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A CASE OF LEUCOCYTHÆMIA IN A CHILD.

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G. R., aged seven years and eleven months, brought to the out-patient room of the Sick Children's Hospital, on December 16, 1889.

Complaints: Enlarged glands in neck, susceptibility to catching cold, weakness, lassitude, and pain after eating.

Family history: None of any importance elicited. Father, mother, and five sisters all healthy.

Previous health: Severe eczema soon after birth, which lasted for eighteen months; with this exception, has been tolerably strong and healthy. No infectious disease until eighteen months ago, when he had an attack of diphtheria, lasting six weeks. About a year ago had "bronchitis and inflammation of the lungs," from which he recovered perfectly. For more than six months has had scabies all over the body (practically untreated), which may account to some extent for some of the glandular enlargement. Three months ago seemed quite well, and about that time walked ten miles in one day without being overtired.

Present illness: About two months ago his mother noticed that he was paler than usual, that he had no energy, and that his appetite was poor and capricious; also, that he frequently complained of abdominal pain. He has become steadily weaker since then. One month ago he walked five miles, but was extremely tired after doing so. Three weeks ago the enlarged cervical glands were noticed for the first time, after a bad cold. He has had no hæmorrhages.

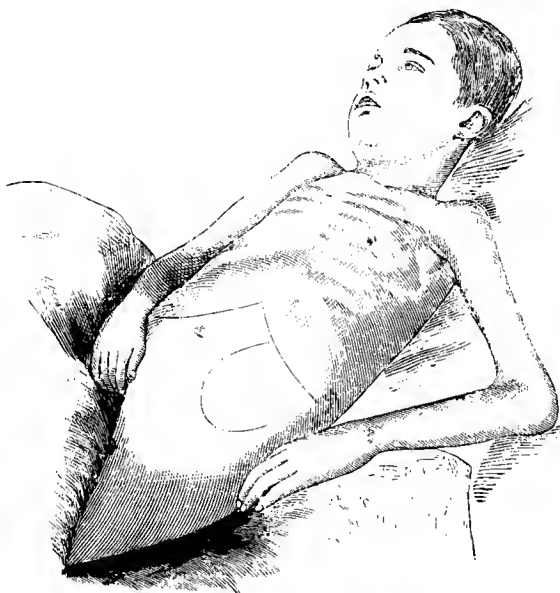
EXAMINATION. (December 26, 1889.)—Rather a small boy for his age (weight three stone thirteen and a half pounds), very pale, yellowish, waxy complexion. Marked swelling in front of each ear, and noticeable fulness of lymphatic glands on both sides of the neck and below the lower jaw. Constant short cough. Temperature (axilla) 99.8°.

Lips and gums very pale. Teeth large and good, except molars, which are carious. Tongue pale, flabby, moist, with prominent fungiform papillæ. Tonsils pale, moderately enlarged.

Appetite very poor, and capricious; constant thirst. Frequent discomfort and giddiness after food; occasional vomiting. Bowels regular.

Abdomen: Inspection (Fig. 1): Very full and distended, especially in the hepatic region. Palpation: Soft liver-edge felt distinctly about two and three-quarter inches below costal margin, in right nipple-line. In the left hypochondrium a hard body is felt coming out from below the ribs. It seems continuous with the liver, but its edge is much harder. It reaches one and a half inches below the edge of the ribs, in the left nipple-line. (When the abdominal distention subsided a little, this was found to be the enlarged spleen.) Extending downward from the left hypochondrium, a large, oblong, solid mass is felt: the lower end

FIG. 1.



is rounded and superficial, and extends fully an inch below the anterior superior spine, while the upper end is deeply situated, and cannot be touched by the hand. (It was found afterward that this tumor did not move with respiration; and it turned out, post-mortem, to be the left kidney.) No enlarged glands felt; no ascites. Percussion (Fig. 2): Liver dulness begins above at the upper margin of the fifth rib in the right nipple-line, becomes absolute at the sixth rib, and extends down about seven inches, to two and three-quarter inches below the costal margin.

