the red corpuscles numbered 2,070,000 per cubic millimetre, the haemoglobin was 45 per cent., and the colour index 1.1. He had four injections of neo-salvarsan (June 14th, 0.4 gram; July 2nd, 0.6 gram; July 16th, 0.6 gram; August 1st, 0.6 gram). Marked improvement in the general condition resulted, but the blood showed little change. On August 4th, 1913, the red corpuscles numbered 2,300,000 per cubic millimetre, the haemoglobin was 40 per cent., and the colour index 0.9. On August 12th, 1913, he was discharged from hospital feeling greatly improved.

After getting home he continued to improve. On February 19th, 1914, his wife wrote me: "The change for the better in my husband is most remarkable; he has been back to business since Christmas, and in his spare time plays golf. All my friends say he looks better than he has done for years." On December 30th, 1914, he was well.

Duration up to date since the salvarsan treatment was commenced, nineteen months.

Remarks.—The improvement, which at first was very slow, has been very striking.

CASE XVII.

Male (T. H.), aged 39, admitted to Chalmers' Hospital on July 27th, 1913. The disease was of one year's duration; previous treatment, arsenic by the mouth. Colour very yellow; feet and legs oedematous. On the day after admission the temperature rose to 102.6°; pulse 103. He vomited several times, was delirious, and apparently in a dying condition; the red corpuscles numbered 1,380,000 per cubic millimetre, the haemoglobin was 30 per cent., and the colour index 1.1. He had four injections of neo-salvarsan (August 7th, 0.4 gram; August 15th, 0.6 gram; August 25th, 0.6 gram; September 23rd, 0.6 gram). He slowly but steadily improved. He was discharged from hospital feeling very well on November 7th, 1913; the red corpuscles numbered 2,015,000 per cubic millimetre; the haemoglobin was 40 per cent., and the colour index 1.

On March 20th, 1914, the patient wrote me: "I now write to tell you of my wonderful improvement. I have got much stouter. I am enjoying very good health; I can walk three or four miles at a time. I am doing a lot of domestic work. Everybody about here is surprised at my improvement."

When seen at Chalmers' Hospital on April 11th, 1914, his weight was 12 st. ½ lb. (he had gained 3 st. since his discharge from hospital); the red corpuscles numbered 5,480,000 per cubic millimetre, the haemoglobin was 80 per cent., and the colour index 0.7. On December 27th, 1914, he was quite well.

Duration up to date since the salvarsan treatment was commenced, fifteen months.

Remarks.—This was one of the most successful cases which I have had. For several days after the patient's admission to hospital he seemed to be in a dying condition. On October 5th, 1913, 10 grains of boric acid, three times a day, were prescribed, with 4 minims of Fowler's solution. He continued to take this medicine for some time after his discharge from hospital.

CASE XVIII.

Female (Mrs. A.), aged 34, admitted to Chalmers' Hospital on October 15th, 1913. The disease was of eighteen months' duration; previous treatment, arsenic by the mouth. The red corpuscles numbered 1,270,000 per cubic millimetre, the haemoglobin was 40 per cent., and the colour index 1.4. She had two injections of neo-salvarsan (October 16th, 0.4 gram; November 4th, 0.6 gram). Great improvement resulted. She was discharged on December 20th, 1913; the red blood corpuscles numbered 3,360,000 per cubic millimetre, the haemoglobin was 65 per cent., and the colour index 0.87.

On March 15th, 1914, her doctor wrote me that she was not so well; after this, she rapidly relapsed, and died at the beginning of April, 1914.

Duration after the salvarsan treatment was commenced, five months.

Remarks.—In this case the immediate result of the treatment was great improvement, but a relapse and death speedily followed.

CASE XIX.

Male (A. C.), aged 44, admitted to Chalmers' Hospital on October 17th, 1913. The disease was of eleven months' duration, previously treated with arsenic by the mouth.

