

bone-marrow smears were noted before and after the injections.

The normal bone-marrow consisted of a large number of fat vacuoles and scanty cellular element. The cells were mostly megaloblasts with few normoblasts, erythroblasts, and erythrocytes. After the course of injections, the fatty nature of the bone-marrow has almost disappeared due to the increased formation of new erythrocytic centres. The cells were found to be mainly normoblasts with a few megaloblasts and erythrocytes.

Discussion

The results described show a fall in the reticulocyte count soon after the injections and then a gradual increase reaching its maximum by about the fifth to the sixth day. The initial fall in the count may be due to a factor in the saliva which hastens the maturation of most of the reticulocytes. The same factor or some other factor may stimulate the bone-marrow, resulting in the maximal production of reticulocytes. Castle and his co-workers demonstrated that the intrinsic factor is present only in gastric mucosa and not in saliva. The reticulocyte response and the symptomatic improvement noticed by Tempka in patients with pernicious anæmia after the oral administration of large quantities of saliva is suggestive of the presence of some hæmopoietic factor in saliva. The results obtained are in close agreement with Tempka. The marked reticulocyte-count increase in the peripheral blood, the increase in the erythrocytic centres in the bone-marrow and the greater preponderance of normoblasts over the megaloblasts after a course of injections are all

suggestive of the presence of a hæmopoietic factor in human mixed saliva.

This investigation was carried out in the Central Institute of Physiology, Medical College, Madras. I am grateful to Dr. M. A. Basir for suggesting the subject and also for the guidance throughout the investigation. My grateful thanks are also due to Dr. B. T. Krishnan for his helpful suggestions and kind permission to submit this paper for publication.

Summary

1. After stabilizing pigeons as to their weight and reticulocyte count, they were given a course of six injections of fresh human mixed saliva intramuscularly.

2. After the injections, the reticulocyte count in the peripheral blood had increased from about 8 to 18 per cent.

3. There was an increase in the hæmogenetic centres in the bone-marrow of the femur after the injections.

4. The great increase in the normoblasts of the bone-marrow was also noticed after the injections.

5. These are suggestive of the presence of a hæmopoietic factor in the human mixed saliva.

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[Note.—Muller's observations on the specific response of pigeons to the hæmopoietic factor have not been confirmed. The experiment reported above is entirely uncontrolled and the fact that fresh saliva was used seems to lay the experiment open to grave criticism. Nevertheless, we consider that the findings are interesting enough to be reported briefly.—EDITOR, *I. M. G.*]

A Mirror of Hospital Practice

INDUCED MALARIA WITH HEAVY MALIGNANT TERTIAN INFECTION

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RAM LAL, a Hindu male, 45 years old, was admitted into the Carmichael Hospital for Tropical Diseases on 27th February, 1941, for malaria therapy. His lower extremities showed signs of great weakness. Examination of blood showed a moderately positive Wassermann reaction. Physical examination revealed the following findings:—Tongue coated; lungs moist and dry sounds all over both lungs; liver slightly enlarged; spleen not palpable; heart nothing abnormal noted; bowels loaded; lower extremities, signs of great weakness in both.

Knee jerk absent on the right and somewhat brisk on the left. Pupils eccentric but react to light and accommodation; gait, tabetic; ankle jerk, absent. The patient was suffering from tabes dorsalis and malaria therapy was advised.

The patient was injected on 28th February with 10 c.cm. of blood showing a scanty infection of benign and malignant tertian parasites, but there was no sign of fever for three weeks. On 23rd March he was given an injection of adrenalin chloride but this also failed to bring about any pyrexia. On 27th March he was re-inoculated with 10 c.cm. of blood showing a moderate infection of *Plasmodium falciparum*. On 29th the patient first showed signs of a rise of temperature but an examination of the blood showed no malaria parasites. The temperature, however, persisted in an intermittent form and on 3rd April, examination of blood revealed the presence of scanty malignant tertian rings. This intermittent temperature persisted more or less daily and the blood also showed scanty malignant tertian rings until 9th April on which day a moderate infection was noticed in the blood (roughly one ring in alternate fields). Spleen was found to be slightly enlarged. The intensity of infection remained like this until 10th April but on 11th we found that

between 30 and 40 per cent of the red cells in a field were infected with rings.

The physical examination at this stage revealed the following:—Pulse—soft, 140 per minute; respiration—40 per minute; lungs—rough, dry and moist sounds all over, especially marked on the right side. The patient was having great difficulty in breathing. Heart sounds very feeble; abdomen slightly distended; spleen—palpable; temperature—104°F. Patient was quite conscious but very restless.