Lymphatic glands: Almost all those which can be felt are more or less enlarged. They are soft, separate, and painless. Those in the parotid region form a prominent tumor on each side of the face, like half a small Tangerine orange. Several of the submaxillary lymphatic

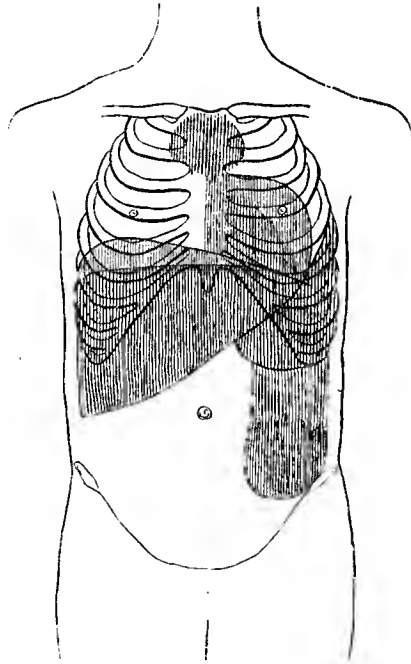
glands on each side are enlarged to the size of a hazel-nut. The sub-occipital, mastoid, supra-hyoid, superior cervical, and both sets of deep cervical glands, are enlarged, varying in size from that of a pea to that of a large bean. Those in both axillæ are large, and the right supra-condyloid is the size of a large pea. There are also numerous large glands in both inguinal regions.

Blood: Hæmocytes, 2,500,000; tolerably normal in appearance. Leucocytes, 125,000; hæmoglobin, 40 per cent. (*v. sub.*)

Heart: No subjective symptoms. Apex-beat in fifth space half an inch outside the left nipple-line. First sound very weak at apex. In pulmonary and auricular areas first sound is replaced by a soft, blowing murmur when the child is sitting up. "Bruit de diable" at root of neck. Pulse 128, weak, but regular.

Thyroid gland not enlarged. *Thymus:* Over the manubrium sterni there is a large patch of dulcnss, which reaches down below the junction of the second costal cartilages, and for more than an inch on each side. (Fig. 2.)

FIG. 2.



Lungs: A few rhonchi at bases; otherwise normal. Urine pale acid, low specific gravity, no albumin, no sugar.

Fundus oculi: Arteries small and pale, veins large and flat, no hæmorrhage, discs normal.

THE TREATMENT aimed at was the administration of arsenic, in as large doses as possible. Fowler's solution was given in doses of from m_j to m_v , but had always to be stopped after a few days, owing to the repugnance to food, vomiting, and diarrhœa, which it invariably produced. Iron (*ferrum redactum*) was also tried repeatedly with similar

bad result. Faradism was applied to the abdomen on several occasions. The first few applications were certainly followed by improvement in the general condition, but latterly no effect was produced.

PROGRESS. (A) *The Blood* (by Dr. Muir).—At first (January 3d) the red corpuscles showed comparatively little change in appearance. They varied in size more than usual (6 to 8.5μ), but they formed rouleaux well, and few were of irregular shape. The white corpuscles were seen in great numbers between the rouleaux. They varied greatly in size (6 to 11.5μ), but by far the greater number were 6 to 8μ —i. e. the increase was chiefly of the small variety of leucocyte. They were quite circular, and practically all were finely granular. In stained preparations it was found that nearly all the leucocytes were of the small uninucleated variety, the proportion of multinucleated leucocytes, which in normal conditions are more abundant than the former, being very small. These uninucleated corpuscles varied considerably in size, and the single nucleus generally showed no structure beyond a finely granular appearance, with faint markings, and in some it was slightly indented at one side. Eosinophile cells were seen, but they were very few in number.

The blood-plates were at first of nearly normal number, and of the usual appearance.

In the progress there are to be noted :

(1) A gradual diminution in the number of red corpuscles, which was more rapid as death approached, along with an increased number of irregular corpuscles and greater variations in size. A few nucleated red corpuscles were seen, but only shortly before death.

(2) A gradual increase of the leucocytes, so that their proportion to red corpuscles changed from 1:20 to 1:25. The uninucleated corpuscles varied more in size, large forms becoming more abundant, and the multinucleated leucocytes became proportionately still fewer.

(3) The number of the blood-plates rapidly diminished.

