Spleno medullary leuchaemia : being a clinical lecture delivered at Guy's Hospital on January 20th, 1900 / by J.H. Bryant.

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SPLENO MEDULLARY LEUCHÆMIA.

BEING

A Clinical Lecture delivered at Guy's Hospital on January 20th, 1900,

BY J. H. BRYANT, M.D.

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9.

SPLENO MEDULLARY LEUCHÆMIA.

GENTLEMEN,—I have a patient suffering from Spleno Medullary Leuchæmia under my care in John ward at the present time, and I have chosen this case as the subject for my clinical lecture to-day. I will first read you an account of the case, derived from the carefully prepared report of Mr. Greenfield, and will then demonstrate to you the physical signs and discuss the diagnosis.

The patient is a man, fifty-five years of age, a cooper, who was admitted under my care on January 9th, 1899, for swelling of the abdomen and pain in the left flank. The family history does not reveal anything of importance.

Personal history.—He has worked as a cooper ever since he was seventeen years of age. He has been a heavy drinker, taking from five to six pints of beer per diem. He has never suffered from syphilis, he has not been abroad and has not suffered from malaria.

Previous illnesses.—He states that he has been feeling out of sorts for quite a year. About July last he noticed that his abdomen was swelling, and a few weeks afterwards he had slight pain in his left side. In August the pain became more acute, he was also short of breath, and, in consequence, had to give up his work. He was treated by a doctor for a short time, and was then recommended for hospital treatment. On October 25th he was admitted under Dr. Pitt into John ward. His abdomen was distended, and an abdominal tumour was found

on the left side similar in character and extent to what he now has. An occasional rub was then heard over the tumour when he took a deep breath. The urine was 1020, and contained a trace of albumen. He did not look pale. The blood was examined with the following result:—

Hæmoglobin, 50 per cent.
Red corpuscles, 76 per cent., *e.g.*, 3,800,000 to c.m.
White corpuscles, 222,500 per c.m.
Differential count of the white corpuscles.
Myelocytes, 41 per cent.
Polymorphic cells, 45·1 per cent.
Eosinophilic, 2·8 per cent.
Lymphocytes, 11·87 per cent.

He was treated with quinine and arsenic, and improved considerably. Dr. Pitt diagnosed Spleno Medullary Leuchæmia.

After his discharge, on November 11th, he felt so much better that he thought he was cured. Three weeks afterwards he again had pain in his left side, and he became short of breath. His feet have slightly swollen, and he has lost two stone in weight. There is no history of any hæmorrhage of abnormal character.

Condition on admission.—January 9th.—He was rather emaciated. The lips and the mucous membrane of the gums were pale. There was no swelling of the feet. The abdomen was distended, and a large tumour could be felt on the left side presenting the characteristic signs of a splenic enlargement. The liver dulness extended one inch below the costal margin, but the edge could not be felt.

Respiratory system.—A few râles were heard at the bases of the lungs. On the left side dulness commenced behind at the eighth rib.

Circulatory system.—A faint systolic murmur, probably hæmic, was audible at the base.

The blood.—It was thin and rather paler in appearance than normal.

Hæmoglobin, 40 per cent.

Red blood corpuscles, 1,900,000 per c.m.

White blood corpuscles, 256,000 per c.m.

Differential count of the white corpuscles—

Myelocytes, 51 per cent.

Eosinophilic myelocytes, 4·5 per cent.

Polymorphic cells, 36 per cent.

Eosinophilic, 5·5 per cent.

Lymphocytes, 3 per cent.

A good number of nucleated red blood corpuscles were also found.

Some slightly enlarged glands could be felt in the posterior triangles and axillæ.

There were no retinal hæmorrhages.

Urine 1020, urea 1·2 per cent., albumen 1 part per 1000. No sugar.

The diagnosis of spleno medullary leuchæmia was confirmed. Mist. Arsenicalis ℥j. t.d.s. prescribed. (Liq. Arsenicalis ♏v.)

The man to-day is practically in the same condition as he was when admitted on January 9th. I hope to have the patient here presently so that I may demonstrate the physical signs to you. He is anæmic, his lips and gums are pale, and he is thin. Mr. Greenfield has mapped out on the patient's abdomen the outline of the spleen, and I shall be able to show you the following points when the man comes in—

(*a*) His abdomen is distended.

