the lateral incisions, in the manner shown in Fig. 5, so as to ensure drainage. The stump is then covered with a dressing of sterile gauze and a bandage.

The ordinary rubber drainage tubes, whether large or small, must not be used.

In some cases, but only rarely, a few interrupted sutures of silkworm-gut may be inserted to reinforce the strapping, but they should be quite slack.

It is a matter of observation that the dirty grey "diphtheritic" infections of the flaps of stumps, which not infrequently supervene upon the insertion of rubber tubes and the use of tight stitches, are usually rapidly overcome by laying open the flaps and packing with gauze and salt tablets. How much easier, then, would be the prevention of such infections if the surgeon would boldly in the first instance pack the whole of the raw surface. A tube, 5 mm. in diameter, may be put into the gauze; it should project on each side and be tied at its centre; holes should be made in it on each side of the point at which it is tied, so that Dakin's fluid, if that preparation be preferred, may be injected from each side into the pack. Personally I consider Gray's salt pack more suitable for the military emergencies existing between the front and the base.

II.—The Forceps Tourniquet in Military Surgery.

During the last eighteen years I have not used the rubber or any other tourniquet for any amputations of the thigh, nor for aneurysms in that situation.

Many of those who have seen the forceps tourniquet in use have adopted it, but as practical knowledge has the

FIG. 6.—Diagram of forceps tourniquet modified for use in military surgery. It shows the probe-pointed blade. The ring at the point of the other blade is shown half scale at the side. The ratchet is of the Girard pattern, self-releasing. The instrument was originally introduced for controlling the femoral vessels (*Lancet*, 1898, vol. i, p. 1112). Later on, in the Boer war, it was used for this purpose, and for controlling other vessels (*BRITISH MEDICAL JOURNAL*, 1904, vol. ii, p. 835; also *Transactions of the International Surgical Congress*, Brussels, 1905). It is made by Messrs. Weiss and Son, London.

peculiarity of slow diffusion, I venture at this moment to draw attention to it again, as the field for its employment in war is very great. Binnie, Jacobson, Kocher, Charles Mayo, and Tuffier have all spoken with enthusiasm of its usefulness.

One blade is smooth and probe-pointed for underrunning the blood vessels to be controlled, the other is roughened and has an expanded ring-shaped end to prevent its slipping over the skin. A stab puncture of the skin is made at a point suitably placed in relation to the vessels to be controlled, and through it the probe-pointed blade is driven forcibly behind the large blood vessels (femoral artery and vein). When the forceps is closed the other blade firmly grasps the skin, and, owing to its roughened edge and the expanded ring end, does not slip. The forceps is securely closed by means of the ratchet on the handles. The time occupied in applying the forceps is not more than a second; the arteries and veins are simultaneously controlled, no assistant is required, and the instrument is always reliable; it is sterilized with the other instruments. The stab puncture in the skin is dressed with iodine and a pad of sterilized gauze, $\frac{1}{4}$ in. in diameter, fixed on with strapping. In military surgery the nature and situation of the wound will often render it unnecessary to make a stab puncture for the probe-pointed blade; I have found, when recently using the instrument in France, that it is necessary, on account of the muscle destruction, to modify the forceps so as to bring the blades closer together. The parts to be compressed are in these conditions considerably thinned. The application of the forceps tourniquet to the thigh has been described, but it will be seen that it can be used also in amputations of the arm or at the shoulder. It has, in fact, been used with success in these situations.

THE INTRASPINAL TREATMENT OF SYPHILIS OF THE CENTRAL NERVOUS SYSTEM; WITH THE REPORT OF CASES.

BY

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It is only within the last few years that a vigorous attempt has been made to treat this disease by the introduction of a powerful antisyphilitic remedy into the spinal canal.

After a brief localization within the primary sore, the *Spirochaeta pallida* very rapidly reaches the systemic circulation—probably within a few days after, or, some hold, even before the first appearance of the chancre. At this stage the spirochaete has been successfully isolated and cultivated from lesions and the blood in the human being, and in experimentally induced syphilis in rabbits and monkeys. The exceedingly fine, spiral, thread-like character and motility of the organism, together with its apparent preference for connective tissue and lymph spaces, cause it early to migrate into the vessel walls, or to pass through the latter into the surrounding connective tissue.