On several occasions, when faradization was applied to the spleen and lymphatic glands, enumerations of the leucocytes were made before and after the application. On one occasion there was a considerable increase in the number of leucocytes in the blood afterward, on another a slight increase, whilst on the other occasions there was practically no alteration. We therefore concluded that the application was followed by no constant change.

Permanent preparations of the blood in such conditions can be rapidly and conveniently made by drying films on cover-glasses, and staining for thirty seconds in a saturated alcoholic solution of methyl-blue. The films are then washed, allowed to dry, and mounted in balsam. The different varieties of leucocytes, and the nucleated red corpuscles, if present, are thus well seen.

(B) *General*.—On the whole the progress was steadily downward, although for a few days after the first application of the faradic current (January 7th) there was considerable subjective improvement. The glandular enlargements varied a good deal, being some weeks much more marked than others. During the last few days of life the glands were noticeably smaller than before (the photograph from which Fig. 1 is copied was taken two days before death). The left kidney also *seemed* to change considerably in size, becoming, so far as could be felt, about an inch shorter, and then enlarging again. The spleen steadily increased in size, and extended before death at least an inch further down than it did when first seen. The temperature was irregular. During the first

fortnight of treatment it was nearly normal in the morning, and from 101.5° to 103° in the evening. Later on, it was frequently subnormal early in the day, and usually from 99° to 101° in the evening. Several hæmorrhages occurred. On December 27th there was severe epistaxis, and on February 2d a slighter attack of a similar nature. On February 3d there was oozing from the gums. Two days before death numerous hæmorrhages were found in both retinae, along with optic neuritis in the right eye. On December 29th a patch of dulness and crepitation was discovered in the right scapular region, but, with this exception, there were no objective lung-signs. During the last weeks there was considerable distress caused by nasal obstruction, which became almost complete. The tonsils also enlarged somewhat, but not very greatly. The urine continued free from albumin, but, toward the end, contained large quantities of colorless elliptical uric-acid crystals.

On the morning of February 13th the patient became suddenly extremely breathless, although air was freely entering all parts of the lungs. He died in the afternoon of the same day.

ENUMERATION OF BLOOD-CORPUSCLES.

Date.	Hæmocytes.	Leucocytes.	Blood-plates.	Proportion of white to red corpuscles.
December 26th	2,500,000	125,000	1 : 20
“ 30th	2,560,000	93,000	194,000	1 : 26.5
January 3d	2,245,000	112,000	252,000	1 : 20
“ 7th	2,260,000	229,000	230,000	1 : 9.8
“ 12th	2,145,000	241,000	224,000	1 : 8.8
“ 14th	2,170,000	226,000	222,000	1 : 9.6
“ 17th	2,085,000	209,000	192,000	1 : 9.9
“ 23d	2,031,000	219,000	1 : 9.2
“ 27th	1,992,000	247,000	72,000	1 : 8
“ 30th	1,686,360	214,000	19,000	1 : 7.8
February 3d	1,181,250	222,000	7,300	1 : 5.3
“ 6th	1,150,000	342,000	19,000	1 : 3.3
“ 9th	902,500	379,000	13,000	1 : .3
“ 12th	721,250	284,000	7,000	1 : 2.5

POST-MORTEM EXAMINATION (twenty-two hours after death).—*Abdomen*: The liver is much enlarged, pale in color, flabby in consistence, apparently fatty on section. There are several minute subserous hæmorrhages in its peritoneal covering. The gall-bladder is moderately distended with pale-green bile. The spleen is much smaller than it was during life, its anterior extremity only reaching forward as far as the anterior axillary line, and its lower border being one inch below the costal margin in the mid-axillary line. Weight, 11 ounces. Size, 6 by 4 by $1\frac{1}{2}$ inches. Capsule smooth, no hæmorrhages. Not very pale in color, consistence rather soft. On section, surface pretty uniform, rather pale; Malpighian

bodies not prominent; trabecular tissue apparently not increased. No infarcts.