In November, 1912, he complained of stomach symptoms, for which the abdomen was opened on November 15th by Mr. Stiles; the appendix was found to contain two or three concretions, and was removed. The patient rapidly became weaker and more anaemic after the operation, though there was no loss of blood. On November 23rd I diagnosed pernicious anaemia; the red corpuscles numbered 1,450,000 per cubic millimetre, the haemoglobin was 55 per cent., and the colour index 1.8. He was treated with arsenic by the mouth. On January 3rd, 1913, when he was discharged, the red corpuscles numbered 3,390,000 per cubic millimetre, the haemoglobin was 80 per cent., and the colour index 1.1.

He continued fairly well until September, 1913, when the symptoms of pernicious anaemia returned. On October 17th, 1913, the red corpuscles numbered 1,600,000 per cubic millimetre, the haemoglobin was 50 per cent., and the colour index 1.5. He had three injections of neo-salvarsan (October 20th, 0.4 gram; November 1st, 0.6 gram; December 7th, 0.6 gram). He was discharged from hospital on December 17th, 1913, feeling very well. On February 23rd, 1914, he looked and felt extremely well; the red corpuscles numbered 4,600,000 per cubic millimetre, the haemoglobin was 90 per cent., and the colour index 0.97.

On January 9th, 1915, the red corpuscles numbered 4,320,000

per cubic millimetre, the haemoglobin was 85 per cent., and the colour index 0.99.

Duration up to date since the salvarsan treatment was commenced, fourteen months.

Remarks.—In this case great improvement resulted.

CASE XX.

Female (Mrs. W.), aged 43, treated in a nursing home. First seen May 17th, 1913. The disease was of two years' duration, but had been worse for three and a half months; previous treatment, arsenic by the mouth. On April 29th, 1913, the red corpuscles numbered 1,575,000 per cubic millimetre, the haemoglobin was 44 per cent., and the colour index 1.3. She had had arsenic continuously for a few weeks before coming under my observation. On May 22nd, 1913, the red corpuscles numbered 1,970,000 per cubic millimetre, the haemoglobin was 40 per cent., and the colour index 0.93. She suffered from very profuse menorrhagia. From May 28th to June 2nd and from June 25th to July 5th two "periods" occurred; both were very severe, particularly the latter. On July 14th the red corpuscles numbered 1,370,000 per cubic millimetre, the haemoglobin was 36 per cent., and the colour index 1.3.

Hysterectomy.—After anxious consultation with two leading gynaecologists and Dr. Lovell Gulland (who agreed with me that the case was a typical case of pernicious anaemia complicated with menorrhagia), it was decided to remove the uterus at the commencement of the next "period." The operation was most successfully performed on July 29th; the uterus was enlarged and fibroid; there was no loss of blood. For forty-eight hours after the operation the patient was extremely ill; she then recovered slowly.

She had four injections of neo-salvarsan (June 7th, 0.4 gram; July 8th, 0.6 gram; August 13th, 0.6 gram; September 1st, 0.6 gram). Remarkable improvement occurred as the result of the first three injections; no improvement followed the fourth injection. On August 29th the red corpuscles numbered 2,020,000 per cubic millimetre, the haemoglobin was 45 per cent., and the colour index 1.0. On October 12th, 1913, the red corpuscles numbered 1,620,000 per cubic millimetre, the haemoglobin was 43 per cent., and the colour index 1.3. The patient went home on October 13th.

After returning home she suffered severely from inflamed piles, relapsed, and died on November 30th, 1913.

Duration after the salvarsan treatment was commenced, five and three-quarters months.

Remarks.—In this case striking improvement resulted from the first three injections of salvarsan; the fourth injection seemed to do harm rather than good.

CASE XXI.

Male (W. R.), aged 62, admitted to a nursing home on December 25th, 1913, suffering from well marked pernicious anaemia and degeneration of the cardiac muscle. The anaemia was of one year's duration, during which time he had lost 3 st. in weight. The red corpuscles numbered 2,180,000 per cubic millimetre, the haemoglobin was 45 per cent., and the colour index 1.04. The heart was in a very unsatisfactory condition—very quick and irregular action with triple rhythm. He had one injection of neo-salvarsan (0.4 gram). He remained in the home for three weeks and did not improve. The condition of the heart was so unsatisfactory that it was decided not to repeat the injection. Mental symptoms developed. He returned home on January 17th, 1914. His mental condition gradually became worse and his heart more and more unsatisfactory; he died on January 26th.