In infants dead of congenital syphilis the organisms are commonly found in vast numbers in the walls of the sinusoids of the liver and spleen, and also within the intermuscular lymph spaces in the wall of the heart. The toxin produced is apparently mild, and the tissues which chiefly respond to this irritation are connective tissue and endothelial cells. When the organism is present in great numbers within the circulating blood and in the connective tissue of the intima—that is, in the secondary stage—the consequent toxæmia is marked by the presence of fever, malaise, anaemia, vague nervous disturbances, general glandular enlargement, etc. Somewhat later the organisms have practically disappeared from the blood, many having perished, while others have penetrated deeply within, or passed beyond the vessel walls in certain localities, where they eventually give rise in the main to the formation of connective tissue lesions. Such lesions are found chiefly in the intima and adventitia of small vessels where the connective tissue, in particular, proliferates enormously. The intima may become so thickened that the lumen of the vessel is partly or totally occluded, and it is owing to this fact that tissues supplied by such vessels are rendered anaemic and in consequence eventually perish, only to be replaced by scar tissue. The organisms lie within or between connective tissue or endothelial cells, and thrive in these granulomata, which, being relatively avascular, are therefore anaemic. Thus, it can readily be seen that in the late secondary or tertiary stages of syphilis the organisms are located deep within these anaemic tissues, are relatively shut off from the blood and lymph stream, and also from antagonistic agents which the blood may contain. It is apparently owing to these facts that the tertiary manifestations of syphilis are often so resistant to treatment.

There are no accurate data to show what percentage of syphilitics in the secondary stage have actual involvement of the central nervous system, but, since the cerebro-spinal fluid has often been found to show changes, it is reasonable to suppose that many of the nervous manifestations of this stage are directly due to the action of the spirochaete upon the meninges, probably of the nature of a miliary syphilitic meningitis. In 1903 Ravaut, examining spinal fluid in secondary syphilis, found abnormal changes in 70 per cent. of all cases. Plant found changes in 66 per cent. Nonne and Montoux, as a result of their own investigations of spinal fluid, found that 40 per cent. of all cases of syphilis eventually exhibit some evidence of involvement of the nervous system. Gennerich thinks that all early constitutional cases (Wassermann positive) will, after salvarsan or mercury, develop an increase of lymphocytes and globulin—that is, a provocative reaction will be obtained in the spinal fluid. It seems, therefore, that nervous tissues and the membranes covering them are particularly susceptible to invasion

by the spirochaete, and, once this has occurred, the infection is likely to persist, for two reasons: (1) The arteries supplying nervous tissues are for the most part "end arteries," which, if they become occluded by syphilitic endarteritis, leave the tissue they supply in a relative state of anaemia—a condition which favours the protection and development of the spirochaete. (2) Any remedial agents introduced by the blood stream do not readily reach the cerebro-spinal fluid which bathes the infected meninges, because this fluid is not a transudate from either the lymph or blood stream, but is a true secretion of the ependymal cells of the choroid plexus. Thus, it can readily be seen how important it is to introduce some powerful remedial agent actually into the cerebro-spinal fluid, if one hopes for any marked effect upon the spirochaete localized in the meninges or the underlying nervous tissues. Especially is this desirable in the early stages of infection of the central nervous system, since, in the majority of cases, the lesions then are chiefly, if not entirely, vascular or meningeal. Later on, should the infection not cease spontaneously or under treatment, the underlying nerve tissue becomes involved in a definite manner. The spirochaetes invade the adjacent nerve tissue, causing marked proliferation of neuroglia and consequent degeneration of nerve cells. The clinical symptoms resulting therefrom will depend upon the locality of the infection. The basal meninges are most frequently involved, and the connective tissue overgrowth in this situation commonly causes headache and often injury to one or more of the cranial nerves which pass through. When the meninges covering the posterior roots and ganglia are involved the symptoms will ultimately be those of tabes dorsalis. Infection of the cerebral meninges and cortex, in a precisely similar manner, means paresis. Clinically, we often see the infection manifest itself as tabes, with later parietic manifestations, and vice versa—the condition being familiarly known as tabo-paresis. Less frequently gummata of the dura or pia-arachnoidal tissues occur. The underlying pathological process, both etiologically and histologically, is the same for all, since, by means of Levaditi's silver impregnation method, Noguchi and others have demonstrated the spirochaete actually within these lesions.