The left kidney is seen at once on opening the abdomen, as a large oblong body, occupying the left lumbar and upper iliac regions, and displacing the spleen upward. It is crossed about the middle by the descending colon. On removal it is found to weigh $16\frac{1}{4}$ ounces, and to measure 7 by $3\frac{1}{2}$ by $2\frac{1}{2}$ inches. The capsule is somewhat adherent, the surface extremely pale, mottled, and yellowish. On section the medulla is of a pale reddish cream-color. The cortex is comparatively enlarged, pale yellow in color, and presents numerous little bright-red spots with pale yellowish centres. There are also a number of narrow red streaks between the tubules in the cortex and in the pyramids. There is one small cyst, about the size of a pea, near the lower end of the organ, and at the surface, near its upper end, there is a hard yellow nodule, evidently an old infarction.

The right kidney is not seen until the intestines are removed. It is, however, about the same size as the left one ($6\frac{1}{2}$ by $3\frac{1}{2}$ by $2\frac{3}{4}$ inches), though situated higher up, and it weighs exactly the same, and in appearance, externally and on section, it is very similar. It contains a cyst the size of a small bean, and an old infarction, like that in the other organ.

The intestine seems normal (it was not fully examined). The mesenteric glands vary from the size of a hempseed to that of half a walnut. They are extremely soft. On section, some are of a pale cream-color, and others yellowish-red from hæmorrhage.

The testicles are not enlarged, and seem normal.

Thorax: On laying bare the ribs, a few small, bright-red subperiosteal hæmorrhages are seen just outside the costo-chondroid articulations on some of them. When the thorax is opened, the upper half of the mediastinum is found to be occupied by a somewhat quadrilateral yellowish white mass, of a hard, almost fibrous consistence. It measures $3\frac{3}{4}$ inches from above downward, 2 to $2\frac{1}{2}$ from side to side, and about 2 antero-posteriorly. On the anterior surface there are several punctiform hæmorrhages. Anteriorly, the upper half of this mass is adherent to the back of the manubrium sterni. Posteriorly, it lies on the aorta and other great vessels, displacing them backward. Above, it tapers off to a point about the level of the top of the sternum. Below and behind it is closely adherent to the pericardium. From the position occupied by this tumor, it seems probable that it is connected with the remains of the thymus.

The pleuræ, both costal and pulmonary, present numerous small hæmorrhages, but seem otherwise normal. No adhesions, no effusion.

The left lung is of a pale color, and on section has a peculiar mottled appearance, due to the occurrence of yellowish-red consolidated patches, about half an inch in diameter (hæmorrhages), which are scattered here and there—there being more in the lower than in the upper lobe.

The right lung has a precisely similar appearance.

The glands at the root of the lung are enlarged, some to the size of a hazelnut. On section some are dark-red, from hæmorrhages into their substance.

The pericardium contains about two ounces of reddish milky serum. There are numerous subserous hæmorrhages into both its layers. It is otherwise normal.

The heart is very pale. All its cavities contain a large quantity of pale, almost cream-colored, soft clot. In the right auricle and left ventricle there is also a little black clot. The musculi papillares of the mitral valve show the peculiar striated appearance of fatty degeneration most typically.

The lymphatic glands in the groin and elsewhere present the same characters as those in the abdomen and thorax.

REMARKS.—The main points of clinical interest in the case may be briefly recapitulated:

(1) The rapid course (less than five months) which is characteristic of the disease in early life.

(2) The powerlessness of treatment, which may partially be attributed to the late stage at which the child was first seen, and to the extremely irritable condition of his alimentary tract, which prevented the satisfactory administration of remedies.

(3) The mediastinal tumor, which from its relations may be almost certainly held to have arisen in the remains of the thymus gland, and which is uncommon, although several instances of a similar condition have been published.

(4) The great enlargement of both kidneys, and the fact of the left one forming, during life, such a prominent abdominal tumor.

Abstract of Microscopic Examination, and Remarks. (By Dr. Muir.)

The bone-marrow was of a pale-pink color, but had not that pus-like appearance which has been described in certain cases of leucocythæmia. On microscopic examination, in a 0.6 per cent. solution of sodium chloride, tinted with methyl-violet, it was found that most of the cells were colorless, uninucleated corpuscles of various sizes (6–10 μ) similar to those in the blood. The proper marrow-cells, nucleated red corpuscles, and ordinary red corpuscles were comparatively few in number. The chief change appeared to be a great increase of small uninucleated corpuscles at the expense of the cell elements more strictly belonging to the marrow. In the spleen and lymphatic glands the same cells were seen in great numbers; in the former some were of larger size than in the latter.