(*b*) The distension is not quite uniform, there being more bulging on the left side, especially in the left hypochondriac and left half of the umbilical regions.

(*c*) There is an indistinct kind of ridge visible, running from the left costal margin, close to the left border of the sternum, to about three-quarters of an inch to the right of the umbilicus.

(*d*) When he takes a deep breath there is a distinct movement downwards of the prominence on the left side.

(*e*) When I place my hand on the abdomen I can feel a large, hard, smooth and somewhat tender tumour on the left side which extends from the left costal margin to within an inch of Poupart's ligament.

(*f*) The tumour is close up against the abdominal wall.

(*g*) Internally the tumour has a well-defined, hard, slightly rounded edge which commences above, just to the left of the ensiform cartilage, passes downwards with a slight convexity to the right, reaching a point one and a half inches to the right of the umbilicus, and then slopes away again to the left to within one inch of Poupart's ligament.

(*h*) A well-defined notch can be felt in the edge, just above the level of the umbilicus.

(*i*) When he takes a deep breath the tumour can be felt to move downwards.

(*k*) The tumour comes down so close under the costal margin that the hand cannot be placed between it and the costal margin, and further, its upper limit cannot be defined by palpation.

(*l*) Posteriorly it does not fill out the loin.

(*m*) No intestine can be made out in front of it either by palpation or percussion.

(*n*) On percussion it yields a dull note; the dull note obtained over the abdominal tumour is directly continuous with an increased area of thoracic dulness, which extends up as high as

the seventh rib in the axilla, and the sixth rib in the nipple line.

(*o*) Behind, on percussing the loin, a resonant note is obtained, showing that the colon has not been displaced.

No bruit or rub can be heard on auscultation.

When you come across a tumour in this region, the first consideration must be to determine whether it is an enlargement of the spleen or of the kidney. It is extremely difficult sometimes to say from a superficial physical examination if the enlargement is splenic or renal. I shall now point out to you the chief differences. I have told you already that this is an enlarged spleen, and I will now run through the various points we have made out from the physical examination, and contrast them with the signs associated with an enlargement of the kidney.

(*a b*) Both conditions may cause a local bulging on the left side of the abdomen. In the case of considerable kidney enlargement, however, the loin is usually bulged more, and the most prominent part of the tumour is lower.

(*c*) No ridge can be seen in the case of a kidney enlargement. I remember, however, seeing once, in a case of sarcoma of the kidney in a child, causing enormous enlargement of the left kiduey, a distinct cylindrical-shaped body lying over the front of the tumour; it was very distinct on account of the extremely thin abdominal wall. On palpation it could be rolled over the anterior suiface of the tumour, and could also be felt to distinctly contract under the hand. It was the descending colon lying in front of the enormously enlarged kidney.

(*d*) A kidney tumour may move downwards when the patient takes a deep breath, but it does not move nearly so much as an enlarged

spleen. This, of course, is due to the fact that the spleen is in such close relationship to the under surface of the diaphragm.

(*e f*) A kidney tumour is more deeply situated in the abdomen, and does not give the idea that it is in such close apposition to the abdominal wall as a splenic enlargement does.

(*g h*) A kidney enlargement has no well-defined edge and no notch, but presents a general rounded conformation.

(*i*) On palpation a kidney tumour does not move to such an extent as a splenic enlargement when the patient takes a deep breath.

(*k*) A kidney tumour generally slopes away towards the ribs, so that the hand can be placed between it and the costal margin. But in this present case, as I have already indicated, the tumour comes down close under the ribs, so close in fact that the finger cannot even be inserted between it and the costal margin. That is an important point in distinguishing between tumours of these two organs.

(*l*) Posteriorly a kidney tumour fills out the loin, which feels very firm and resistant.

(*m*) Occasionally the colon can be felt lying in front of a renal enlargement.

(*n*) A kidney enlargement often gives a resonant note on percussion anteriorly, on account of the position of the colon, which has been pushed forward by the enlargement of the organ and lies in front of it.

(*o*) Behind, on percussing the loin, the note is dull, as the colon has been pushed forward and its position is taken by the solid kidney tumour.

(*p*) Occasionally a systolic bruit can be heard over an enlarged spleen. I have heard it in two

cases of enlarged spleen secondary to cirrhosis of the liver.