The problem, then, is to detect syphilis of the central nervous system at the earliest possible stage, and then endeavour to arrest the process or destroy the spirochaete *in situ*. Since the introduction of salvarsan and neo-salvarsan great expectations have been aroused in this direction, especially since it is now possible to introduce these agents directly or indirectly into the cerebro-spinal fluid.

It was first attempted to introduce salvarsan directly into the subarachnoidal space. Wechselsman in 1912, Marinesco in 1913, and also Levaditi and Marie failed to do this successfully on account of the strong toxic action of salvarsan. But Ravaut was successful in injections of neo-salvarsan without apparently producing any serious results. Wile followed Ravaut's technique in 15 cases—7 tabetics, 5 parietics, and 3 cases of cerebro-spinal syphilis; of these 7 showed marked improvement. He advised the use of only very small doses of the drug. This method is the direct introduction of neo-salvarsan. Other observers, however, who ventured this treatment reported untoward symptoms, and Alfred Gordon of Philadelphia had a most distressing result in which extensive gangrene and paralysis of the lower extremities resulted, eventually leading to death.

Swift and Ellis were the first to employ what is now regarded as the safest method—that is, first to give an intravenous injection of neo-salvarsan, and one hour later to withdraw about 50 c.cm. of blood, which is allowed to clot over a period of twenty-four hours. The resulting auto-salvarsanized serum is now pipetted off, heated to 56° C. for half an hour, diluted in 0.6 per cent. salt solution to a 40 per cent. strength, and about 30 c.cm. of this is injected into the spinal canal after an equal quantity of spinal fluid has been withdrawn.

Osborne has modified this method by adding a definite measured amount of neo-salvarsan directly to the patient's blood serum, and then injecting this into the spinal canal. Its advantage lies in the fact that a definite measured amount of the drug itself is introduced into the spinal fluid, whereas by Swift and Ellis's method the auto-

salvarsanized serum undoubtedly contains an amount of the drug which will vary in each case. In fact, such an infinitesimally small amount of the drug is introduced by the Swift and Ellis method that it is difficult to understand how the drug in itself is the actual beneficent agent. Some observers believe that the drug acts by calling forth a larger production of syphilitic antibody, and that the activity of auto-salvarsanized serum depends upon its relatively larger content of syphilitic antibody than that of normal serum. However this may be, the fact remains that a large percentage of cases of central nervous system syphilis have shown marked improvement or have been completely cleared up—depending, of course, upon the degree of involvement. The present belief is, that in general paresis, and advanced tabes dorsalis, only partial improvement can be effected, but that in early tabes, and syphilitic meningitis the chances of a cure both from a clinical and laboratory standpoint are excellent.

The following cases embrace both slight and advanced involvement of the central nervous system. The laboratory examinations were made chiefly for determining the relative decrease in the strength of the complement-fixation reaction, and of the globulin content as a result of each intraspinal treatment, and to see how these compared with the changing clinical condition.

CASE I.

A. F. M., aged 36; May 28th, 1914. No admission of syphilis. Five weeks ago while reading in bed the vision of the left eye suddenly became blurred. The following morning this eye was painful, and he noticed then for the first time that the left pupil was much larger than the right. It remained dilated, and ten days later a Wassermann test of his blood serum proved strongly positive. During the last year he had had shooting pains in the legs which were worse at night and often awakened him.

August 8th, 1914. Pupils react well to accommodation but sluggishly to light, the left remaining much larger than the right. Optic discs normal. Knee-jerks absent. Slight anaesthesia of soles of feet. No definite Rombergism or ataxia. Diagnosis: Tabes dorsalis (pre-ataxic stage). Gave salvarsan 0.6 gram.