In sections of the spleen it was seen that the great increase in size was due to an increase of the cellular elements of the pulp. The Malpighian bodies were small and ill-defined, the trabeculæ were relatively small, and the reticulum of the pulp was scarcely thickened. The cells in the splenic pulp were uninucleated corpuscles of varying size, but most were small. There were no eosinophile cells. Red blood-corpuscles were few in number.

The enlargement of the lymphatic glands also was due to a great increase of the lymphoid corpuscles, and not to any fibrous overgrowth. The corpuscles were most closely packed in the cortex, being in some places very densely aggregated in the lymph-sinus under the capsule. In the medullary portion the tissue was more open, and very vascular. There were no thrombi in the small vessels, but in the chief artery of one of the glands a thrombus was seen composed of mixed layers of leuco-

cytes and a hyaline material. There was no fatty change in the lymphatic glands or in the spleen.

The mass in the upper mediastinum was much more fibrous than the lymphatic glands. It had a stroma of dense bands of fibrous tissue which carried the bloodvessels. These broke up into small bands, between which were spaces filled with lymphoid tissue, in which were many capillaries. There was nothing seen by which it could be identified definitely as the thymus.

The enlargement of the kidneys was seen to be due to an infiltration of its connective tissue with small lymph-corpuscles. This infiltration was pretty uniform in the cortex, where it separated widely the tubules and Malpighian bodies. In the boundary area and in part of the medulla it was arranged in cord-like masses which ran along the vessels, the tubules being found running in the spaces between. Toward the apices of the pyramids there was no infiltration between the tubules. There was considerable fatty change in this lymphoid tissue. The epithelium of convoluted tubules was at places detached and granular, but showed no signs of proliferation, and the change was rather degenerative than inflammatory. The glomeruli were practically normal, and contained comparatively few of the small round cells. There were hæmorrhages scattered in the cortex of the kidneys, and in one place was an old infarct which was encapsuled in fibrous tissue, and in which could be seen the necrosed tubules separated by degenerated lymphoid corpuscles. This showed that the infiltration of the connective tissue must have lasted for a considerable time.

In the liver there was a somewhat similar leucocytic infiltration extending along the portal spaces, and pushing out between the liver cells. There was fatty degeneration of the cells, chiefly around the central vein of the lobule. Some of the liver cells contained yellowish pigment, which did not blacken with sulphide of ammonium.

The muscular fibres of the heart showed extensive fatty degeneration, and the connective tissue under the endocardium was infiltrated with small lymphoid corpuscles. The clot in the heart was composed of numerous uninucleated leucocytes closely arranged, between which were delicate fibrin filaments.

In the lungs many of the smaller vessels were filled with leucocyte thrombi, and the neighborhood of such vessels was often the seat of hæmorrhage. Where hæmorrhage had occurred most of the air-cells were filled with red corpuscles, with leucocytes intermixed, but some were packed almost entirely with leucocytes. This arrangement was probably brought about by the influence of gravity on the corpuscles in the effused blood, or it might have been due to the giving way of vessels which were plugged with leucocytes, these being poured out into the nearest air-cells. The parts of the lung free from hæmorrhage showed dilatation of the alveolar capillaries, which contained many leucocytes, and, in some of the air-spaces numerous round catarrhal cells, many of which contained granules of brownish pigment. The peri-bronchial connective tissue and many of the septa were densely infiltrated with small leucocytes, and the infiltration could be traced along the bronchi to the glands at the root of the lung which were affected like the other glands. Some parts of the pleura were infiltrated in the same way, some were quite free. No part of the lung showed fatty change.

I also examined a specimen of ordinary connective tissue (taken from

the neighborhood of the aorta), and found an abnormally large number of lymphoid corpuscles in its lymphatic spaces.