Duration after the salvarsan treatment was commenced, one month.

Remarks.—In this case no improvement resulted from the treatment.

N.B.—Cases I, II, III, IV, V, VI, VII, VIII, IX, XI, XII, and XIII were more fully reported in the BRITISH MEDICAL JOURNAL, May 24th, 1913, p. 1093.

BENZOL THERAPY IN LEUKAEMIA AND
LYMPHO-SARCOMA.*

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DURING the last year I have had an opportunity of testing the reputed action of benzol as a useful therapeutic agent in leukaemia. I have now treated altogether four cases with this drug—one of myelogenous leukaemia, one of lymphatic leukaemia, one of lympho-sarcoma, and one of what was regarded as osteo-sarcoma.

The introduction of the drug and its mode of action have been very fully discussed in recent papers, many of which contain a full bibliography up to the date of publication. In consequence, I only propose to refer to those facts which it is essential to bear in mind in order that the reasons for employing the drug at all may be understood, and I will omit practically all reference to the literature of the subject.

In 1910 Selling reported in the Johns Hopkins

* A paper read before the Royal Academy of Medicine in Ireland.

Hospital *Bulletin* three cases of purpura haemorrhagica that had occurred amongst workers in a factory where benzol was largely used. Careful investigation of these showed that the clinical symptoms of benzol poisoning consisted of giddiness, headache, vomiting and diarrhoea, and purpuric eruptions. The blood picture showed a striking diminution in the number of the white cells, the polymorphonuclear cells being diminished out of proportion to the lymphocytes, and moderate red cell anaemia. Two of the cases proved fatal, and the most significant pathological lesion found was a striking diminution in the number of the white cells in the bone marrow. Experimental work, consisting of the subcutaneous injection of benzol into rabbits, showed that moderate doses produced in these animals a leucopenia and changes in the marrow similar to that described in the patients referred to, but did not injuriously affect the red cells. If the drug was pushed, ultimately red cell anaemia was produced.

Reasoning on the above stated facts, von Koranyi concluded that moderate doses of benzol might prove of use in cases of leukaemia. He put the matter to the test, and in June, 1912, was able to report a case of spleno-medullary leukaemia in which as a result of benzol therapy the white cells had been reduced within three months from 173,000 per c.mm. to 8,000 per c.mm. with concomitant general improvement.

The conclusions derivable from von Koranyi's cases and those of others may be summarized as follows:

1. Benzol first tends to increase the number of white blood cells, but shortly leads to an improvement of the leukaemic condition. The decrease in white cells is at first slow and later more rapid, and may proceed in an irregular manner. Once the decline in number of white cells has started, it tends to continue for some time, even if the benzol is stopped.

2. As the white cells diminish in number, the differential count both in spleno-medullary and in lymphatic leukaemia approaches more nearly to the normal, but as a rule some myelocytes persist in the spleno-medullary disease, and in the lymphatic form the lymphocytes continue to be excessive in proportion to the other white cells. In short, even when the total number of white cells is reduced to normal, the differential count shows the presence of some leukaemic characteristics.

3. The average dose of benzol that may be administered with safety is from 3 to 5 grams daily. It is best given in gelatine capsules, combined with an equal quantity of olive oil, which seems to lessen the tendency of the benzol to produce heartburn and gastric irritation.

4. The effect of benzol on the spleen in spleno-medullary leukaemia is variable. In some cases the spleen diminished almost to normal; in others, even when the blood picture is reduced almost to normal, the spleen remains large.

5. The ultimate result in apparently cured cases of leukaemia is still to be waited for. There is as yet no proof that the cure produced is of a permanent nature. One case of von Koranyi's was reported as quite well ten months after the cessation of the treatment.

