THE TREATMENT OF SYPHILIS AT THE ROYAL INFIRMARY, DUBLIN, BY INTRAVENOUS INJECTIONS OF SALVARSAN.

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Salvarsan came into use at the Royal Infirmary, Dublin, on February 1, 1911, when a small quantity (20 grm.) was obtained for the treatment of a few cases which had been a long time in hospital, and had proved refractory to mercury.

The method employed in this hospital is that used at the Military Hospital, Rochester Row, London, viz.; intravenous injection of an alkaline solution of salvarsan in physiological saline solution, 50 c.c. of the solution containing 0.1 grm. of the drug. (See JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xvi, p. 351).

When 0.4 grm. of salvarsan is given, the average quantity of fluid injected is 250 c.c., that is, 200 c.c. salvarsan solution and 50 c.c. saline fluid to wash all the salvarsan into the veins. Varying strengths of saline were used with the salvarsan, in the endeavour to eliminate the reaction; sixty-eight doses were given with saline solution containing 0.7 per cent of sodium chloride, forty-four with 0.6 per cent. As no appreciable difference in the reactions could be made out between any of these strengths, a return was made to the original solution containing 0.85 per cent sodium chloride. The important point appears to be that when all apparatus and solutions are germ-free and freshly sterilized before each set of injections, and in addition all solutions are freshly prepared, the number of severe reactions becomes practically nil. In the last 100 cases there has not been one, in the first 100 there were three severe reactions, with high temperature, collapse, severe vomiting and diarrhoea lasting some six hours. The question of the cause of these reactions has given food for much thought, and one is compelled to believe that the disease has a large influence in their causation. Occasionally only one case out of six injected at a sitting has shown a reaction, and invariably it has been the one showing the most active signs of syphilis. May it not be due to the syphilo-toxins from the killed treponemata? In support of this theory is the fact that a negative Wassermann may become positive after a dose of salvarsan.

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That dead organisms in the water used to prepare the saline solution are sufficient to cause a reaction was proved when giving a series of salvarsan injections at an out-station. As the supply of distilled water was insufficient rain water was substituted. Unfortunately this was not examined until after use, when it was found to contain large numbers of bacteria and moulds. This water, sterilized by the autoclave, was employed in six cases, all of which had fairly severe, though not serious, reactions. The six patients injected on the day before and the six on the day following, had no reaction of note; the solutions for these cases had been made with germ-free water. Moreover, while the six injected with rain water as a diluent felt ill for three days, the other twelve cases were normal on the following day.

The water we are using at present is tap water which contains practically no organisms or salts, and answers the purpose as well as distilled water. It is proposed to use a candle filter for a series of cases and note the reactions, the solutions will still be autoclaved as at present.

The method of dosage which was adopted for the first 100 cases was to give two doses of 0.4 grm. salvarsan with an interval of nine to ten days and await results, but the occurrence of a few relapses amongst these cases made it seem necessary to give mercury, to destroy the organisms which were not got rid of by the salvarsan—treponemata which are shut off from the blood stream by plasma cells or fibrous tissue.

Hence, nine weekly injections of 1 grain of mercury in the form of mercurial cream, are now given immediately after the two intravenous injections of salvarsan.

For purposes of comparison, and to show the different effects of the drug on syphilis in its various stages, cases presenting primary, secondary, and tertiary signs of the disease have been collected into separate groups. The occurrence of sensory lesions is of such interest that these have been also dealt with separately.

Primary Cases.

An attempt was made to diagnose every initial lesion microscopically. Two methods were employed—the dark ground illumination, and Burri's Indian ink. A considerable number of the men had used either Condy's fluid or one of the mercurial preparations for some time before coming under observation. This rendered diagnosis by the microscope more difficult. In a few of the cases, however, in which antiseptics had not been used on the
sore for a week, treponemata were discovered before the onset of
the secondary stage.

The dark ground illumination was used with much success. At
first an acetylene light was employed, but was replaced by incandes­
cent gas, as the definition of the Treponema pallidum was much
better than by the acetylene light. Neither of these sources of light
is entirely satisfactory, compared with the illumination of a Nernst
electric lamp. During the summer months recourse was had to
the direct rays of the sun with a large stand condenser. An illumina­
tion was obtained which equalled the electric light, though not
so constantly available.