August 22nd, 1914. No change clinically; lightning pains severe. Wassermann reaction positive, but weaker than on August 8th, 1914. Gave 0.9 gram neo-salvarsan intravenously.

October 6th, 1914. Wassermann reaction of blood serum faintly positive.

October 9th, 1914. Feeling better; pains less severe and less frequent. Gave 0.9 gram neo-salvarsan intravenously.

October 10th, 1914. Lumbar puncture. Spinal fluid limpid and clear. It shows marked increase of globulin by Noguchi's butyric acid test. Improvement of symptoms.

October 24th, 1914. Wassermann test of blood serum negative. Gave 0.6 gram salvarsan intravenously. Twenty minutes later withdrew 50 c.cm. of blood.

October 25th, 1914. Diluted 12 c.cm. of the auto-salvarsanized serum with 18 c.cm. of 0.6 per cent. saline, and gave intraspinally, first having withdrawn an equivalent amount of spinal fluid. Raised foot of bed six inches for four hours. Pain in legs somewhat severe four hours later, but soon subsided. Otherwise no other symptoms. Noguchi test gives weaker globulin reaction than on October 10th, 1914.

October 28th, 1914. Intravenous salvarsan 0.6 gram, and withdrew blood as before.

October 29th, 1914. Gave auto-salvarsanized serum intraspinally as before. Noguchi globulin test of spinal fluid faintly positive. General health of patient is markedly improved. The dilated left pupil is perceptibly smaller. The lightning pains are much less frequent and less severe.

January 14th, 1915. Intravenous neo-salvarsan 0.9 gram. January 15th, 1915. Intraspinous serum as before. Spinal fluid gives positive Wassermann reaction with a minimum of 0.4 c.cm. Noguchi test faintly positive.

April 28th, 1915. No lightning pains since the last injection. Health excellent. Knee-jerks absent. Pupils still unequal, but the left is slightly less dilated than when last seen. Both also react to light more vigorously than on October 29th, 1914. Gave intravenous salvarsan, 0.6 gram.

April 29th, 1915. Gave intraspinal serum as before with no uncomfortable symptoms following. The spinal fluid gives a negative Wassermann reaction with 1.0 c.cm. The Noguchi test still shows a slight increase of globulin. The general health of the patient is very markedly improved; the left pupil is much smaller, though still larger than the right.

In this case the general health of the patient has undergone marked improvement. The dilated left pupil has diminished in size, and both have become more active to light. The lightning pains have been completely abolished up to the last date of treatment. A positive Wassermann reaction of blood and spinal fluid has become negative.

CASE II.

W. A. M., aged 51; January 1st, 1915. Fairly clear history of syphilis about eighteen years ago. Has always led a laborious

outdoor life until three years ago. Two years ago shooting pains in the legs began to trouble him, and during the last year the gait has been a little unsteady. There has been a numbness in the feet, as if walking on velvet. Has had cystitis for several months, with marked atonicity of the bladder. On examination: Pupils very small, inactive to light; fundi normal. Anaesthesia of palms of hands and soles of feet. Gait very slightly ataxic in daytime, but more markedly at night. Slight Rombergism; some muscular hypotonicity. Blood gives leucocytosis of 10,000, and strong positive Wassermann reaction with 0.1 c.cm. inactivated serum.

January 13th, 1915. Neo-salvarsan 0.9 gram intravenously; withdrew blood half-hour later. On following day gave intraspinal serum as detailed above. Spinal fluid is under pressure; is clear, shows marked globulin increase (Noguchi), and positive Wassermann reaction with a minimum of 0.4 c.cm.

February 1st, 1915. General health much improved; putting on weight. No lightning pains, and much less anaesthesia of feet. Has much better control of urine, and voids voluntarily. Gave intravenous salvarsan 0.6 gram.

February 2nd, 1915. Gave intraspinal serum. Spinal fluid gives increased globulin (Noguchi), and positive Wassermann reaction with a minimum of 1.0 c.cm.