It may perhaps appear to be a simple matter to distinguish enlargements of the spleen and kidney when there are so many points of difference. In the majority of instances a careful attention to the physical examination, and a critical investigation of all the points I have drawn your attention to will suffice. There are, however, instances in which it is impossible from a mere physical examination of the abdomen only, to say whether the tumour is an enlargement of the kidney or the spleen. Such an anomalous kidney tumour, however, is most likely to be mistaken for a leuchæmic spleen, and this can only be distinguished by a careful blood examination. The detection of leucocytosis, even to a marked degree, is not sufficient, however, as this may occur with kidney disease. It is necessary to make a differential count of the leucocytes. I shall illustrate my point by relating to you a case of pyonephrosis and perinephric abscess I saw at my out-patients in the beginning of April last year.

The patient was a woman, aged fifty-six. She sought advice for pain and swelling in her left side, just below the ribs. She was married and had one child fifteen years of age. She stated that she had had pain in her back ever since adult life. About the middle of March, 1899, she felt very ill and prostrate. She consulted a doctor, who examined her and told her there was some enlargement of her left kidney. On April 17th I saw her at my out-patients. I examined her abdomen and found a large swelling occupying the left hypochondriac, left lumbar, and left half of the umbilical region. On palpation, it was tender, and a fairly well defined

hard rounded edge could be felt extending from the ninth left costal cartilage downwards, and inwards towards the umbilicus, to a point about one inch below that point. On percussion a dull note was elicited over the front of the tumour. It could be well palpated bimanually as it extended far back into the loin. This last sign made me think it was renal. The dull percussion note which extended upwards into the thorax made me think it was splenic. I examined a fresh specimen of blood, and found an enormous increase in the number of white blood corpuscles; they appeared to be in the proportion of one to eight or ten red. This examination of the blood made me still more think that she was suffering from leuchæmia. She was admitted under Dr. Taylor, and on May 22nd she died. I performed the necropsy and found a pyonephrosis and a perinephric abscess; the primary cause of which was a small calculus which I discovered in the pelvis of the left kidney. The abscess had opened into the colon at the splenic flexure; it was bounded above by the spleen, anteriorly and externally by the abdominal wall, and internally by the colon.

Cabot also writes, when discussing the diagnostic value of blood examinations, that "tumours of the spleen, and more especially of the kidney, are very apt to be mistaken for leuchæmia. Within a single year I have been asked to examine the blood in three cases of leuchæmia, all of which turned out to be malignant disease of the kidney. In all of these there was a large tumour resembling the spleen in the left hypochondrium, and a very large increase of white cells. In two of them the blood was examined fresh, and the great number of white cells in the slide taken as evidence confirmatory of leuchæmia. The stained specimen,

however, showed only marked leucocytosis with 90 per cent. of adult cells of the ordinary type, and no myelocytes. Other large tumours of this region show similar results." In the case I saw at my out-patients, I have no doubt that if we had taken a film of blood and stained it, we should have found that the excess of the white blood corpuscles was due to an increase of polymorphic cells or of eosinophilic cells only, which observation would have with certainty excluded leuchæmia.

At this stage of the lecture, the patient was brought in and the lecturer explained the case in accordance with the condition and physical signs already described.

Having concluded, proceeded the lecturer, that the tumour is an enlargement of the spleen, the next consideration will be to determine the nature of that enlargement, and to do this you must have a knowledge of all the possible causes of enlargement of that organ, and the symptoms and signs which are associated with each.

The following is a list of the causes of enlargements of the spleen :—

1. Active congestion
   - (*a*) Typhoid fever.
   - (*b*) Typhus.
   - (*c*) Ague.
   - (*d*) Variola.
   - (*e*) Scarlatina.
   - (*f*) Diphtheria.
   - (*g*) Relapsing fever.
   - (*h*) Erysipelas.
   - (*i*) Puerperal fever.
   - (*k*) Septicæmia.
   - (*l*) Anthrax.
   - (*m*) Pneumonia,
   - (*n*) Influenza, &c.