The patient was given 7½ grains of quinine bi-hydrochloride dissolved in about 20 c.c.m. of water by the intravenous route, injection being given very very slowly. One hour after the injection examination of blood smears showed only 2 or 3 rings per field, but the general condition of the patient still caused anxiety. The pulse was small and rapid and there was a considerable amount of respiratory distress. The patient, from the beginning, was put on rum, 2 drachms every two hours and glucose by mouth; injections of cardiazol, and strychnine-digitaline were also given. He was given oxygen and an injection of atropine was also given for the respiratory difficulty.

Examination of blood smears every hour showed a gradual increase in the number of parasites and five hours after the injection of quinine 4 or 5 rings were noticed per field. Quinine bi-hydrochloride (7½ grains) was given by the intramuscular route. The condition of the pulse appeared to improve and the temperature came down to 99.6°F., the patient perspiring profusely. Oxygen, glucose and rum were continued.

On 12th April the condition of the patient was slightly better, temperature went up to 101°F. and blood smears showed 5 or 6 rings per field. The patient was put on quinine sulphate, 5 grains three times a day by mouth. The temperature persisted throughout the whole day and night. The highest temperature on the 13th was 102.6°F., blood smears showing 2 or 3 rings per field with very scanty crescents. The condition of the lungs was much better and the respiratory distress was much less. The pulse and respiration ratio varied from 120/40 to 140/36.

On 14th April the temperature came down to 99°F. and blood was showing scanty rings and a fair number of crescents. There was considerable improvement in general condition, pulse had good volume and there was practically no respiratory distress.

On 15th April temperature came down to 98°F., pulse attained normal tension and examination of blood showed very scanty rings and a large number of crescents. The administration of quinine by mouth was stopped, the patient having had 9 doses in all (45 grains).

On 16th April the temperature was normal and the general condition was much improved. Blood smears showed rings in thick film only and a large number of crescents were observed.

On 17th April temperature was subnormal. Blood showed fair number of crescents but no rings were detected in thick and thin films. The patient's condition was quite normal.

Discussion

The senior author (Chopra, 1936) has been using artificial infection with malaria in the treatment of neuro-syphilis for many years with beneficial results. In temperate climates the method of choice is to transmit the disease by infected mosquitoes. In India, however, cases of malaria are always available and injection of infected blood is more convenient. Further in non-malarial countries *Plasmodium vivax* is always used for malaria therapy, but our experience in India is that it is not always possible to induce infection with this species, probably on account of the immunity which a large number of people have against this parasite, because of the frequency of its occurrence. The senior

author has, therefore, often used blood infected with *P. falciparum* with which infection is more readily established, the patient being kept under careful observation all the time by examination of blood once or twice daily, as soon as the infection is established.

So far no untoward results have been observed and 8 to 10 paroxysms of fever could be given without any difficulty and danger to the patient. In this patient two injections of infected blood had to be given and it is possible that the extraordinarily heavy infection which suddenly developed was due to the summation of effects of the two injections. It will be observed that after this first injection there was an appreciably long incubation period and it is likely that the second injection served the purpose of exciting the previous one, as well as producing its own effects.

The second point of interest in this case is the ready way in which infection produced by direct inoculation of blood is controlled by quinine. Here 7½ grains of quinine intravenously brought the number of parasites from 30 to 40 per field to 2 or 3 per field in one hour. The effect of a single intravenous injection, however, lasts for a short time on account of rapid excretion of the drug. Hourly examination of the blood films in this patient showed an appreciable increase in the number of parasites per field within five hours and an intramuscular injection of seven and a half grains of quinine, and later quinine by the mouth had to be given.

The increased vulnerability of parasites given by direct inoculation of blood compared with natural infection by mosquito bites was also demonstrated in this case. Chopra and Das Gupta (1936) showed a definite increase in the number of parasites in natural infection with *P. falciparum* after an intravenous injection of quinine. In this case there was not only no increase but in one hour the parasites were reduced from 30 to 40 per field to 2 or 3 per field.

In our cases of induced malaria in the Carmichael Hospital for Tropical Diseases in case of *P. vivax* infection by direct inoculation of blood, five grains of quinine usually suffice to get the infection under control, but in *P. falciparum* much larger quantities have to be used.

The last point is the peculiar rough, moist and dry sounds which were heard in the lungs during the height of infection. Were these adventitious sounds due to accumulation of parasites in the lung capillaries, or were these severally the result of very laboured respirations? As these disappeared as the number of parasites decreased it is possible that parasites had something to do with it.

This case should serve as a warning to those using malaria therapy in this country by direct inoculation of blood. It is not uncommon to get mixed infections and in spite of all precautions *P. falciparum* may be grown with *P. vivax* and may suddenly flare up.

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INTERSTITIAL KERATITIS DUE TO FOCAL SEPSIS

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THE majority of cases of diffuse interstitial keratitis occur in congenital syphilis. Other but rare causes are acquired syphilis, tuberculosis, trypanosomiasis and leprosy. A unilateral post-influenzal parenchymatous keratitis has been recorded by Doggart (1931). Duke-Elder (1938), in an extensive review of the literature, makes no references to focal sepsis as a primary factor in the aetiology, but the following case seems to indicate that focal sepsis may be a rare cause.