February 20th, 1915. Intravenous salvarsan, followed by intraspinal serum as before. Spinal fluid globulin test (Noguchi) weaker than on February 2nd, 1915. Wassermann reaction positive with minimum of 1.0 c.cm.

April 14th, 1915. Intravenous salvarsan 0.6 gram. Intraspinal serum given eight hours later. Spinal fluid shows still an increase of globulin, but less than before. Wassermann reaction still positive with 1.0 c.cm.

May 10th, 1915. Intravenous and intraspinal treatment as above. Spinal fluid shows faint increase of globulin, and Wassermann reaction still present with 1.0 c.cm. The general health has steadily improved; he feels much less anaesthetic in the feet, and his hands are now normally sensitive. He has perfect control of the bladder.

June 14th, 1915. Combined treatment as given above; the spinal fluid shows no change.

September 3rd, 1915. Combined treatment as given above, using diarsenol for the first time. Spinal fluid shows very weak globulin reaction. Wassermann reaction negative now with 1.0 c.cm., but positive with 1.5 c.cm.

October 20th, 1915. Combined treatment, using diarsenol. Spinal fluid shows very faint globulin reaction, and a negative Wassermann with a maximum of 1.5 c.cm. The patient's health is still improving, and he states that he is now in better health than he has been for several years. He is now able to carry on with his work as usual.

In this case of well-marked tabes dorsalis in the early ataxic stage, where both blood and spinal fluid gave a strong positive Wassermann reaction, and the spinal fluid showed marked increase of globulin, the Wassermann reaction has become negative, and the amount of globulin reduced to a trace. Clinically there has been complete alleviation of his distressing symptoms, particularly the atonicity of the bladder, so that he again has perfect control. The lightning pains have ceased; the anaesthesia has disappeared in the hands, and has markedly improved in the feet. He has gained in weight, and feels in excellent health.

CASE III.

D. S., aged 31. Primary sore in April, 1914. In August he had an ulcerated throat, and was treated with mercurial inunctions. In October he noticed that he was becoming deaf, and received an intramuscular injection of salvarsan. On November 23rd, 1914, Wassermann reaction of blood negative.

He was seen on March 7th, 1915, for the first time. Feels nervous; has headaches often; believes that he is becoming progressively deaf, for which he has lately been treated for Eustachian tube trouble without improvement. On examination, the pupils are unequal, the left is slightly larger. Both react to light and accommodation. All reflexes are normal. A diagnosis of central nervous system involvement was made on the strength of progressive deafness, inequality of pupils, headache, and nervousness. The spinal fluid is clear, and slightly under increased pressure; its Wassermann reaction strongly positive with 0.5 c.cm. Marked increase of globulin (Noguchi). Has been taking maximal doses of mercury by mouth. Wassermann test of blood strongly positive.

May 22nd, 1915. Gave intravenous salvarsan 0.6 gram, followed by intraspinal serum. Spinal fluid shows positive Wassermann reaction.

July 9th, 1915. Combined treatment as above. Spinal fluid: Positive Wassermann reaction with minimum of 0.5 c.cm. Globulin test strongly positive.

September 4th, 1915. Combined treatment as above, using diarsenol. Spinal fluid: Wassermann reaction negative with a maximum of 1.5 c.cm. Noguchi globulin test faintly positive. This is a very marked improvement since the last treatment two months ago. The patient's hearing is progressively improving, and the inequality of the pupils is very much less.

October 9th, 1915. Combined treatment as before. Spinal fluid: Wassermann reaction negative with maximum of 1.5 c.cm. Globulin test (Noguchi) very weakly positive. His hearing now is practically normal, but there still remains very slight inequality of the pupils. He has no headaches, is not nervous, and feels perfectly well.

The lesion here was probably an early syphilitic basilar meningitis of sufficient severity to cause headache and also irritation, and possibly constriction of the third and eighth nerves where they pass through the meninges. The nervousness was also probably the result of meningeal irritation. After four combined intravenous and intraspinal treatments all symptoms entirely disappeared, the defective hearing was restored, and the inequality of the pupils was much reduced.

