

subject. Ehrlich could find only one case of this description in recent literature.⁹ At Sloane Maternity Hospital from 1892 to 1899 Ewing states that he saw many cases of severe anaemia but none of the progressive pernicious type.¹⁰ Ahlfeld, with a wide experience, could not report a single case following pregnancy (1898).¹¹

4. *Cancer*.—It has been often stated that cancer, especially cancer of the stomach, may give rise to the blood changes characteristic of progressive pernicious anaemia. Hunter, however, who has gone very fully into the literature of this subject, comments on the extreme rarity of such a connexion, as he was able to find only the following cases:—Quincke, 1 case; Eisenlohe, 2 cases; Letten, 1 case; Grawitz, 3 cases. He also states that these cases from the accounts given are not entirely free from question as to the character of the anaemia present.¹²

The following cases of severe anaemia associated with malignant disease will show that the blood changes are, as a rule, totally different from those of true pernicious anaemia.

Date.	Red Cells, per c.mm.	White Cells, per c.mm.	Hb.	Colour Index.	Pmn.	Lymph.	Eosines.	*N.	†M.	Diagnosis.
19/1/02	2,760,000	11,000	22.0	0.40	81.0	17.0	0.2	o	o	Cancer of stomach.
6/1/02	2,120,000	3,100	21.7	0.51	76.8	23.2	0.0	c	o	Cancer of stomach.
12/2/00	3,190,000	7,000	45.4	0.71	—	—	—	—	—	Lymphadenoma.
12/9/02	1,760,000	6,000	28.0	0.79	62.0	36.0	2.0	o	o	Malignant epulis.
13/8/02	2,480,000	9,000	41.4	0.82	65.5	34.5	0.0	o	o	Endothelioma (peritoneum).
28/2/03	2,180,000	6,900	38.8	0.89	70.0	30.0	0.0	o	o	Cancer of stomach.
17/10/00	2,060,000	38,500	37.0	0.90	92.2	7.4	0.4	o	o	Malignant disease of lung.
16/10/01	3,090,000	10,100	38.0	0.61	76.0	23.6	0.4	o	z	Hodgkin's disease.

* Number of normoblasts found in counting 500 leucocytes.

† Number of megaloblasts found in counting 500 leucocytes.

Considering, therefore, the extreme rarity with which the blood changes which are characteristic of progressive pernicious anaemia are associated with such causes of anaemia as haemorrhage, intestinal parasites, pregnancy, and cancer, and considering the fact that in the vast majority of cases such conditions produce an entirely different type of anaemia—namely, the secondary type—the question naturally arises, Are such cases, when they do occur, to be regarded as the direct result of the apparent cause, or is there not some additional factor which accounts for the departure of the condition of the blood of such cases from the secondary type of anaemia? The case which has been detailed seems to show that this additional factor was to be found in the malignant deposits in the bone marrow, and that there was a direct connexion between these deposits and the peculiar condition of the blood found in this case. In Epstein's case, which has already been referred to, Ehrlich has explained the condition of the blood as due to the direct stimulation of the remaining bone marrow by the tumour deposits. He also believes that the pernicious type of anaemia found in some cases of bothrioccephalus infection is the result of the action on the bone marrow of some specific poison generated by the parasite. I think that a similar explanation applies to the case that is now recorded, and probably to all secondary cases associated with the pernicious type of blood.

If this explanation be the correct one, this case has an important bearing on a much disputed point in the pathology of progressive pernicious anaemia; for, by inference we are forced to conclude that the changes found in the bone marrow in cases of progressive pernicious anaemia are an essential lesion of the disease directly accounting for the condition of the blood, and not, as some have supposed, of a secondary nature—the result of the severe anaemia.

REFERENCES.

- ¹ The Oedema of Anaemia, BRITISH MEDICAL JOURNAL, June 14th, 1902, p. 1464. ² *Histology of the Blood*, Ehrlich and Lazarus, Myer's translation, pp. 62-63. ³ Blutbefunde bei metastatischer Carcinome des Knochenmarks, Zett. f. klin. Med., 1896, vol. xxx. ⁴ Loc. cit., p. 115. ⁵ *Clinical Pathology of the Blood*, p. 84. ⁶ BRITISH MEDICAL JOURNAL, 1895, vol. i. ⁷ *Journal of Hygiene*, vol. iii, No. 1, pp. 95 to 156. ⁸ Loc. cit., p. 165. ⁹ Laache, Case IX. ¹⁰ Loc. cit., p. 178. ¹¹ *Lehrbuch d. Geburtshilfe*, Leipzig. ¹² *Pernicious Anaemia*, Hunter, p. 39.