2. Passive congestion from portal obstruction
   - (*a*) Thrombosis of the portal vein.
   - (*b*) Pressure on the portal vein by adjacent tumours, *e.g.*, of the liver, gall-bladder, pancreas, stomach, &c.
   - (*c*) Cirrhosis of the liver.
   - (*d*) Perihepatitis.
   - (*e*) Carcinoma of the liver.
   - (*f*) Obstruction of the inferior vena cava above the hepatic veins by thrombosis, or from pressure by a mediastinal tumour.
   - (*g*) Chronic lung disease, *e.g.*, emphysema and fibroid lung.
   - (*h*) Some cases of chronic valvular disease of the heart.
3. Leuchæmia.
4. Malaria, chronic (ague-cake spleen).
5. Splenic anæmia.
6. Hodgkin's disease.
7. Lardaceous disease.
8. Infarction (infective endocarditis).
9. Sarcoma (secondary).
10. Carcinoma (secondary).
11. Gumma.
12. Abscess.
13. Tuberculosis.
14. Hydatid.
15. Congenital syphilis.
16. Rickets.

It will not be necessary in connection with this particular case to discuss the symptoms,

signs and characteristics of each individual enlargement mentioned above as there are very few conditions which give rise to such an enormous enlargement as you see in the patient I have just presented to you. Enormous enlargement of the spleen, *e.g.*, an enlargement which extends well below the level of the umbilicus may occur in :—

Leuchæmia.
Ague cake.
Splenic anæmia.
Cirrhosis of the liver.
Hodgkin's disease.

It is not likely to be an ague cake spleen, as the patient has never been abroad, and has never suffered from malaria, or lived in a malarial district.

It is not likely to be cirrhosis of the liver, in spite of the alcoholic history, for it is most unusual in adults to find such an enlargement as you have seen in this case. I have never seen the spleen, in a case of cirrhosis of the liver in an adult, extend lower than the level of the umbilicus. In children, however, the spleen in this disease may be so enlarged that the lower end of it is jammed right into the pelvis so that you cannot feel its lower extremity. Some of you who are present here to-day no doubt remember seeing a little boy, who has often been admitted under Dr. Taylor, and whose spleen was thus enormously enlarged. He died last year, and at the necropsy the cause of the enlargement was found to be cirrhosis of the liver. During life the most prominent symptoms were jaundice, ascites, enlargement of the liver, and enormous enlargement of the spleen.

The only positive and conclusive way of determining the actual cause of the enlargement

is by making a careful blood examination, and I shall now tell you how this should be conducted. You have already heard the result of the blood examination, and may have noticed that the red corpuscles were diminished in number, that the hæmoglobin was reduced, that the white blood corpuscles were much in excess, and that a very large proportion of these were cells (viz., myelocytes) which are not found in normal blood. A complete blood examination should consist of:—

1. A description of the naked-eye appearances of the blood.
2. An emuneration of the number of corpuscles (*a*. red; *b*. white).
3. An estimation of the percentage of colouring matter.
4. A microscopic examination of: *a*. fresh blood; *b*. fixed and stained films.
5. A determination of the specific gravity.
6. An estimation of the alkalinity.
7. A determination of the coagulation time.
8. A spectroscopic examination.

For practical clinical purposes the first four should be undertaken. The instruments used here are the Thoma Zeiss hæmocytometer, and the Von Fleischl's hæmoglobinometer, or Oliver's hæmoglobinometer.

As stated above, the blood examination showed:—

Red blood corpuscles, 1,900,000 to c.m.

White blood corpuscles, 256,000 to c.m.

Hæmoglobin, 40 per cent.

That is—a reduction in red blood corpuscles and hæmoglobin, and an enormous increase in the number of white corpuscles, the normal number to a c.m. being about 6,000 to 8,000. I have

already mentioned to you that a mere leucocytosis, although it may be considerable, associated with a tumour in the left hypochondriac region, is not sufficient to enable you to diagnose leuchæmia with certainty. You must carefully examine thin films of blood which have been properly stained, and count up the different kinds of white corpuscles, and calculate in what percentage the various forms are present. You have been shown the technique of this examination in the excellent classes given by Mr. Pakes. It is so important that I shall again draw your attention to it.

The blood is obtained most readily and with the least inconvenience to the patient, from the lobule of the ear, which must be first carefully washed, then rubbed with lysol, and lastly with alcohol and ether. A puncture must then be made with a sterilized, sharp, broad-pointed needle. This one puncture should suffice for the use of the hæmocytometer and hæmoglobinometer and for the films.

The requisites for taking the films are :—

(1) Some long cover-glasses which have been boiled in a strong chromic acid solution, then washed in water, then in rectified spirits, and lastly in absolute alcohol. They should be kept in absolute alcohol.

(2) Some pieces of cigarette paper, about two by three-quarters of an inch.

(3) The fixing fluid.