Burri's Indian ink has proved most satisfactory, and is a very
rapid method of demonstrating the organism. Many varieties of
Indian ink have been tried, but the ink which has answered best
is Gunter and Wagner's commercial ink, Pelican brand, waterproof:
The dilution of one part of serum to two of Indian ink is the most
satisfactory, as this gives a clear even field with the minimum of
diluting ink. To get a film of the thickness necessary to demon­
strate the T. pallidum most easily the quantity of the mixed ink
and serum should be very small, just enough to spread over the
whole slide and no more, otherwise the layer of ink will obscure
the spirals and lessen the number of positive results. The colour
of the film thus prepared is a dark brown and quite transparent.
In twenty-four cases examined by this method and controlled
by the dark ground illumination the results were similar. The
average time required for finding the T. pallidum was ten seconds.
In most cases, however, the organism could be detected almost
immediately. Where no dark ground condenser is available, the
Indian ink method is a cheap and efficient aid to diagnosis, and is
more reliable than dark ground illumination unless the source of
light is electric or sunlight.

Up to date there have been thirty-three cases of primary syphilis
treated with salvarsan; the T. pallidum was found in twenty-eight
of these.

Of the five negative instances, one gave a positive Wassermann
reaction and the other four had typical hard chancre, which had
been acquired over fifteen days previously.

Nine months have elapsed since the first of these cases had the
"606" treatment, four months in the case of nine others, of which
only one has shown any occurrence of secondary signs, and in him
it was not quite certain that these were syphilitic when he received
his injection. Somewhat severe reactions were observed in two.
Primary Cases.—No. 85, Private C., admitted to hospital with gonorrhoea, April 8, 1911. Developed a hard sore during the time he was in hospital and was diagnosed syphilis on June 2, 1911. He was anaemic and debilitated, and gonorrhoeal orchitis still existed. Treponema pallidum was not found, owing probably to permanganate irrigation treatment for the gonorrhoea.

June 26, 1911. He was given 0.4 grm. salvarsan at 2.30 p.m. At 5 p.m. a rigor began, which lasted for three hours. At 6 p.m. he vomited for two hours. When the patient was seen at 7 p.m. he was in a collapsed condition, and cyanosed. He was given 15 minims of ether subcutaneously. He slowly recovered, and though very weak was fairly comfortable by 8 p.m. Temperature at this time was 104.2°F. The inflamed testicle became tender and swollen three hours after the dose of salvarsan, and in less than twenty-four hours had become quite soft and nearly the same size as the unaffected left testicle. The question of including this case amongst the primary syphilitic ones was decided by the fact that the usual time of onset of secondary infection of the testicle is three or four months after the primary infection, sometimes a little earlier. In this particular case the onset of the orchitis could not have been more than two months from the date of infection. If the condition was syphilitic it is one of the earliest cases of syphilitic orchitis noted. The sore healed rapidly, and in six days the patient was appreciably less anaemic. He was inspected on October 2, and showed no signs of active syphilis, and looked in good health. However, his Wassermann reaction (as modified by Lieutenant-Colonel Birt, R.A.M.C.) was strongly positive, November 12, 1911.

No. 86, Lance-Corporal S. J., was admitted to hospital on May 9, 1911, with a typical hard chancre in the coronal sulcus. He was anaemic, even more so than the last case. The glands of his groin and axilla were hard and shotty. He lost weight weekly, and the anaemia became more pronounced. Owing to previous treatment Treponema pallidum could not be found, though searched for repeatedly.

He was given 0.4 grm. salvarsan on June 22, 1911. Soon after the injection he had a severe rigor, and vomited for two hours. Mental and bodily depression was a prominent feature for hours after the injection. Next morning the anaemia was still more

marked than before. Twenty-four hours later the sore was softer and drier. It had completely healed in twelve days. Extensive herpes on both lips and on the tongue developed in thirty-six hours; this cleared in a week. Patient was discharged from hospital on July 12, 1911, still anaemic, but slowly improving. No active signs of syphilis were present. He was seen on October 25, 1911, when he appeared to be quite well. Wassermann reaction positive.