The following is the record of the cases that have been under my care:

CASE I.—*Spleno-medullary Leukaemia.*

The patient, a married woman, aged 35, was sent to the Rotunda Hospital for treatment, on account of the existence of a large abdominal tumour, and through the kindness of the Master of the Rotunda she was transferred to my care on April 30th, 1914. She then complained of pain in the side, palpitation, fatigue, and inability to stoop owing to the pressure of the tumour in her abdomen. She stated that she had had no previous illnesses. She was the mother of five children, and had had two miscarriages, the last eleven months previously.

In December, 1912, she first felt a lump in her left side. She was then pregnant, and after the birth of her child in February, 1913, she noticed that the lump was getting bigger. It did not, however, trouble her much till early in 1914, when, owing to difficulty in stooping and breathlessness, she consulted a doctor, and was sent to Dublin for treatment.

On admission it was found that the spleen was enormously enlarged, practically filling the entire abdomen; some crepitations were audible at the base of the left lung; there was a heavy deposit of albumin in the urine, but no casts; the temperature was slightly raised; the patient's weight was 8st. 4lb. With the exception of the blood condition, which will now be dealt with in more detail, nothing else of importance was noted. A Wassermann test was negative.

The blood examination showed at once that the patient was suffering from spleno-medullary leukaemia. The red cells numbered 4,400,000 per c.mm. The haemoglobin was 40 per cent. and the white cells were 133,000 per c.mm. A differential count

of white cells was difficult owing to the enormous variety of cells present, but, as far as could be determined, the myelocytes numbered about 56 per cent. of the total white cells, a majority of these being of the myeloblast type. The actual count made at the time of admission gave the following figures:

	Per Cent.
Lymphocytes (large and small) ...	4.4
Neutrophiles ...	32.0
Eosinophiles ...	3.3
Basophile myelocytes ...	10.4
Eosinophile myelocytes ...	1.8
Myeloblasts ...	45.7
Nucleated red cells ...	2.4

100.0

On May 1st the benzol treatment was started, 30 minims being given daily in capsules with an equal quantity of olive oil. On May 8th the dose was increased to 60 minims daily, and on May 22nd to 90 minims daily.

On July 3rd the benzol treatment was stopped. On July 6th x-ray exposures of the spleen were started; these were given every second day until the end of the month—twelve treatments in all. They were then discontinued owing to our x-rayist being summoned to rejoin the army.

The progress of the case is best seen by reference to the following tables:

Date.	White Blood Cells.	Hb.	Red Blood Cells.	
May 1 ...	133,000	40 %	2,400,000	Benzol 30 m.
" 4 ...	136,000	—	—	" "
" 5 ...	135,000	—	—	" "
" 8 ...	132,500	—	—	Benzol 60 m.
" 11 ...	76,000	50 %	2,350,000	" "
" 18 ...	69,400	55 %	—	" "
" 22 ...	65,000	—	—	Benzol 90 m.
June 2 ...	26,500	—	2,650,000	" "
" 11 ...	24,000	60 %	—	" "
" 16 ...	25,000	—	2,950,000	" "
" 23 ...	18,500	65 %	—	" "
" 27 ...	9,375	—	—	" "
July 3 ...	8,260	65 %	3,800,000	" "
" 11 ...	7,500	68 %	—	X-ray.
" 16 ...	8,300	—	—	" "
" 22 ...	8,000	—	—	" "
" 25 ...	9,500	—	—	" "
Aug. 1 ...	7,600	—	—	" "
" 13 ...	7,100	75 %	4,175,000	" "

	May 1.	May 11.	May 29.	June 11.	July 3.	July 11.	Aug. 13.
Lymphocytes (large and small) ...	4.4	2.0	4.0	8.0	7.0	24.0	19.0
Neutrophiles ...	32.0	69.0	70.0	76.0	87.0	72.0	80.0
Eosinophiles ...	3.3	2.0	3.0	2.0	2.0	0.0	1.0
Basophile myelocytes ...	10.4	1.0	4.0	1.0	0.0	2.0	0.0
Eosinophile myelocytes ...	1.8	2.0	2.0	0.0	0.0	0.0	0.0
Myeloblasts ...	45.7	24.0	17.0	13.0	4.0	2.0	0.0
Nucleated red cells ...	2.0	0.0	0.0	0.0	0.0	0.0	0.0

From May 11th onwards many of the cells classed as myeloblasts showed some neutrophile granulations.