CASE IV.

A. B. G., aged 30, seen on February 15th, 1915. Hard chancre six years ago and took mercury for one year. Two years later his blood gave a negative Wassermann reaction. Between three and four months ago the left pupil began to enlarge, though in every other respect he was perfectly well. Present condition: Right pupil widely dilated 8.5 mm. and absolutely inactive to light and accommodation. Ocular movements and fundi normal. All other cranial nerves normal. All other reflexes normal. Blood: Wassermann reaction negative. Spinal fluid gives positive Wassermann reaction with minimum of 0.5 c.cm. Globulin test (Noguchi) positive. Cell count 80 mononuclears to the cubic millimetre.

February 18th, 1915. Intravenous neo-salvarsan 0.9 gram. Twenty minutes later blood was withdrawn, and eight hours later auto-salvarsanized serum given intraspinaly.

April 2nd, 1915. Combined treatment as above, using salvarsan. Spinal fluid shows the same degree of reaction as on February 18th, 1915.

May 22nd, 1915. Combined treatment as on April 2nd, 1915. Spinal fluid: Globulin (Noguchi) test strongly positive. Wassermann reaction positive with 1.0 c.cm.

July 3rd, 1915. Combined treatment. Spinal fluid: Globulin (Noguchi) test positive. Wassermann reaction positive with 1.0 c.cm.

August 6th, 1915. Combined treatment, using diarsenol. Spinal fluid about the same as on July 3rd, 1915.

August 23rd, 1915. Combined treatment as on August 6th, 1915. Spinal fluid: Globulin (Noguchi) test weakly positive. Wassermann reaction positive with minimum of 1.5 c.cm. This shows a marked improvement since the last examination.

Clinically there has been absolutely no change in the degree of inequality of the pupils, though his health in general is excellent. It may be assumed that with the degree of pathological change in the spinal fluid further subjective and objective symptoms would eventually show themselves had no treatment been interposed. Treatment has made a marked improvement in the condition of the fluid. Further treatment is to be given with the intention of still improving its condition and preventing the onset of graver central nervous system involvement.

CASE V.

J. S. S., aged 30, seen on December 4th, 1914. Chancre seven and a half years ago. No history of secondaries. About seven months ago he began to feel nervous without cause. While walking quietly, even, he would gradually but rapidly be overcome with a sense of weakness, would perspire freely, and tremble all over. He would also have some vertigo, and often upon getting up in the morning he would become nauseated. He slept poorly, but had no pain other than a dull ache over the eyes and occiput, which he thought might be due to constipation.

On examination he shows fair physique and nutrition. The pupils are unequal, the left larger and more sluggish to light than the right. Both accommodate. All ocular and other movements normal. Heart negative, except for slight accentuation of the aortic second sound. Radial arteries fairly hard and tortuous. Lungs negative. Thyroid normal in size. The outstretched hands show a moderately fine tremor, not increased under purposeful movements. Reflexes: Those of the upper extremities are markedly increased; both knee-jerks absent. Tendo Achillis reflex very weak. Plantar flexion. Slight Rombergism. No anaesthesia or disturbance in thermal sensation. The gait is not definitely ataxic, though it is slightly hesitating, which he attributes to weakness.

December 5th, 1914. Intravenous salvarsan 0.6 gram, followed the next day with intraspinal auto-salvarsanized serum. Spinal fluid shows Wassermann reaction positive with minimum of 0.5 c.cm. Globulin (Noguchi) test strongly positive.

December 21st, 1914, combined treatment as above. Spinal fluid shows no improvement, but he says he feels, and he looks, better.

January 8th, 1915. Combined treatment as before. Spinal fluid still positive with 0.5 c.cm., and Noguchi globulin test still remains strongly positive, but much less so than on the former examination.

February 27th, 1915. Combined treatment. Spinal fluid: Wassermann reaction barely positive with 0.5 c.cm. and strongly positive with 1.0 c.cm. Globulin (Noguchi) test positive, but much weaker than on the last examination.