Both these cases were treated on separate days; others injected at the same time and under like conditions had only slight or no reactions. A second dose of salvarsan was not given as it was thought that these two cases might have an idiosyncrasy to arsenic; they were used as controls to the others. Up to a month ago neither of them had any mercury; they have now been put on a course of mercury (intramuscular) as the blood reaction is positive.

It has been noted in all the cases that the chancres became soft in twenty-four hours, but that healing of the ulcer did not proceed at a very rapid rate. Calomel powder was used to dust over the sore, and it may have been too irritating, for when a less irritating form of mercury was substituted cicatrization was more rapid. Calomel is now used for the first few days and replaced by the less irritating calomel lotion. Some experiments were tried with the local application of salvarsan to sores which contained T. pallidum, and other spirochaetes. The sores dried up after one application, but the results were not lasting. This may have been due to the very small quantity of the drug applied (it was only the trace left in the mixing glass) or to the very dilute solution.

The other primary cases presented no particular points of interest; all are still under observation, and have not shown any further signs of the disease. Nine of the cases have remained free from active syphilis for five to seven months since they were treated.

Secondary Cases.

Owing to the overlapping of secondary and tertiary syphilis only those early secondary cases which showed the ordinary signs of the disease are included under this heading.

One hundred and eighty-four cases of early secondary syphilis were injected with salvarsan; no symptoms of any importance ensued. Most of them were given two doses of 0.4 grm., with an interval of seven to nine days between them, followed by nine injections of mercurial cream, one grain of mercury in each. The average time which elapsed before all signs of the disease had
disappeared was 9.1 days after the first dose. The most common interval was seven days, but the average was raised by papulou-squamous rashes, which were found more intractable than any of the other syphilides. However, in future these will give less trouble as the local application of an ointment containing ammoniated mercury or calomel causes these rashes to disappear as rapidly as any of the others. In four cases the sores took over three weeks to heal, though the induration was less marked in twenty-four hours after the injection. A suggestion has been made that iodide of potassium given at the same time as the salvarsan may intensify its action, by absorbing newly formed and partially organized fibrous tissue, and thus allow the drug to gain access to the T. pallidum. This is being tried in all cases at present.

EYE AND EAR AFFECTIONS.

The following six cases occurred during the first month or two after salvarsan was injected. They were also amongst the first hundred cases which were treated with salvarsan alone. At the outset we were inclined to impute the serious eye and ear affections to the drug, but the effects of further treatment with salvarsan proved that syphilis 'not arsenic' was the causative factor.

No. 9, Lance-Corporal N., was admitted into hospital on January 16, 1911, with a chancre, a papular rash, mucous patches on both tonsils, and melancholia. He was given two mercurial injections without much improvement in the lesions or the melancholia. On February 12, 1911, he was given 0.4 grm. salvarsan; this was followed by a slight reaction, temperature 101.6°F. The notes record that the chancre healed in four days, the rash had disappeared in ten days, the tonsils were clear in sixteen days, and that the melancholia had disappeared in a few days after the treatment. He left hospital free from active signs on March 10, 1911. Two months later he was admitted into the general wards with vomiting, dizziness, and headache. He could not stand or turn round sharply without supporting himself with his hands. Six weeks from the date of admission he was discharged hospital, but was still dizzy, and suffered from noises in the ear. On September 21, 1911, he returned to hospital with mucous patches on both tonsils, and the condition of his hearing unchanged. September 21, 1911, he was given 0.4 grm. salvarsan. No reaction. Next day all trace of tinnitus had gone. A third dose, 0.4 grm., was injected

3 G. H. Mills, Guy's Hospital Gazette, December 9, 1911.
on October 2, 1911, and the patient was discharged hospital on October 6, 1911, free from active signs, and ordered to commence mercurial treatment.