(4) The stains.

The method of procedure is as follows :—

Take out singly as many cover-glasses as you require films, with a pair of pointed forceps, pass through the flame of a spirit lamp to ignite the alcohol. This leaves the cover-glass dry and free from grease. Pass the small end

of one of the cigarette papers across the drop of blood so as to get a little blood on the under surface of the paper close up to the edge, then quickly lay this edge of the paper, blood downwards, on to the cover-glass near one end, and draw it along to the other end; a very thin film of blood will be left on the cover-glass. In fixing and staining I have during the last year used the solution recommended by Jenner* in the *Lancet*, February, 1899, p. 370. It is a solution of eosin, methylene blue, and absolute alcohol. Place the cover-glass in a small open-mouth bottle containing the Jenner fluid, and allow it to remain there one minute; remove it and wash it a very little with distilled water, dry it with filter paper, and mount in Canada balsam.

I have found Jenner fluid act admirably. Its chief advantage is the ease with which it can be worked. The film can be fixed, stained and mounted ready for examination in five minutes, rendering the examination of blood films easy and practicable in the wards, out-patient department and consulting room. It not only gives good results in cases of leucocy-

* JENNER'S STAIN.—"Equal parts of a 1·2 per cent. to 1·25 per cent. solution of Grübler's water soluble eosin, yellow shade, in distilled water and a 1 per cent. solution of Grübler's Medicinal Methylene Blue, also in distilled water, are mixed together in an open basin (not in a flask) and thoroughly stirred with a glass rod. The mixture may with advantage be left for twenty-four hours. It is next filtered and the residue is dried, either in the air or more quickly in an incubator or water oven. I have dried it at 55°C. without harm. When quite dry the residue is scraped off the filter paper and is powdered. It is then shaken up with distilled water and washed on a filter, where the washings should be of a thin, dirty, purplish colour. Finally, it is again dried and powdered and may be stored in suitable bottles. For use thoroughly shake up 0·5 gramme of the powder in 100 c.c. of pure methyl alcohol (G. Merck 'for analytical purposes') and then filter. The solution keeps well."

tosis and anæmia, but is very satisfactory for demonstrating the malaria parasite.

Another simple method is to fix the film by passing it four times through the flame of a Bunsen burner, then stain for thirty seconds in the following solution:—5 per cent. Grübler's yellow shade eosin, 75 per cent. alcohol. Pass through the flame again two or three times, and stain for about five seconds in a filtered aqueous solution of methylene blue. Wash in water, dry between sheets of filter paper, and mount in Canada balsam.

I have already mentioned to you the percentage number of the different kinds of blood corpuscles found in the blood of this patient. The nomenclature adopted by Cabot was used. A good deal of confusion exists on this point and is apt to be very misleading, as the same kind of white corpuscle appears under different names in the different text-books. The nomenclature which is now generally adopted and which in future I shall use is that recommended by Kanthack and Hardy, and is undoubtedly the most scientific and satisfactory. They describe the following kinds of white corpuscles in normal blood:—

(1) Lymphocytes, up to 30 per cent.
(2) Hyaline cells, 2 per cent.
(3) Coarsely granular oxyphile cells, 2·4 per cent.
(4) Finely granular oxyphile cells, 20 to 70 per cent.
(5) Coarsely granular basophile cells, absent in health.
(6) Finely granular basophile cells, 1 to 5 per cent.

The lymphocyte is an immature leucocyte, with very little protoplasm, and a large nucleus which stains deeply. It is not amœboid and

not phagocytic. They are increased in number after food, and diminished after starvation. They resemble very closely the cells of lymphoid tissue. They are much increased in lymphatic leuchæmia, and are much diminished in spleno-medullary leuchæmia.

The hyaline cell consists of an abundance of hyaline non-granular protoplasm, and a round or reniform nucleus which only stains lightly. It is amœboid and phagocytic.

The coarsely granular oxyphile.—The protoplasm contains large, highly refractile granules which stain deeply with acid aniline dyes. The nucleus is usually large and horseshoe in shape. It is amœboid but non-phagocytic.

The finely granular oxyphile is the most common form. The protoplasm contains small spherical granules which stain fully with acid dyes. The nucleus is polymorphic and it stains deeply. It is the same cell as Ehrlich's neutrophile cell, and it is the form which is mostly increased in simple leucocytosis.