March 25th, 1915. Combined treatment. Spinal fluid positive with 1.0 c.cm., and the Noguchi globulin test is very weakly positive. Result: His health in general has improved very much; he feels stronger, more confident, and is eager to

return to work. There are no changes in the reflexes, and the tremor of the hands, though considerably diminished, is still marked. Only five combined treatments having been given, with marked improvement, a continuance was advised, but he left the city. About six months later he again presented himself, with a return of his old symptoms. He also has had for the first time some lightning pains at infrequent intervals, and a few weeks ago he first noticed on the plantar surface of the foot a painless shallow ulcer. There is definite decrease of sensation to pin-prick over the soles. The spinal fluid gives a positive Wassermann reaction with 1.0 c.cm., and the Noguchi globulin test is stronger than on examination six months ago.

The involvement of the central nervous system is evidently extensive in this case, and already degenerative changes in the sensory tracts are present. There is also a syphilitic basilar meningitis causing nervousness, frontal and occipital headache, and the lateral extension to the meninges covering the cortex for the upper extremities probably accounts for the increased reflexes of the latter.

CASE VI.

H. D. K., aged 29. Primary syphilis nine years ago, followed by typical secondaries. Treatment was not commenced until he was in his secondaries. Took mercury regularly for one year. Three years ago he began to feel nervous, as he says, with headache at times, though not of a severe character. On examination: He is obviously worried over the state of his health (neurasthenia), and finds his work—that of motorman on a street railway—very fatiguing. He is a big fellow, of splendid physique and good nutrition. Pupils unequal, which he has never known before; the left being the larger and more sluggish to light than the right. Physical examination otherwise negative. Blood and cerebro-spinal fluid give negative Wassermann reaction. Cerebro-spinal fluid, however, shows marked increase of globulin (Noguchi).

November 3rd, 1914. Intravenous salvarsan 0.6 gram.

November 27th, 1914. Intravenous salvarsan 0.6 gram.

December 18th, 1914. Intravenous salvarsan 0.6 gram.

February 19th, 1915. Intravenous neo-salvarsan 0.9 gram, followed the next day by intraspinal injection of auto-salvarsanized serum. Spinal fluid gives positive Wassermann reaction with 1.0 c.cm. Globulin test (Noguchi) strongly positive.

March 24th, 1915. Combined treatment as above. The globulin test is still positive, but the Wassermann reaction is negative with 1.0 c.cm.

May 4th, 1915. Combined treatment. Globulin test positive, and Wassermann reaction positive with 1.0 c.cm.

May 20th, 1915. Combined treatment. Spinal fluid shows very slight improvement since last examination.

June 9th, 1915. Combined treatment. Still very slight improvement of spinal fluid.

July 6th, 1915. Combined treatment. Slight improvement in spinal fluid.

July 30th, 1915. Intravenous salvarsan.

October 30th, 1915. Combined treatment. Spinal fluid shows very marked improvement. The globulin test (Noguchi) is only faintly positive, and the Wassermann reaction is negative with 1.5 c.cm.

After seven combined treatments the spinal fluid shows very marked improvement. The general health of the patient has improved. He no longer feels nervous. The dilated pupil is much more active, and has contracted perceptibly, though it remains still a little larger than the other.

CASE VII.

J. B., aged 34. Seen on April 21st, 1915. Indefinite history of syphilis eight years ago. Nothing happened until seven weeks ago, when diplopia suddenly came on, with dilatation of the left pupil as well. Wassermann reaction of the blood negative, though it is possibly due to the fact that he has been taking mercury and potassium iodide since the onset of symptoms.

May 14th, 1915. Combined treatment given. Spinal fluid shows positive Wassermann reaction with 0.5 c.cm. Globulin test (Noguchi) strongly positive.

June 4th, 1915. Combined treatment as above. Spinal fluid gives weaker Wassermann reaction than before, requiring twice as much fluid. Globulin test strongly positive.

June 25th, 1915. Combined treatment. Wassermann reaction of spinal fluid, and also the globulin content unchanged.

July 16th, 1915. Combined treatment. Spinal fluid remains unchanged. Clinically, there is marked improvement. The diplopia has considerably decreased, and the dilated pupil is more active, and slightly more contracted.