No. 18, Corporal F., was admitted to hospital on February 28, 1911, with giant papular rash on his face and body, severe ulceration of both tonsils, and debility. On February 28, 1911, 0·3 grm. salvarsan was injected; this was followed by a slight reaction, temperature 100°F. The throat ulceration had ceased to extend in twenty-four hours, and healed in four days. The papular rash took much longer to disappear, quite a month. Two and a half months later he was readmitted with deafness and vertigo. On May 8, 1911, he was given 0·3 grm. salvarsan; this was followed by a decided improvement in his hearing and the dizziness became less. On May 24, 1911, a dose of 0·3 salvarsan was given which further improved the ear condition. This patient was discharged on June 13, 1911. His hearing was practically normal, and he had gained 10 lb. in weight. On August 15, 1911, he was free from signs and seemed to be in robust health.

No. 20, Private Q., was admitted to hospital March 7, 1911, with a granulomatous sore, a papular rash over the body and limbs, and anaemia. On March 7, 1911, 0·4 grm. of salvarsan was injected. Reaction not severe. Three days later a decided improvement in the anaemia was noticeable. The sore did not heal well, it was septic and there was much oedema of the penis. The actual sore had healed by March 21, 1911. On April 29, 1911, a second dose of 0·4 grm. was given. His weight had gone up 15 lb., from 123 to 138 lb. in six weeks. On May 1, 1911, he was clear of active signs and discharged hospital. He was re-admitted four months later with subcutaneous gummatas on both shins and was treated for a fortnight with potassium iodide; this removed the gummatas. Eye symptoms developed about August 20, 1911, and on examination double optic neuritis was found to exist. On August 21, 1911, he was given 0·3 grm. salvarsan; a distinct improvement was noted by the ophthalmoscope and also in his vision within three weeks. A fourth dose of salvarsan, 0·45 grm., was injected on September 21, 1911. Eyes almost normal. Fifth dose, 0·4 grm., given October 2, 1911.

The patient was discharged from hospital on October 5, 1911. Vision normal, no ophthalmoscopic signs of optic neuritis. He is now undergoing a course of nine weekly injections of mercurial cream, 1 gr. of mercury in each. His blood gave a negative reaction on November 20, 1911. This case has had five intravenous injections, equal to 1·95 grm. of salvarsan.
No. 22, Private R., was transferred to this hospital, March 25, 1911. He had had nine mercurial injections and iodide of potassium since the appearance of the secondary signs. Condition on that date: Thick papulo-squamous rash on the front of the body, corymbose syphilide on the back. There were mucous patches on both tonsils, and perianal condylomata. On March 25, 1911, 0·3 grm. salvarsan was injected. In five days all active signs had disappeared, leaving the skin pigmented where the rash had been. He was discharged on April 1, 1911. Re-admitted on May 10, 1911, with deafness and headache. The deafness was very marked, he could not hear a watch ticking at one inch distance with either ear. On May 12, 1911, he was given 0·3 grm. salvarsan. Improvement began within twenty-four hours, and on May 18, hearing was normal when tested by a watch. On October 18, 1911, he had a third dose—0·4 grm., no active signs being then visible. He is now undergoing weekly injections of mercurial cream.

No. 24, Private B., was admitted on March 28, 1911, with a hard sore, mucous patches on both tonsils, condylomata, syphilitic alopecia, and anaemia. On the same day he had 0·3 grm. salvarsan. The above signs had all disappeared by the tenth day with the exception of the chancre, which healed on the fifteenth day. Iritis of the left eye developed about April 15, 1911. Posterior synchiae was also present, which took a week to break down with atropine. On May 1, 1911, well-marked optic neuritis of both eyes was noted, worse in the left eye. May 9, 1911, 0·4 grm. salvarsan was injected. In four days the iritis was distinctly less. May 15, 1911: Vision in both eyes \( \frac{6}{15} \). Optic neuritis was less in both eyes, but still marked in the left. One month after the onset of optic neuritis his vision was normal and no ophthalmoscopic signs of the lesion remained. He was discharged without any active signs of syphilis on June 12, 1911.