MEDICAL MAGISTRATE.—Captain J. Booth-Clarkson, Reserve of Officers, District Surgeon and Health Officer, Alexandra County, has been appointed Justice of the Peace for Alexandra County, Natal, South Africa.

NOTE ON THE BODIES RECENTLY DESCRIBED BY LEISHMAN AND DONOVAN.

By MAJOR R. ROSS, F.R.S., F.R.C.S., C.B.,

Professor of Tropical Medicine, University of Liverpool.

(From the Johnston Tropical Laboratory, Liverpool.)

IN May, 1903, Major Leishman, R.A.M.C., described¹ certain small oval bodies occurring in smear preparations made *post mortem* from the spleen of a soldier suffering from low fever, chronic dysentery, and cachexia. The observation was made in London at the Military Hospital, and the patient had contracted his illness at Dum-Dum, near Calcutta. Leishman gave a very accurate description of these bodies. He said that they existed in large numbers among the spleen cells and red corpuscles; that they were round or oval, and 2 μ to 3 μ in diameter; that on staining with Romanowsky's method they were found to contain two masses of chromatin—a large circular mass or ring, and another smaller mass, "usually in the form of a short rod set perpendicularly or at a tangent to the circumference of the larger mass." The outline of the bodies containing these two masses of chromatin was faintly visible with this stain. The bodies were usually isolated, but occasionally aggregated into "clumps composed of twenty to fifty members." Regarding their nature, he thought it probable that they were the residue of trypanosomes of which the vibratile membrane had disappeared after death, leaving behind the nucleus and micronucleus shrunk together in a small mass, and quotes in support of this view the occurrence of similar *post-mortem* changes in the trypanosomes of dead rats.

In July Captain Donovan, I.M.S., stated² that he had already found the same bodies on April 9th, 23rd, and 24th in *post-mortem* smears from the spleens of three consecutive cases said to have died from chronic malaria in Madras. At first he thought that the bodies represented the long-sought-for resting stage of the malaria parasite, but, after finding them in two other cases, began to think that they were *post-mortem* degenerations of spleen cells. On reading Leishman's paper he recognized their similarity to the bodies described by that observer; and next was able to recover them in blood taken *intra vitam* from the spleen of a boy suffering from irregular pyrexia (June 17th). He remarks that this case excludes the possibility of the bodies being due to *post-mortem* changes, and adds that nothing resembling trypanosomata could be found in the boy's blood.

Captain Donovan was good enough to send me three preparations well stained by the Romanowsky method—namely, one preparation from his case of April 9th (*post mortem*), one from his case of June 17th (*intra vitam*), and a third dated July 4th from the splenic puncture (*intra vitam*) of yet another case. I have examined these carefully, and as there has already been considerable delay over them I think that the following brief notes should be recorded at once as a verification of the previous papers:

1. All these preparations contain bodies agreeing exactly with Leishman's description, and he himself admits the similarity after having been so kind as to examine the specimens.

2. In Donovan's specimen of April 9th (*post mortem*) the bodies number about 30 in a field and measure about 2.5 μ . They are disconnected from each other, but often lie fairly close together in groups of 10 or more. In the specimen of June 17th (*intra vitam*) they number only about 1 in 12 fields, but are slightly larger—up to 3.25 μ . In that of July 4th they are also large, and number about 1 in every field or so; while groups of from 2 to 12 of them can often be found embedded in what seems to be some kind of matrix which stains a faint bluish-grey colour, and which has an oval contour measuring up to 8 μ in the long diameter. Some of the bodies appear even to be intracorpuseular, but this may be due to accidental superposition.

3. Both large and small nuclear masses are almost invariably present, and both are always stained a deep vivid crimson. The smaller one is very often rod-like and pointed at the large one, just as Leishman describes, and stains somewhat deeper than it. The bioplasm is generally colourless, but its contour is reddish in the specimens made *intra vitam*.