History.—Anglo-Indian, male, aged 29 years, telegraphist. According to the patient, in the winter of 1936-37, he suffered from an attack of epiphora, photophobia and dimness of vision in the left eye which responded to treatment in about two months. He states that he had no further trouble until October 1939 when one eye, and soon after the other, became inflamed, causing him an intense epiphora and photophobia. Atropine and hot bathing gave little relief and for eight months he was only able to work occasionally. His general health had otherwise been good; he had malaria two years ago for which he had been given a full course of quinine and plasmochin. No history of allergic disease in either the patient or his family could be elicited.

Examination.—The writer (E. J. S.) first saw him in May 1940 and he presented the following picture:—

Right vision 3/60. Left vision. Counts fingers at 2 feet. Photophobia was so great that he could not tolerate the light of an indoor room and kept the eyes covered with a bandage. Epiphora was intense and was one of the main features of the case, being so marked that on raising either upper lid tears actually poured out. Both corneae showed signs of inflammation, characterized by a diffuse grey haziness, denser in some areas than in others, but involving the whole of the interstitial tissue. There was no deep vascularization perceptible to examination with a loupe. The surface of the corneae appeared normal and there was no staining with fluorescein or any superficial vascularization. There were no signs of trachoma. Tension was normal. Corneal microscopy was not available but with the loupe the inflammatory process appeared to be confined to the interstitial tissue. There was no K. P. but a moderate amount of ciliary and conjunctival congestion were apparent. There was no discharge on bandaging the eyes for twenty-four hours.

On 21st May he was admitted into hospital for investigation, he was kept in bed and atropine drops and hot fomentations were given. This treatment had little effect upon the disease process. The Wassermann and Kahn reactions were negative. Ears, nose and throat were reported normal. Physical examination revealed no other abnormality. X-ray of the chest was normal.

Dental report (F. H. R. D.) was as follows:—

Superficially the mouth appeared to be clean. A small amount of tartar was removed from the lingual aspect of the lower incisors. 62/ and 456 were very loose and pus could be expressed from the gingival margins of these teeth. 76/ were slightly loose. X-ray

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of the loose teeth showed rarefaction areas around the roots especially marked in the region of 2/. It was considered that these teeth might be subscribing to the eye condition and their extraction was recommended. Extractions were completed under Evipan anaesthesia on 10th June. Sockets were curetted and healing was uneventful.

Following dental operation, a dramatic change took place in the eye condition. In a few days the epiphora had almost ceased and at the end of a week the photophobia had disappeared. On 21st June the ciliary congestion was no longer present. In view of the immediate improvement following the extractions a further critical examination of the mouth condition was made. It was considered that 5/46 were very slightly loose and x-ray showed a small degree of apical absorption. These teeth were therefore extracted under nitrous oxide anaesthesia on 28th June and the patient left hospital on 2nd July with 6/15 vision in each eye.

Progress.—The corneae continued to clear and by 10th September, three months after operation, there were no corneal opacities visible to examination with the loupe and the vision was 6/6 in each eye. There has been no further trouble to date (March 1941).

Discussion.—It is just possible that the dental extractions coincided with a spontaneous remission of the disease, but in view of the long history, the lack of response to atropine and hot bathing, and the dramatic response to dental extraction, it would appear that the dental sepsis in this case was the cause of the interstitial keratitis.

Summary.—A case of interstitial keratitis due to dental sepsis is recorded. Intense epiphora was a marked feature of the case.

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A RARE CASE OF DERMATALGIA

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THE following case may be of interest owing to the rarity of the condition and the dramatic improvement in the state of the patient:—

A farmer, aged 28, was admitted into the Sassoon Hospitals, Poona, on 15th February, 1941, for severe burning sensation in the feet of 2½ months' duration. He was brought to the out-patients' department on a stretcher as he would not put his feet to the ground for fear of the burning sensation that would be increased thereby. He was admitted as a case of some disturbance of the sympathetic nervous system. On admission, it was found that he had severe burning sensation in both his feet, particularly in the soles, so intense that he could not bear even contact with light clothing. The complaint started suddenly, without any obvious cause about 2½ months back, and is continuing with the same intensity. He was treated in an ayurvedic hospital without any relief, for about a month. On examination, it was found that there was no change in the colour of the skin nor in the temperature of the affected part compared with the rest of the body. His hands were cold and clammy and he wore gloves to keep them warm. There was no history of alcohol, syphilis or leprosy in the family. There was no history of any change in the environment to precipitate this trouble. He had malarial fever for about a week 1½ years back. There was no objective evidence of disturbance of his nervous or other systems. Lumbar