No. 90, Private D., was admitted on June 26, 1911, with a papulo-squamous rash over chest and limbs and severe headache. In addition there was marked depression. On June 28, 1911, he received 0·3 grm. salvarsan; this was followed by a sharp reaction, temperature 103·6° F., a rigor and severe headache for half an hour. Though the rash and headache disappeared in a few days, the depression was unchanged. On July 10, 1911, he was given a second dose of 0·3 grm., and was discharged on July 13 with no active signs of syphilis. He was still suffering from depression. No mercury was given at any time to this patient.

While stationed at Kildare he suddenly experienced a severe
pain in the right ear, followed in a short time by complete paralysis of the right seventh and eighth nerves. When inspected on December 16, 1911, he was found to be suffering from complete facial paralysis and optic neuritis in both eyes. Hearing had improved in the right ear. He could hear a watch ticking at an inch, the normal distance at which the tick of the watch should be heard being 18 inches.

It will be noticed that the dosage of these cases, with one exception, was small, and the interval between the first and second doses long. Also that no mercury had been given to any of the cases after the "606." They belonged to the first hundred on whom the effect of salvarsan alone was tried, as already stated.

TERTIARY CASES.

Twenty-four cases of tertiary syphilis were treated. The average number of grains of mercury each had received was 16. This does not mean that the patient was neglected and did not receive the usual mercurial courses prescribed in the Army, but that one-third of the tertiary lesions (seven of the twenty-four cases) occurred within one year of the primary chancre. The largest mercurial dosage in any one case was 46 gr. grains.

The following are some of the most interesting of these cases:

No. 3, Private D., had been suffering from syphilis for fifteen months, and shown active disease for nearly a year. He came under observation on December 29, 1910, for salvarsan. The treatment up to this time, as shown on his Syphilis Case Sheet, was mercurial cream containing 16½ grains of mercury, iodipin eight injections, soamin 170 gr., and one course of Zittmann's treatment. His soft palate, tonsils, and naso-pharynx were represented by a huge sloughing ulcer. The movements of the jaw were limited to about half an inch. Speech was almost impossible, and consisted in a slur, difficult to understand. Iodides and mercurial injections had no effect, they were tried for one month before the arseno-benzol was given.

February 3, 1911.—He had his first injection of 0.4 grm. No reaction. Temperature was normal. Healing began within twenty-four hours, and was extraordinarily rapid; ten days later there was little granulating surface to be seen.

February 24, 1911.—Given 0.42 grm. salvarsan. No reaction. In the twenty-one days since the first dose he has gained 6 lb. in weight.
February 26, 1911.—He could eat and drink without holding his nose, which had been the only method of preventing regurgitation of food until February 14, 1911. He spake without difficulty, and could enunciate almost as well as a person with a normal palate. He could also open his mouth to the full extent. Discharged hospital in twenty-three days.

This case has been seen regularly, and without any further treatment has remained free from active signs. Wassermann reaction (Lieutenant-Colonel Birt's modification) was negative before and after treatment for nine months; it has since become positive.

No. 13, Lance-Corporal L., was transferred to the Royal Infirmary on December 29, 1910. He was suffering from perforation of the hard palate, the necrosis slowly extending along the middle line towards the incisor teeth. He had at the same time gummatous ulceration of the dorsum of the tongue and mercurial stomatitis. Anæmia and debility were pronounced. As this patient had a thorough course of mercury and iodides, it was considered that more good would result if extra food and tonics were given for a time, especially as he was sensitive to mercury. At the end of six weeks there was no change in the condition of the case. On February 12, 1911, he received 0·2 grm. salvarsan. The reaction was severe, viz.:—temperature 104° F., rigor and vomiting, followed by collapse. Next morning he felt and looked better. On February 22, 1911, 0·18 grm. salvarsan was injected; this was followed by a slight reaction only. All ulceration had ceased and the patient was discharged from hospital on February 27, 1911, free from active signs. Readmitted to hospital on April 13, 1911, with further palate ulceration. He had been taking alcohol to excess, and had lost 4 lb. in weight. He was given 0·4 grm. of salvarsan on April 13, 1911. Profuse bleeding from the palate and nose resulted two hours after the injection. Next morning the perforation of his palate, which before the injection had looked foul and sloughing, showed a clean granulating surface. In seven days the edge of the perforation was completely covered with epithelium. Discharged hospital in ten days.