From the tables it will be seen: (1) That there was a slight increase of white cells immediately after starting the benzol, and that the later decrease of cells occurred in an irregular way. Within three days the drop from 132,500 to 76,000 took place; and, again, a sudden drop from 18,500 to 9,375 took place within four days; (2) coincident with the drop in white cells a slow but steady increase in haemoglobin and in red cells took place; (3) the change in the differential count was very striking. At the last examination made, and in several previous ones, not included in the table, no myelocytes of any form could be detected, and the blood picture was practically normal.

During the period that benzol was being taken the albuminuria cleared up completely. The urine during this time became quite dark when allowed to stand for twenty-four hours, due, presumably, to hydroquinone. On July 3rd, when the benzol treatment was stopped, although the blood was practically normal, the spleen was still considerably enlarged, extending almost half-way to the umbilicus. X-ray treatment was therefore started, and brought about rapid reduction. At the time of leaving hospital—August 14th—the spleen could be felt about a fingerbreadth only below the ribs. The patient then felt and looked perfectly well, but I, of course, await a report of her further progress. During her stay in hospital she had gained 5 lb. in weight.

CASE II.—*Nodular Lymphatic Leukaemia.*

This patient was of interest from several points of view. He was a labourer, aged 56, admitted complaining of weakness and of lumps in his groins.

When 36 years of age he had had rheumatic fever. During the second week of this attack the ankles became swollen, and later the legs, thighs, and abdomen. This necessitated his staying in bed for two months, and when he got up he noticed that the veins on the front of the abdomen were swollen. This venous swelling increased gradually and persisted up to the time of admission. His present illness started six months before he came to hospital. He began to suffer from pains in his legs and giddiness, and found lumps appearing in his groins, his armpits, and elsewhere.

On admission a large swelling was noticed under each eyebrow, there were enlarged glands on each side of the neck, in both axillae, and in the groins. In addition the glands in the popliteal space, and those at the elbow were enlarged, and numerous subcutaneous nodules were present, scattered here and there over the body. The mammary glands were very firm, hard, and swollen. The case, in fact, in these particulars is seen to belong to the group known as nodular leukaemia, the facial and mammary swellings being specially characteristic of this type.

The veins of the abdominal wall were enormously distended and tortuous, due presumably to thrombosis of the inferior vena cava, dating from the rheumatic attack of twenty years previously. There was a slight trace of albumin in the urine. The thorax appeared normal to both radiographic and other examination, as did the abdomen. With the exception of the blood, no other abnormality was detected anywhere in the body, and a Wassermann test proved negative.

The first blood examination made on April 26th gave the following counts: Red cells, 2,475,000 per c.mm.; white cells, 222,500 per c.mm.; haemoglobin, 58 per cent. Differential count: Lymphocytes, 97 per cent.; neutrophils, 3 per cent.

On this date, April 26th, benzol was administered in 60 minim doses daily; this was increased to 90 minims on May 9th, and on May 21st was discontinued.

The progress of the case as far as the blood was concerned can be seen best in the following tables:

Date.	White Blood Cells.	Red Blood Cells.	Hb.	
April 26 ...	222,500	2,475,000	58 %	Benzol 60 m.
May 2 ...	277,500	—	—	" "
" 6 ...	361,000	—	—	" "
" 9 ...	237,500	—	—	Benzol 90 m.
" 12 ...	198,000	—	—	" "
" 16 ...	57,000	2,500,000	63 %	" "
" 22 ...	37,700	—	—	Benzol stopped.
" 26 ...	28,300	—	—	" "
" 29 ...	26,000	—	—	" "
June 5 ...	18,300	2,800,000	65 %	Liq. arsen. 10 m. i.d.
" 11 ...	10,000	—	—	" "
" 20 ...	5,000	—	—	" "
" 26 ...	6,100	—	—	Liq. arsen. stopped.
July 2 ...	6,423	—	—	" "
" 7 ...	7,000	3,500,000	60 %	" "
" 13 ...	6,800	3,500,000	—	" "
" 24 ...	9,500	3,400,000	—	" "
Aug. 6 ...	8,100	3,250,000	—	" "
" 13 ...	7,200	2,725,000	62.5 %	" "
" 21 ...	12,500	2,600,000	—	" "

	Apr. 26	May 6	May 29	June 26	July 20	Aug. 13
Lymphocytes (large and small) ...	97	98	83	95	78	65
Neutrophils ...	3	1	17	5	22	34
Eosinophiles ...	0	1	0	0	0	1
Hyaline cells ...	0	0	0	0	0	0

From these it will be observed (1) that there was an increase in white cells almost immediately on starting the benzol, and that, as in the previous case, the subsequent decrease occurred irregularly—for example, the fall from 189,000 to 57,000 occurred within four days; (2) the decrease in white cells continued progressively after the benzol was stopped; (3) only very slight, if any, increase of red cells and of haemoglobin took place during the benzol course; (4) even when the white cells had been reduced to the normal number, the proportion of lymphocytes remained very much in excess of the normal. The increase of neutrophils to 34 per cent., as shown in the last count, was probably due to septic infection. It may be added that at first most of the lymphocytes were of the large variety, that soon after the benzol was started numerous degenerated cells, which could not be counted, were found in the films, and that later on the predominant lymphocytes were of the small variety.

Further points of importance in the case are as follows: Shortly after the benzol was started it was noticed that the lumps in different parts of the body were much lessened in size, and by the end of May the glands in the neck and axillae were completely gone. The subcutaneous nodules, with the exception of those under the eyebrows, also disappeared completely, and the facial ones became very much smaller. The groin glands became reduced to about one third of their original size, but never completely disappeared. The discontinuance of the benzol on May 21st was due to the onset of an attack of right sided abdominal pain, the diagnosis of which was uncertain, but which was believed to be either appendicular or due to gall stones. There was in addition much gastric disturbance, with thirst, so that it was thought possible that the benzol might be to blame. Subsequent examination, however, seems to show that the diagnosis of gall stones was correct. On recovery from this attack the patient felt much better. On admission he was with difficulty persuaded to leave his bed; he now got up, spent most of the day in the open air, ate well, and was anxious to go home. His urine still contained a trace of albumin, and during the period of benzol therapy, got quite dark on standing.

While in this condition, in the beginning of July, he got a gumboil, and all his teeth rapidly became septic and loose. I urged him to have them removed, but he refused, and it was only after ten days' pain that he consented. From this time on he went downhill. His temperature remained persistently about 100° F.; he developed a cough, with foul, purulent expectoration, and signs of a low septic pneumonia; and finally died on August 22nd. It is possible that the great diminution in number of his neutrophile cells rendered him an easy prey to septic infection.

Necropsy.

Only a partial post-mortem examination could be performed. The heart was flabby, and microscopically showed marked fragmentation; the lungs, especially the upper lobe of the left lung, showed much septic involvement, with gangrenous patches here and there; and several bronchial glands were enlarged to almost the size of a bean. In the abdomen the abnormalities noted were as follows: Both kidneys were in an advanced cystic condition, and presented numerous uric acid crystals scattered throughout their substance; microscopically there was advanced chronic interstitial nephritis. The spleen was rather enlarged and soft, and was found on section to be packed with lymphocytes; the liver appeared normal macroscopically; the gall bladder contained one large gall stone, and there were very extensive adhesions between the colon and the gall bladder; microscopically islets of lymphoid tissue were found throughout the liver in the fibrous tissue of the portal system. The lymph nodes of the colon were rather prominent, but otherwise the intestinal tract was normal; numerous lymph glands, whitish in colour, and of about the size of a bean, were found in the gastro-hepatic omentum and along the vertebral column. The inferior vena cava was with difficulty discovered; it was completely obliterated as far up as the renal veins, and was represented by a cord of fibrous tissue; the iliac veins were also obliterated, and were calcified.