4. In none of the specimens can I find either entire trypanosomes or the remains of dead ones, such as the characteristic flagella.

It is to be hoped that Major Leishman and Captain

onovan will be able shortly to elucidate the nature of these very interesting objects. Their size and shape and the arrangement of their chromatin are so constant and characteristic that it is scarcely possible to doubt that they are parasites of some kind, probably protozoa. For my own part, I find some difficulty in adopting Leishman's view that they represent involution stages of trypanosomes in the *post-mortem* spleen. He describes accurately such forms in the rat; but there, it should be carefully noted, the stained flagella are always present (with a successful Romanowsky technique) in addition to the macronucleus and micronucleus, and are, indeed, the last of the elements to refuse colouration. If, then, these bodies are nothing but disintegrating trypanosomes, we should certainly find a few of the flagella among them. Then, again, neither the large nor the small nucleus in the preparations seems to me to recall those of trypanosomes; and they are, moreover, approximated in a much more regular manner than, I think, we observe in dead trypanosomes.

Lastly, as Donovan observes, his two preparations made *intra vitam* exclude *post-mortem* changes altogether, and should, therefore, contain some unaltered trypanosomes. *Prima facie*, then, I am strongly inclined to think that we have to do with some quite novel organism. As it has already been found in eight cases of fever and cachexia, it promises to be a common and important one. The charts of two of Donovan's cases sent by him to me certainly recall the chronic pyrexia with enlarged spleen so frequently observed in India, and are, indeed, not a little suggestive of kala-azar.

REFERENCES.

¹ Leishman, On the Possibility of the Occurrence of Trypanosomiasis in India, BRITISH MEDICAL JOURNAL, May 30th, 1893, p. 1252. ² Donovan, *ibid.*, July 11th, 1903, p. 79.

FILARIASIS IN MAN CURED BY REMOVAL OF THE ADULT WORMS IN AN OPERATION FOR LYMPH SCROTUM.*

By A. PRIMROSE, M.B., C.M. EDIN., M.R.C.S. ENG.,
Professor of Anatomy and Associate-Professor of Clinical Surgery in the University of Toronto.

FILARIASIS is very rarely met with in Canada; in fact, I am unable to find the record of a single instance in which *filaria sanguinis hominis* has been reported. In the case at present under consideration the patient had for many years been a resident at Barbadoes, and had contracted the disease whilst living there.

The pathogenesis of filariasis is well known, and we may sum up the historical record of our knowledge of filariae as follows:

The embryo filariae were first discovered in the fluid of chylous hydrocele by Demarquay in 1863. Lewis showed that the embryos had their normal habitat in the blood of a man in 1872. Bancroft found an adult worm in an abscess in a lymphatic gland in the arm in 1876, and later four others in a hydrocele of the spermatic cord. Manson,¹ who studied the disease in China, was the first to observe a periodicity in the occurrence of the embryos in the peripheral blood; his paper was read before the Pathological Society of London in 1881. As early as 1877 he had suspected the mosquito (¹, p. 291) as playing the part of the intermediary host, and of transmitting the infection to man. In 1879 he demonstrated the life history of the parasite in the body of the mosquito *Culex ciliaris*. Low in 1900 observed and described the filariae lying in the proboscis of the mosquito. In 1901 Annett, Dutton, and Elliott,² whilst studying the disease on the West Coast of Africa, determined still more accurately the manner in which the mosquito parted with the parasite; they found that the filariae passed into the labium of the mosquito, and made its way from thence into the blood of man by rupture of a thin chitinous membrane on the upper surface of the labium. It would thus appear that infection is communicated to man by the bite of the mosquito. There is another possibility, though it is considered a remote one—namely, that drinking water may become contaminated by the dead bodies of mosquitos containing filariae, and thus infection of man may occur.