The coarsely granular basophile.—The protoplasm contains large spherules which stain with basic dyes. The nucleus is usually round and stains fully. It is not usually found in the blood in health.

The finely granular basophile.—The cell substance is clear and contains a number of small spherules which stain with basic dyes. Their nucleus is usually trilobed. It is spherical in shape.

The following table which I have written on the blackboard is adopted from Adami's article on "Inflammation," in *Allbutt's System of Medicine* (Vol. I.). I have added to it the nomenclature adopted by Cabot, and I think it may be useful to you:—

Kanthack & Hardy.	Ehrlich.	Cabot.	Metschnikoff.	Max Schultze.	Wharton Jones.
Lymphocyte ...	Lymphocyte ...	Small lymphocyte	Lymphocyte ..	Small round cell I.	Non-granular nucleated cells
Hyaline cells...	—	Large lymphocyte	Macrophagocyte	Large round cell II.	—
Coarsely granular oxyphile	Eosinophilic cells	Eosinophiles ..	Eosinophile cells	Cells with coarsely granular protoplasm	Granule cells coarsely granular
Finely granular oxyphile	Neutrophile cells Amphophile cells	Polymorphonuclear neutrophiles	Microphagocyte	Cells with finely granular protoplasm	Granule cells finely granular
Coarsely granular basophile	Basophile cell with granulation	— ...	— ...	— ..	—
	Mastzellen	Mast cells ...	— ...	Cells with finely granular protoplasm	? Granule cells finely granular
Finely granular basophile	Basophile cell with granulation	— ...	— ...	— ..	—

In simple leucocytosis the finely granular oxyphile cells are chiefly increased, and this fact distinguishes it from leuchæmia.

There are two distinct forms of leuchæmia, viz:—

(1) Spleno medullary leuchæmia.
(2) Lymphatic leuchæmia.

Before the blood was subjected to such careful examinations, three varieties were described, viz:—

(1) Splenic
(2) Lymphatic } leuchæmia.
(3) Medullary

The patient you have seen to-day is suffering from spleno medullary leuchæmia, and his blood is very characteristic. The stained films show a very large number of cells which do not occur in normal blood at all. They are called myelocytes, because they are supposed to originate in the bone marrow. They are large spherical cells, each nearly filled by a large faintly stained nucleus immersed in oxyphile granules, and the nucleus is often in close contact with the cell wall for some considerable part of its extent. They are not amœboid. They are the largest cells found. Cabot gives the following measurements of the different kinds of leucocytes.

Average diameter of 100 myelocytes, 15·75 μ.

Average diameter of 100 polymorphonuclear neutrophiles (*i.e.* finely granular oxyphiles, 13·50 μ.)

Average diameter of 100 large lymphocytes (hyaline cells) 13 μ.

Average diameter of 100 eosinophiles (coarsely granular) 12 μ.

Average diameter of 100 small lymphocytes oxyphile, 10 μ.

Average diameter of 100 red blood corpuscles, 7·5 μ.

The percentage of finely granular oxyphiles is usually diminished, and so also is the percentage of lymphocytes. Cabot gives as an average of 18 cases:—

Myelocytes, 37·7.

Eosinophiles, 4·4.

Polymorphonuclear neutrophiles, *i.e.* (finely granular oxyphiles), 49·2.

Lymphocytes, 7·6.

In addition, nucleated red blood corpuscles are also present in this disease and were found in the blood of the patient I have shown to you.

The above figures apply only, of course, to the percentages; in all cases the total number of white corpuscles in a cubic millimetre are increased in number.

Such a large total increase in the number of white corpuscles, with such a very high percentage of myelocytes is absolutely characteristic of spleno medullary leuchæmia, especially when associated with such an enormous enlargement of the spleen.

In leuchæmia lymphatica the

(1) Red blood corpuscles are diminished in number.

(2) The percentage of hæmoglobin is reduced.

(3) The white blood corpuscles are increased in number, but not to such an extent as they are in the spleno medullary variety.