September 6th, 1915. Combined treatment. The spinal fluid shows marked improvement, the Wassermann reaction being positive with 1.5 c.cm., and the globulin test being very much weaker.

October 7th, 1915. Combined treatment. The spinal fluid is still somewhat improved.

After seven combined treatments the improvement is very marked, though there still remains some diplopia, and dilatation of the left pupil. The patient had to discontinue treatments for the present, though continued improvement could be confidently expected under further combined treatments.

CASE VIII.

R. P., aged 34, contracted syphilis in February, 1914. In the following month secondaries developed, which quickly disappeared with one intravenous salvarsan 0.6 gram. The blood Wassermann reaction was strongly positive. This was followed by maximal doses of grey powder daily for one year, during which time four Wassermann reactions of the blood proved negative.

April 17th, 1915. For some weeks he has had several small areas of leucoplakia on the margin of the tongue, which are regarded as trophic lesions resulting from an early syphilitic involvement of the central nervous system.

April 24th, 1915. Spinal fluid is under slightly increased pressure, is clear, gives a positive globulin test (Noguchi), and also a weak positive Wassermann reaction. Combined treatment given.

May 14th, 1915. The areas of leucoplakia had entirely disappeared within a week of the combined treatment. The same intravenous and intraspinal treatment again given. The spinal fluid now gives a negative Wassermann reaction and negative globulin test.

During regular and maximal dosage of mercury—following a single intravenous injection of salvarsan—for one year, the blood reaction remained negative though a progressive involvement of the central nervous system, probably of the nature of a basal meningitis, supervened, manifesting itself only as small trophic areas of leucoplakia on the tongue. A single combined intravenous salvarsan and intraspinal salvarsanized serum treatment was sufficient to eradicate promptly the leucoplakia and restore the spinal fluid to its normal condition. A second combined treatment was given to consolidate the good result, and the patient advised to have one or two more for the same reason. As he was on military service this could not be done at present.

REMARKS.

Of these eight cases, two (Cases III and VIII) showed early, and in Case VIII slight, involvement of the central nervous system within a year of the primary infection. Each had received during the secondary period a single injection of salvarsan, followed by maximal doses of mercury by mouth, without, however, preventing the onset and progressive involvement of the central nervous system. It may be presumed, therefore, that this treatment was inadequate. A single combined treatment by intravenous salvarsan and intraspinal salvarsanized serum in Case VIII sufficed to clear up the leucoplakia on the tongue and convert the pathological spinal fluid into a normal fluid. In Case III a progressing nerve deafness was arrested, hearing restored to approximately the normal, the eye condition much improved, and the headache and nervousness abolished. The general health was also markedly improved, so that he was able to enlist for active service. The spinal fluid became negative to the Wassermann reaction.

The other six cases were all of long duration, and showed various manifestations of the disease. In all the general health was markedly improved, and where headache and nervousness were present they disappeared. Shooting pains, present in three cases, were abolished. In all but one of six cases, eye changes—usually inequality of pupils—were improved. In one case of early tabes dorsalis the atonic bladder recovered, and the anaesthesia of hands and feet was remarkably improved.

In seven cases the butyric acid test (Noguchi) for globulin was diminished to a faint reaction, and in one it was entirely abolished. The Wassermann reaction became negative in six of the cases.

CONCLUSIONS.

The consideration of these eight cases from both a clinical and laboratory standpoint shows us that we have a powerful form of therapy in the combined intravenous and intraspinal treatment. Whether the improvement will be lasting in these cases time alone will tell. Though the results resemble very closely those of other workers using the same method, and claiming good results, I feel that this system of treatment is destined to undergo considerable change ere we arrive at an ideal method.

THE prefect of the province of Cagliari has issued an ordinance making compulsory the notification of leprosy in every stage. Suspected cases are to be detained for observation in the dermato-syphilitic clinic of the university. The houses and clothes of persons thus isolated are to be disinfected, and their families kept under observation. A pavilion of the Civil Hospital of Cagliari is set apart for cases with open sores.