The victim of filarial infection does not necessarily suffer any inconvenience from the presence of the worm and the embryos; in fact it would appear to be the exception for pathological lesions to manifest themselves in persons thus infected. Annett, Dutton, and Elliott² found in some locali-

ties of the West Coast of Africa as many as 50 per cent. of the inhabitants infected; it was extremely rare to find these individuals suffering any inconvenience whatever; seldom was any diseased condition manifested. Nevertheless filariae are capable of producing disease; this may be brought about by the adult worms blocking the lymphatics and thus interfering with the circulation of the lymph. Occasionally, too, parent worms may die and in process of disintegration may produce local inflammatory trouble. Then, again, the embryo forms are, under certain conditions, responsible for disease. The normal embryonic filariae are apparently incapable of producing any pathological lesion whatever; they circulate freely in the blood and cause no disturbance of function, but immature ova have been shown by Manson to be a cause of trouble. Under certain conditions, probably in consequence of injury to the parent worm, immature ova are discharged in large numbers into the blood, and as a result pathological conditions subsequently manifest themselves. This is due to the fact that the immature ova cannot move as smoothly in the circulation; they are apt more particularly to block the finer lymph vessels, and then trouble ensues.

The filarial diseases which may thus be produced have been enumerated by Manson³ as follows: Abscess, lymphangitis, varicose groin glands, varicose axillary glands, lymph scrotum, cutaneous and deep lymphatic varix, orchitis, chyluria, elephantiasis of the leg, scrotum, vulva, arm, mamma, and elsewhere, chylous dropsy of the tunica vaginalis, chylous ascites, chylous diarrhoea, and probably other forms of disease depending on obstruction or varicosity of the lymphatics or on the death of the parent filaria.

The patient whose history I now record suffered from elephantoid fever, lymph scrotum, lymphadenitis, and abscess with varicose groin glands. The details of the case are as follows:

J. W. W., aged 47 years, a native of Barbadoes, West Indies, came under my care in the Toronto General Hospital on December 18th, 1900, in order to get advice concerning a swelling of the scrotum.

History.

He had lived in Barbadoes all his life with the exception of six or eight short trips which he had made to Canada and Europe. He gave the following history:

In 1881, when he was 28 years of age, he suffered from what he believed to be hydrocele, for the treatment of which both sides of the scrotum were tapped and fluid drawn off, after which iodine was injected. This apparently effected a cure. With the exception of the hydrocele he enjoyed perfect health and never had a serious illness of any kind until 1884, when on one occasion he became suddenly ill; an initial chill was followed by high fever and drowsiness. The chill was not repeated, but he was in bed for a week, the fever continuing, and there developed a painful swelling of the right leg below the knee; this gradually subsided and he fully recovered. He remained well for two years, when a similar attack occurred with exactly the same symptoms, but in addition, coincident with the occurrence of the chill, the glands in the right groin became swollen and tender. In subsequent attacks pain in the groin glands formed the first symptom and warned him of the approach of trouble. These attacks occurred at long intervals for the next few years: an interval of a year or eighteen months would pass without one. During an attack in 1891 an abscess developed in the calf of the right leg; this was opened and subsequently healed up without much trouble. At this date the scrotum first began to be affected and to swell up during the attack, and this became a feature of all subsequent seizures. At first the scrotal swelling would go down after the attack, but soon permanent thickening resulted. From October, 1899, until March, 1900, he had a series of successive attacks in Barbadoes: they were more severe than he had previously had. In all, seven attacks occurred during the six months mentioned. In one of them he had a severe rigor which lasted half an hour.

The patient never suffered an attack whilst in a cold climate, and hence during his visits to Northern Europe and Canada he has been free from the trouble altogether. A curious fact is that, in spite of the series of attacks such as I have described, filariasis had not been suspected, and he had never had his blood examined until he came under my care in Toronto. The history, too, would indicate that he had been a victim of the infection for sixteen, possibly for twenty, years.

Condition on Admission.

The whole scrotum was greatly thickened. There was sufficient enlargement to form a heavy, somewhat flabby mass about three times the normal size. He supported the scrotum in a flannel bag when he walked about. The enlargement diminished slightly after he had been lying down for some time, but there always remained a considerable amount of permanent thickening. The tissues of the scrotum had a thick, indurated, leathery feel on manipulation, and there was some additional enlargement in the region of each testicle. On the right side there was a nodule about the size of an almond apparently in the epididymis. The condition about the testicles might have been due to the hydrocele from which the patient had suffered in 1881.

Examination of Blood.

On my first examination of the patient I suspected that I had to deal

* Read before the Canadian Medical Association at Montreal.