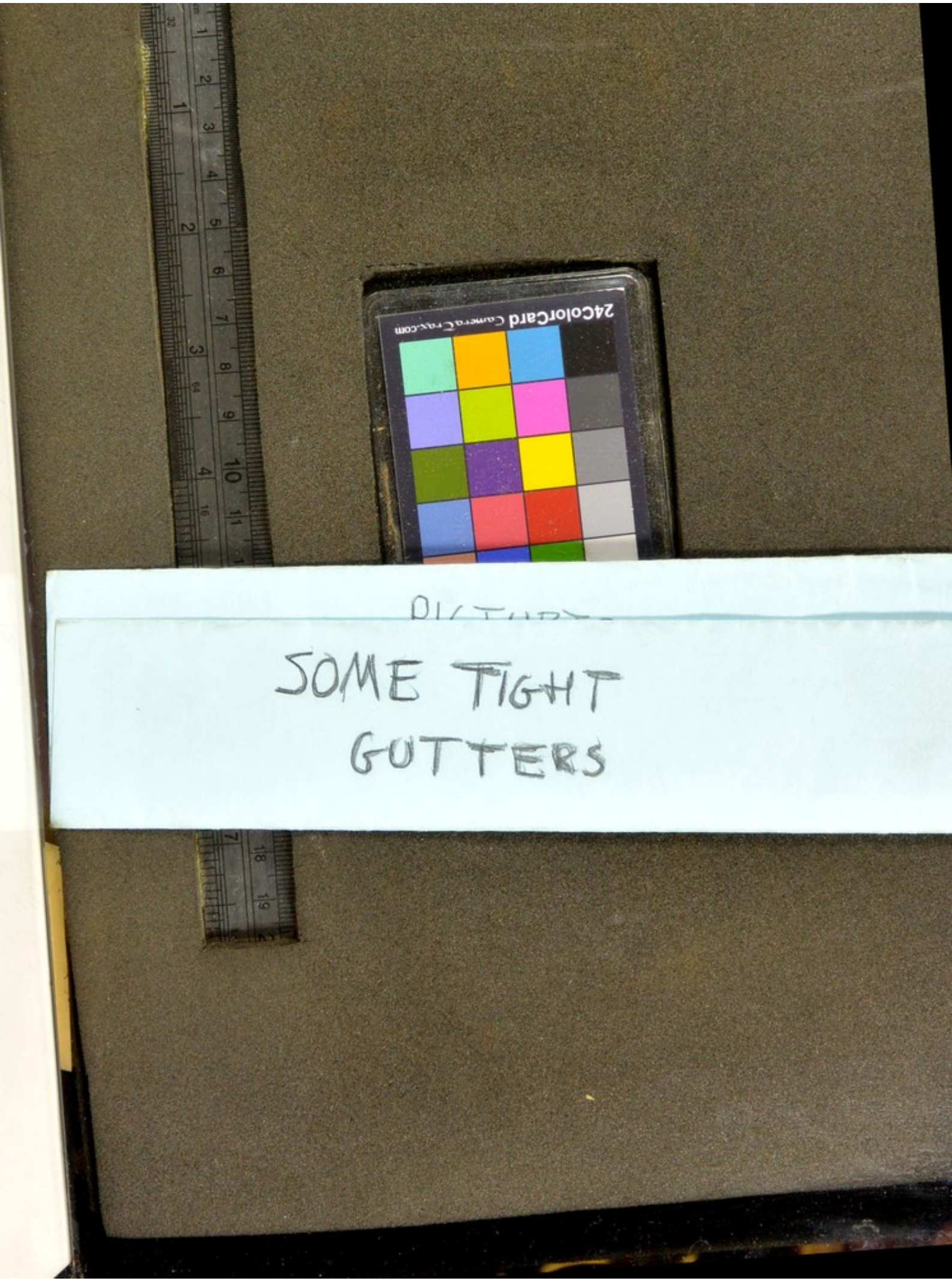
(4) The percentage of lymphocytes is enormously increased, and the percentage of the other varieties much reduced.

e.g. The average in five cases of Cabot's.
Lymphocytes, 95.9 per cent.
Finely granular oxyphiles, 3·04 per cent.
Myelocytes, 0·7 per cent.
Eosinophiles, 0·36 per cent.

The examination of the blood and the discovery of such an extraordinary increase in the percentage of lymphocytes distinguish lymphatic leuchæmia with certainty from Hodgkin's disease and other conditions causing glandular enlargements or enlargement of the spleen.

In splenic anæmia the red blood corpuscles and the percentage of hæmoglobin are diminished and there is no leucocytosis.

I see my time is up, but I hope the fragmentary remarks I have made to-day will be of service to you and will stimulate you to make more elaborate blood examinations. I allude particularly to the making and staining of blood films.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