with the precipitation in a positive case. In one patient diagnosed as having cerebral hemorrhage, there was a ± in the first two tubes.

Thus far my work has been confined to psychiatric patients. What the action will be in such diseases as poliomyelitis and tuberculous meningitis must be further investigated.

SUMMARY

The mastic test, when taken together with the history and with the cell count, is of undoubted aid in the diagnosis of syphilis of the nervous system.

By the addition of potassium carbonate, the degree of positiveness can be graded very accurately.

By first incubating and then centrifugalizing, the test can be completed in two hours.

It parallels quite closely the colloidal gold reaction, and is more easily interpreted and much more easily and quickly performed.

In eighty-four cases of syphilis of the nervous system, the mastic test was uniformly positive.

Workmen's Compensation.—Thirty-seven states, the territories of Alaska, Hawaii, and Porto Rico have enacted compensation laws, the United States adopting a like principle for the relief of its civilian employees under date of Sept. 7, 1916.—National Industrial Conference Board.

Clinical Notes, Suggestions, and New Instruments

METHODS FOR THE COLLECTION AND TRANSPORT OF BODY FLUIDS FOR BACTERIOLOGIC INVESTIGATION

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The exigencies of war have made the bacteriologic investigation of the body fluids even more imperative than during times of peace, while at the same time the accommodations

Fig. 1.—A, trocar and cannula; B, collection tube or flask of quartz glass.

surrounding the soldier-patient are frequently less adaptable to bacteriologic technic than they are in civilian practice. Consequently it seems desirable at the present time to record any advantageous modifications in the instruments and apparatus used for the collection and transport of such fluids. Improvements to be of value should simplify the technic at the bedside, should insure safety and sterility during transport, and should not necessitate elaborate methods of preparation. Indeed, it is most desirable that the value and the result of the final investigation should not be dependent on any special care or expertness on the part of the nurse or lay attendant responsible for the original sterilization or for the transport of the material. In this connection it may be stated that devices by which sterilization may be carried out in the dry oven or autoclave, and which will leave without further manipulation the apparatus or instrument ready for transport, and convenient for use at the bedside, are the most satisfactory and trustworthy. Particularly is this true for those enjoying the facilities of organized hospitals and institutes, as it relieves them of all irksome detail or improvisation. For such metal articles as needles, trocar-cannulas, etc., dry sterilization is preferable,

Fig. 2.—Syringe.

in that any possibility of rusting and blocking of the bore is avoided. It is along these lines and with these points in view that I have attempted to develop the technic.

The general satisfaction I have experienced with the method herein described (which is an amplification of those previously used by me) is to a great extent due to the use of quartz glass for certain parts of the apparatus; and as the use of this material, so far as my knowledge or information goes, is not at all general with the profession, I venture

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