REMARKS.—Of the various pathological changes found, some are evidently secondary in character. Such are: the fatty degeneration in several situations, but most marked in the muscular fibres of the heart, the hæmorrhages in the kidneys, lungs, etc., the clotting within the heart, and the plugging of the pulmonary vessels with leucocyte-thrombi. The essential change is the presence of an enormous number of uninucleated leucocytes in all situations where these are normally present. These situations are—(1) in the blood, (2) in the spleen, bone-marrow, and lymphatic glands, (3) in the lymph-spaces of the connective tissue in various organs and parts of the body, *e. g.*, the connective tissue of the kidney (where the phenomenon is most marked), the portal tracts in the liver, the peri-bronchial and subpleural connective tissue¹ in the lung, the subendocardial connective tissue in the heart, and, as an example of ordinary fibrous tissue, the connective tissue along the aorta. Such a condition can only be explained, I think, by an active proliferation of these uninucleated corpuscles. The cells found in the tissues have most probably passed out of the bloodvessels, as they are most numerous around these, though they may proliferate after doing so. The lymphatic glands are, I think, infected secondarily from the tissues, through the afferent lymphatics, and accordingly we find the corpuscles most closely packed in the cortical lymph-sinuses. In fact, given the condition of the tissues as found in this case, we could almost predict such an affection of the glands. I have also seen a case in which the change in the blood was of the same nature as in the present case, though less advanced, whilst the lymphatic glands were not affected, or only very slightly. Hence, though in cases of leucocythæmia in which the glands are affected, the leucocytes, as a rule, are mostly of the small uninucleated variety, the change in the glands is most probably not the cause of the leucocythæmia, but the effect of it. It is difficult to determine the exact starting-point of the proliferation, nor is it so important as the determination of its cause. I have been unable to find micro-organisms in this case, though Fermi¹ has cultivated a bacillus from a spleen in leucocythæmia, and Kelsch and Vaillard² have found a similar organism in the blood and in leucocytic deposits, and have made cultivations of it. In both instances the lymphatic glands were affected. The theory that a microorganism is the cause of the proliferation of the leucocytes would be in accordance with the facts, and would be rather favored by the course of the temperature in this case.

The anæmia I consider to be due to the occupation of the blood-

¹ Fermi, *Centralb. f. Bakt. u. Parasit.*, vol. viii., November 18, 1890.

² Kelsch and Vaillard, *Annales de l'Institut. Pasteur*, 1890, p. 276.

forming area in the bone-marrow by these leucocytes, with consequent diminution of the nucleated red corpuscles, etc., rather than to a failure of transformation of leucocytes into red corpuscles; it being now generally held (and my own observations support the view), that the leucocytes in the blood do not become red corpuscles.

A CASE OF SUCCESSFUL REMOVAL OF A RETRO-PERITONEAL FATTY TUMOR.¹

IN THE COURSE OF THE OPERATION A VEIN, SUPPOSED TO BE THE LEFT COMMON ILIAC, TORN AND TIED.

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It has been my fortune to meet with several large fatty tumors in the abdomen and on the thigh. Three of those in the abdomen weighed over fifty pounds, and two in the thigh weighed over ten pounds each, and extended from Poupart's ligament to the patella.

The case which I report is interesting, as being the only one of its kind which has been successfully removed by laparotomy, or perhaps I ought to say that I can find none reported.

The patient was a woman, fifty-four years old; married. She was the mother of five children, the youngest being thirteen years old. On the day I first saw her she was, in general appearance, rather pale and anxious-looking; there was no oedema, and but slight emaciation. On examination, the abdomen was found uniformly distended, and enlarged to the size of a five months' pregnancy. There was a rounded, smooth, rather hard, non-fluctuating tumor filling the pelvis and rising nearly to the umbilicus. The abdomen was tympanitic, except just below the umbilicus over an area the size of the palm of the hand. On deep pressure a larger area of dulness was found. Both flanks were tympanitic. On auscultation, no aortic sound nor impulse was heard. There was slight tenderness in the left flank. The parietes were moderately thick. The tumor was very slightly movable. The girth at the umbilical level was thirty-one and a half inches. The uterus was pressed downward and backward, and could not be decidedly separated from the tumor. Bimanually the tumor was found to be slightly movable, non-fluctuating, and rather flabby-feeling. The urine had a specific gravity of 1009, and contained a large trace of albumin and numerous hyaline and granular casts, pus, and renal epithelial cells.

Since the change of life, twelve years before, at the age of forty-two, she had been troubled by frequent vomiting, usually in the morning; and for the past three weeks it had been almost incessant. It was for

¹ Read before the Boston Society for Medical Improvement.