He was readmitted two and a half months later with ulceration of the alveoli, gummatous periostitis, and necrosis of the two upper incisor sockets with loss of the teeth; these signs had been present for fourteen days. He was at once given an injection containing 0·2 grm. of salvarsan. Reaction—bleeding from the ulcerated surface. In the next week there was no further advance of the disease,
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and he was given a fifth dose of 0.2 grm. He complained of a pain in the chest for a short time after the injection. On July 18, 1911, he received a sixth dose of 0.2 grm. When about three-quarters of the dose had been injected, the patient complained of very severe pain in the back, which extended to both legs. The pain was so severe that he could not walk. Massage of the back and legs gave some relief, and the patient got back to bed. The pain recurred once or twice in a less degree during the next four hours. On the following morning he appeared to be quite normal. None of the other cases of the same day showed any reaction. During the following six weeks, iodides and half-grain doses of mercurial cream were given. The dead bone came away a month after the sixth dose of salvarsan. He was discharged hospital September 8, 1911.

What struck one in dealing with this man was the fact that on each readmission he showed marked signs of recent alcoholic poisoning. The dosage of salvarsan was small, but with the bad history of the case, and the broken-down condition of the patient, it seemed too risky to employ the quantity usually given to robust individuals. Lance-Corporal L. has been free from active syphilis for six months, without any further treatment.

No. 99, Shoeing-Smith P., was admitted to hospital with an injury to his left arm. He was thrown by his horse ten days before, and his arm was “pulled” by the reins as he endeavoured to hold the horse as he fell. There was a swelling like a haematomata in the biceps, with limitation of movement. In the course of a week this induration had involved the deltoide as well as some of the other muscles of the shoulder. There was nothing in his Medical History Sheet to assist in the diagnosis. He acknowledged that he had had a venereal sore some eleven years before, which healed so rapidly that he attached no importance to the abrasion. Examination of his blood by Lieutenant-Colonel Birt’s modification of Wassermann’s reaction showed a strongly positive result. On July 4, 1911, 0.3 grm. of salvarsan was injected. A sharp reaction followed with rigor and sweating. Within forty-eight hours the biceps was free, and could be moved through the normal angle, though previously he had been unable to raise his arm from his side further than a few inches. On July 12, 1911, the second injection of 0.3 grm. was followed by severe pain in the affected shoulder. Iodide of potassium was prescribed a few days after the dose of salvarsan. He was discharged in a month with complete movements of his arm, and nothing to be felt at the site of the gumma. On admission his weight was 148 lb., and in four
months he had added 29½ lb. No mercury had been given in the interval. In consequence of relapses among those who were treated by salvarsan alone he is now going through a course of mercurial injections.

The remainder of the cases of tertiary syphilis showed no points of any special interest. All reacted with wonderful rapidity to the drug. From the time that the dose was given a marked improvement was noted, even as early as twelve hours after. The average time from the injection to the healing of the gummata was 10·7 days. Some were septic on admission; this complication added considerably to the time in healing, as salvarsan has had no effect on the pyogenic organisms associated with the *Treponema pallidum*. One case in particular illustrated this point. He was admitted with multiple subcutaneous gummatous ulcers of both forearms, in a septic condition. On the same day he had 0·4 grm. of salvarsan. During the night the gummata became very painful and red. The following morning the dressing was saturated with pus and the forearms looked much worse than on admission. However, in a week the affected area had healed. In all the other cases which were not septic healing began within twenty-four hours.

**Relapses.**

Among 186 cases which have been kept under observation there have been nineteen relapses. All these occurred in the first 100 cases, that is, among those who were treated with salvarsan without mercury. No relapses have been met with yet in the second hundred (treated by the combined drugs). The shortest time in which a relapse occurred was fifty-five days. The longest, up to date, was nine months. Five of these had only one dose of 0·4 grm., three had 0·8 grm. in two doses, and one had two doses of 0·2 grm. It was evident that those who relapsed earliest were the alcoholic subjects. Under the impression that they were cured, they indulged in all sorts of excesses immediately after leaving hospital.

This was the history in three of the relapses. The other recurrent cases must be accounted for by the fact that too small a dose of salvarsan was given and that mercury was not used in the treatment.