The most interesting fact about this case appears to me to be that although a very striking improvement was effected at the beginning of the case no real disappearance

of the leukaemic symptoms was ever brought about. At the *post-mortem* examination excess of lymphocytes was found in several organs, and the blood throughout retained its leukaemic aspect as far as the differential count was concerned. At the same time the patient undoubtedly improved enormously coincident with the fall in total number of his white cells, and it was not till the septic infection alluded to had set in that his progress towards apparent recovery was interrupted.

CASE III.—*Lympho-sarcoma.*

P. G., aged 65, a farmer, was admitted on May 11th, complaining of lumps in his neck and of difficulty in breathing and swallowing. He stated that he had always been a healthy man until about seven months previously. He then noticed a swelling on the right side of his neck, and shortly afterwards found that his breathing at night was troublesome so that he had to sit up in a chair. He also began to be troubled with a cough, without expectoration, and by hoarseness, and before admission to hospital coughed incessantly day and night. Early in April he found difficulty in swallowing, and could only get down fluids.

On admission enlarged glands were found on both sides of his neck. On the right side these were very big, and practically filled up the entire space between the clavicle and the lower jaw; on the left side they were smaller. The veins on both sides were distended. In the thorax there was an area of dullness over the manubrium sterni, and extending slightly out on each side beyond the sternal margin. This dull area merged below with the cardiac dullness. The breathing was slightly stridulous, and on auscultation seemed very harsh all over the upper part of the thorax. An *x-ray* examination showed that the superior mediastinum was opaque to the rays, presumably due to the presence of a growth, and also showed an area of opacity extending on each side of the heart. In the abdomen nothing abnormal was found except slight splenic enlargement. The glands in the groins and axillae were palpable, and perhaps very slightly enlarged. Laryngeal examination by Dr. Graham showed slight paralysis of the right vocal cord.

The blood examination was as follows: Red cells, 3,210,000; white cells, 11,660; haemoglobin, 65 per cent. Differential count: Neutrophiles, 61 per cent.; lymphocytes, 31 per cent.; hyaline cells, 7 per cent.; eosinophiles, 1 per cent. Wassermann test negative.

The diagnosis made in this case was lympho-sarcoma. Not anticipating a favourable result, I did not have one of the neck glands removed for section. In consequence the diagnosis must remain open to doubt; but the picture of an intrathoracic growth, with enlarged glands in the neck and slight splenic enlargement, appears to me practically unmistakable, and in my own mind I have no doubt that the diagnosis was correct. Some may, perhaps, think that the case was one of Hodgkin's disease.

On May 13th benzol was started, and 60 minims were given daily up to June 2nd. The dose was then increased to 90 minims daily, and this was continued until July 3rd, when the drug was discontinued. An *x-ray* exposure was given every third day from May 15th to July 13th.

During the first three weeks in hospital the patient complained much of his breathing and of his cough, and felt a sensation of choking immediately on lying down. It was necessary to give morphine each night to give him relief. After the lapse of three weeks the glands in the neck were much smaller than on admission, and after a month they had completely disappeared. The dullness over the upper part of the thorax began to diminish, and a series of *x-ray* photographs seemed to indicate a gradual clearing of the intrathoracic opacity.

Symptoms also improved and by the middle of June the patient was quite free of cough, of hoarseness, and of difficulty of breathing.

On June 20th Dr. Graham again examined his larynx, and could then find nothing abnormal. On July 3rd a purpuric eruption suddenly appeared all over the body, with here and there urticarial wheals. This was regarded as a sign that the benzol had been pushed far enough; it was therefore discontinued and the skin eruption rapidly cleared up. The patient left hospital on July 16th feeling and looking perfectly well.

