THE CLINICAL SIGNIFICANCE OF THE BLOOD-FILM

ABSTRACT OF A LECTURE TO THE FELLOWSHIP OF MEDICINE (M.R.C.P. COURSE).

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The object of this lecture is to summarise the conditions in which the examination of a blood-film is of value in diagnosis and as an indication for treatment. In some cases it is desirable also to perform a total count of the cells and estimation of the haemoglobin content, but the count itself is of no value without accurate study of the histology of the corpuscles in a well-stained film.

The value of this investigation depends on two facts. Firstly, the different blood-cells are not separate entities, but descendants of a common ancestor; and secondly, the various noxae and stimuli which affect the haemopoietic organs in disease are combated by these organs in different ways. It is, therefore, possible, by observing the variations from the normal in regard to the proportion of the different cells present, to form some idea of the nature of the attack, and then, by noting the extent to which a shift towards primitive forms is found, to estimate the strength of the resistance thereof. The blood-film is, therefore, valuable both in diagnosis and prognosis, and its significance goes further than mere detection of the so-called diseases of the blood. Strictly speaking, it is as incorrect to talk...
about "diseases of the blood" as it would be to describe renal lesions as "diseases of the urine." It is the condition of the hæmopoietic organs that is important.

In normal blood we recognize four main types of cell: erythrocytes, polynuclears, lymphocytes and hyalines. Eosinophilia is now regarded as a chemical change that may affect various types of cell, so we do not describe the eosinophile as a separate entity.

Primitive forms of cell are not found in normal blood, though they are present in the hæmopoietic organs. The erythrocytes are descended from the original "stem" cell, through the different types of nucleated red cell, the polynuclears through the myelocyte group and myeloblast, and the lymphocytes through the lymphoblast. The exact origin of the hyaline cells is still doubtful, but as these are not of much significance in common diseases, the point is of no great clinical importance.

In health, the erythrocytes are produced in the red bone-marrow, the polynuclears in the white marrow and the lymphocytes in the lymph nodes. Whatever the intermediate stages may be, all blood-cells are ultimately derived from the endothelial cells of the blood-vessels of the part.

The normal blood-picture for an adult is roughly as follows: Erythrocytes 5,000,000 to 7,000,000 per c.mm.; total leucocytes 8,000 to 9,000 per c.mm.; differential count: polynuclears 65 per cent., large lymphocytes 15 per cent., small lymphocytes 15 per cent., hyalines 3 per cent., eosinophils 2 per cent.; blood-platelets 300,000 per c.mm. In children and old age the relative proportion of lymphocytes is some 10 per cent. higher.

Coming now to the clinical application of these principles, there are four main conditions in which a blood-film is of utility.

(a) Pyrexia.—Here it is of importance to know whether we are dealing with a coccal or a bacillary infection. Having excluded the exanthemata, the chief coxal lesions may be grouped under the head of septic infections, but the focus thereof is not always clinically manifest, as it may be present in an internal organ, such as the heart, lungs, liver, spleen, intestine or appendix. Bacillary infections comprise tubercle, the typhoid-paratyphoid food-poisoning group, and systemic infections due to the varieties of Bacillus coli. In the coxal group we get a predominance of polynuclear cells, and if the resistance is low, myelocytes as well. The total count is usually raised, but in very severe infections it may be normal or even subnormal. In the bacillary group, the total count is lowered and lymphocytes predominate, lymphoblasts being present in severe cases.

The importance of the distinction is often seen in cases of continued pyrexia with vague abdominal symptoms, and may enable a diagnosis of enteric fever to be made at an early stage before the Widal reaction is positive.

(b) Chronic Apyrexial Infections.—These are numerous and a purely clinical diagnosis is often impossible. Perhaps the most common are rheumatoid arthritis and the various forms of severe malaise. If the coxal picture is found, such foci as teeth, tonsils, accessory sinuses and the ear are suggested, while with a bacillary picture, the intestine, kidneys and bladder are most likely, though care may be necessary to exclude tuberculosis.

(c) Anaemia.—Here we have to distinguish between the primary diseases, of which pernicious anaemia is the most important, and the secondary anæmias, the latter being due either to deficiency of hæmoglobin, haemorrhage or bacterial infection. In regard to the latter, the aforesaid principles apply, but it is worth noting that bacterial infection often escapes notice owing to the blood not having been examined. If it is present and the signs are found in the white cell series, the administration of iron alone is almost valueless, and combating of the
systemic infections by vaccine therapy is indicated.

With regard to pernicious anaemia, time will not permit of the discussion that the subject deserves, but the essential features in the blood are a lowered erythrocyte count, a colour index of 1.0 or over, an increase in the average size of the red cells, with presence of embryonic erythroblasts of the type peculiar to this disease. These cells are easily recognized by an experienced observer and are similar to those found in the islets of Pander on the walls of the yolk sac of the embryo, and in foetal liver. They are quite distinct from the normoblasts and macronormoblasts present in the bone marrow, though these latter may be and often are present also in pernicious anaemia. Leucopenia is markedly present, with a relative lymphocytosis.

In secondary anaemia, on the other hand, while the total red cell count may be diminished, and always is in severe cases, especially those due to hemorrhage, normoblasts and macronormoblasts may be present, but the embryonic erythroblasts are absent, the colour index is lowered to 0.6 or less and the average size of the red cells is not increased. Carcinoma generally gives rise to the blood-picture of septic infection.

Inequality in size and shape of the red cells is found both in pernicious anaemia and severe cases of secondary anaemia due to hemorrhage or sepsis.

The rare condition known as aplastic anaemia should be mentioned here. The features are a marked diminution in the number of all the cells, with absence of primitive forms, the differential count usually showing no histological abnormality. It is sometimes seen as the terminal stage of sepsis or haemorrhage, but it is more often a primary disease, the exact causation of which is at present unknown. It is sometimes due to excessive doses of X-ray or radium.

(d) The Leukæmic group. Here there is no difficulty in diagnosis if the blood be examined. There is a large increase in the total and relative number of the granular cells in the spleno-medullary type, and of the lymphocytes in the lymphatic variety, with a shift towards primitive forms, which becomes more prominent as the disease progresses.

This is often so marked that in the terminal stage it is sometimes difficult to say whether the disease was originally myeloid or lymphatic, the blood-picture consisting almost entirely of ancestors of both forms.

(e) The Purpura group.—Here we have haemorrhages into or underneath the skin, with bleeding from mucous membranes or internal organs. The two main causes of this are platelet deficiency and bacterial infection. In the former group (essential thrombocytopenia haemorrhagica) the platelets are reduced to 50,000 per c.mm. or may even be practically absent, so that only two or three are seen in a whole slide. The importance of this observation lies in the fact that splenectomy is usually the only successful treatment whereas, in bacterial infection, the operation is almost always fatal and is contra-indicated.

The lecture was illustrated by drawings of the cells referred to and by diagrams and charts showing the various methods of blood formation.

A LECTURE ON CRIME AND INSANITY.

GIVEN AT THE MAUDSLEY HOSPITAL, APRIL 30, 1929.

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The association of crime with mental deficiency or insanity may become a matter of importance to the family physician as well as to the alienist, for both may be consulted.
The Clinical Significance of the Blood-Film

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doi: 10.1136/pgmj.4.47.185

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