The commonest relapses were mucous patches in the mouth or on the tonsils and condylomata. Recurrence on the skin did not occur in any of this series. The relapses affecting the special senses have already been referred to, under the heading of eye and ear affections.
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Hereditary Syphilis.

The above cases show that in acquired syphilis none have been refractory to the treatment. But in hereditary syphilis the experience of one case has borne out the observations of other observers, that interstitial keratitis does not respond to salvarsan. This is due in all probability to the anatomical difficulty of bringing the drug in close contact with the diseased cornea in sufficient quantity.

No. 15, Boy G., suffering from interstitial keratitis of four months' duration, was given 0.4 grm. of salvarsan on February 24, 1911, which was followed by no reaction. For six months following the injection there was no change in the cornea but since then he has been slowly improving under iodides and mercury. The dose was a comparatively large one for his age and weight. This completes the number of cases of syphilis treated by this drug 272, up to date.

Lymphatic Leukæmia.

One non-syphilitic patient suffering from this disease was injected as a last resort. No. 142, Boy C., was admitted into the surgical wards with a brawny induration, pain and stiffness of the right knee joint and pyrexia. He was profoundly anaemic, and a blood examination showed an advanced form of acute lymphatic leukæmia, symptoms of which he had had for three weeks. Blood count: Red blood-cells 1,250,000; white blood-cells 80,000, of which 96 per cent were lymphocytes.

On September 21, 1911, he was given 0.15 grm. salvarsan. During the administration of the dose the boy complained of severe pain in the chest, and nausea. The same evening his temperature was 105° F., but there was no further reaction. Next day his knee, which had been flexed before the injection, could be straightened, and there was no pain. In the following twenty-four hours all swelling had left the knee and free movement was carried out without discomfort or difficulty. Red blood-cells, 1,000,000; white blood-cells, 83,000. He vomited twice in the morning. The slight improvement in the boy's appearance was not maintained. The temperature fell to 99° F. for a few mornings, but rose to 103° F. at night. He was somnolent during both day and night. Red blood-cells, 900,000; white blood-cells, 43,000; 96 per cent lymphocytes; haemoglobin 20 per cent. Normoblasts were present.

On the eleventh day after he had received "606" he suffered from pain in the chest, and vomiting became more and more frequent. Temperature changed from the hectic type to continuous pyrexia.
The patient died on the morning of October 7, 1911, sixteen days after the administration of "606." Post-mortem examination showed that the cause of death was acute lymphatic leukemia, on which a general streptococcic infection had supervened.

This was not a fair test of the drug as the case was in the very last stage of the malady before he came under observation and treatment. Notwithstanding the rapid improvement in the knee condition, the enlarged glands of the body, were not diminished in size by the remedy.

CONCLUSIONS.

In common with other observers, our experience shows that salvarsan is a distinct advance in the therapeutics of syphilis. From a military point of view it is of great value, as the soldiers become efficient much sooner than when treated by mercury alone. The most important and encouraging fact is that the early treatment of the initial stage of syphilis prevents the onset of the secondary signs of the disease. If men could be induced to report themselves as soon as the disease becomes manifest, the prophylactic treatment by "606" would constitute an important advance in the treatment of syphilis.

The difficulty of getting hold of the cases early will persist as long as the present penalties are attached to those who have contracted venereal diseases. It would appear to be a justifiable conclusion that we have arrived at the stage when the routine use of the drug in the Army in all cases of syphilis should be recommended. In the selected lives met with in the services, very few would present contra-indications to the use of salvarsan.

As to the question of dosage. In the Royal Infirmary, perhaps an error was made in giving too small a dose in the early days. Now the routine is to administer two doses, each of 0·4 grm., or even a third dose with intervals of one week, followed by nine weekly injections of mercurial cream.

In conclusion, I wish to thank Lieutenant-Colonel Birt, R.A.M.C., for his valuable help and advice in carrying out the treatment, also Major D. J. Collins and Captain P. J. Hanafin, R.A.M.C., for their expert assistance in noting the progress of those cases of optic neuritis referred to in the text.