A comparison of radiograms taken on May 13th and on July 15th, and now exhibited, I think, leaves no doubt that the thoracic opacity had largely cleared up. Some opacity undoubtedly remains in the latter *x-ray*, but this could only be expected, as some fibrous change would probably accompany the disappearance of a lympho-sarcomatous growth.

During the course of the benzol treatment the white cells sank from 11,660 on admission to 4,000 per c.mm., but increased later to 6,000 per c.mm.; no change took place in the differential count, the red cells increased from 3,210,000 to 4,300,000, and the haemoglobin from 65 per cent. to 75 per cent.

In recording this case as a cured case of lympho-sarcoma the following queries arise, namely: (1) Was the diagnosis correct? This question has already been dealt with. (2) Is the cure permanent? The answer to this lies, of course, in the future. The patient promised to communicate with me at once if any symptoms returned, and so far I have not heard from him. (3) Was the benzol or the *x-ray* treatment the factor in bringing about the

improvement? This question, of course, cannot be answered. My own previous experience of *x-ray* treatment in both Hodgkin's disease and lympho-sarcoma is uniformly unfavourable.

I am therefore inclined to think that the benzol was the more important factor. The case seemed so serious on admission that I did not feel justified in employing benzol alone, as I felt that in so formidable a disease everything that could possibly be of value should be at once put in action.

CASE IV.—*Osteo-sarcoma.*

Encouraged by the result obtained in Case III, a course of benzol was given to a man sent me by Mr. Moore, with the statement that he was suffering from an inoperable osteo-sarcoma of the pelvis. The growth had spread into the groins and was rapidly advancing. The benzol was pushed over a period of four weeks, but no improvement was noted, and in consequence no further details of the case need be recorded.

In conclusion, I have contented myself with reporting these results without speculating on the way in which they are brought about. It appears to me probable, however, that the etiology of the disease may before long be solved through the therapeutic channel now opened out.

TRENCH "FROST-BITE."

SOME OBSERVATIONS ON CASES ADMITTED TO THE
DUCHESS OF WESTMINSTER'S WAR HOSPITAL,

BY

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AND

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EARLY in December last a number of men suffering from "frost-bitten" feet were admitted into the Duchess of Westminster's Hospital at Le Touquet, usually after a few days in a clearing hospital, and other cases have been admitted since. The following observations, taken from an analysis of these cases, seem to us worthy of record.

History of Onset.

Such a case as this may be regarded as typical:

CASE I.

Sergeant W. N. marched eight miles to the trenches, which he entered with wet feet. The trenches were very muddy; rain fell at first, frost occurred on the second, and snow fell on the third day. He woke on the third morning in the trenches to find his feet "stone cold" and numb. His feet continued numb although he walked about. He felt pain in them for the first time two days later, on marching to his billet six miles away, which he reached with great difficulty. There he took off his boots, changed his socks, and rubbed his feet, but did not wash them. He slept that night without pain, but the next morning his feet were so swollen that he could not get his boots on. He "reported sick." The feet began to be again painful after he had been in hospital for two days.

"Exposure to cold and wet" would be a more suitable name to apply to these cases than "frost-bite," for in some instances the feet were affected in the absence of actual frost. There were a few instances, too, in which the feet only began to show signs of being affected some days after the patient had left the trenches.

In the slighter cases, especially when the patient left the trenches after only two or three days' exposure, no swelling of the feet occurred, but only numbness followed by pain. In one of the severer cases, on the other hand, the swelling was said to have burst the bootlaces. In several instances the patient managed to remain on duty by wearing larger-sized boots.

The pain before admission was variously described as "burning," "throbbing," "like pins and needles," "like electricity." In two cases it was attributed to the "boots getting tight" and compared to "a tight string running up between the laces and across the ankle." Generally, the pains increased as the swelling diminished, when the shooting pains, described below, usually began. In a few cases, however, the pains in the toes were preceded by "cramps" in the legs and pains in the knees.

At this stage, when the boots were removed before or at the onset of swelling, the feet were found to be not only cold but often discoloured—that is, "dark blue," "black,"