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BY

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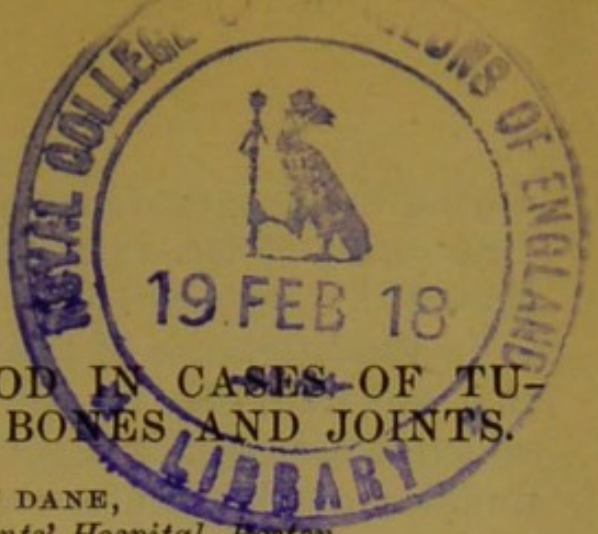
Reprinted from the Boston Medical and Surgical Journal,
May 28 and June 4 and 11, 1896.

BOSTON
DAMRELL & UPHAM, PUBLISHERS
283 WASHINGTON STREET
1896

S. J. PARKHILL & CO., PRINTERS
BOSTON



A STUDY OF THE BLOOD IN CASES OF TUBERCULOSIS OF THE BONES AND JOINTS.

BY JOHN DANE,
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ALTHOUGH such a vast amount of labor has been spent during the past ten years in investigating the conditions occurring in the blood in a great number of diseases, as yet very little has been recorded concerning the alteration that it shows as a result of tuberculosis affecting the various bones and joints. The surgical aspect of disease in these situations has been ably dealt with by many of the leading surgeons, both in general works and in special volumes devoted to this subject. Moreover, making up, as disease of the bones and joints does, so large a part of the cases that are brought for treatment to the orthopedic surgeon, their nature has been most exhaustively dealt with in all the text-books and countless monographs of that specialty. But so far as I have been able to find, no attempt has as yet been made to see if there is any constant relation between the pathological lesion in these cases of surgical tuberculosis and the condition of the blood, especially with reference to the presence or absence of a leucocytosis. Feeling that such a relationship, if it were proved to exist, would not only be interesting from a scientific point of view, but might be made to contribute some valuable data to the practising surgeon in his attempts to treat this frequently recurring disease, I set about a series of examinations of the blood upon the cases in the wards of the Children's Hospital in Boston. For the use of this clinical material, and for many acts of kindness

during the progress of the work I am indebted to Dr. Bradford and Dr. Burrell of the staff of that institution.

In the literature of the blood it is generally agreed that tuberculosis, in all the vast variety of forms in which it occurs, is a disease that does not increase the number of the white corpuscles to any considerable extent. When it appears to do so, it is owing to a superadded lesion of an inflammatory nature. In dealing with the subject of tuberculosis, however, the authors of the various treatises upon the blood confine themselves almost exclusively to tuberculosis of the lungs. In this disease Hayem[1] says that the leucocytosis follows the irritative lesions and is not at all marked where these do not exist. His figures, for adults, range between 6,200 leucocytes in simple cases, to 18,600 where inflammatory complications were present. He also states that the erythrocytes follow the general condition of the patient, and not the local condition in the lung. Klein[2] in his catalogue of affections that do not give rise to a leucocytosis includes miliary and pulmonary tuberculosis and tubercular meningitis. He does not mention any other varieties of tuberculosis, except that of the serous membranes, where he says that he found the number of white cells normal. He reports one case of tuberculosis pulmonalis in which there were 9,800 leucocytes and a proportion of mononuclear to polynuclear elements of 15 to 85; and one case of tuberculosis seroserum with 7,840 leucocytes and a proportion of 28 to 72. Still more interesting for us in this connection are his reports upon two cases of what he calls "struma cystosa" in women of twenty-seven and twenty-three

[1] G. Hayem: Du sang et de ses alterations anatomiques, Paris, 1889, p. 924.

[2] S. Klein: Die diagnostische Verwerthung der Leukocytose, Volkmann's Sammlung klin. Vortrage, No. 89, p. 730.

years respectively; the counts were 9,400 and 10,640. Rieder[3] does not go into the subject much more than the others, and turns as usual to tubercular affections of the lungs. He reports one case of chronic anemia following tuberculosis in a girl of nineteen years, in which there were 8,700 leucocytes and the percentage of the mononuclear elements was 22. Also a case of "scrofula, combined with rhachitis," in a boy of three years, where the blood count showed 11,800 leucocytes with 29.2 per cent. of mononuclear cells. With a few exceptions such as these, there seems to be no data with which to compare the counts that I am about to give.

As regards the interesting question of the cause of leucocytosis in general, about which so much has been written, the accompanying reports can, so far as I can see, add nothing. The theory of chemotaxis as expounded by Goldscheider[4] is the one that seems to have least to be said against it and most fully to explain the facts as we meet them clinically; but as to the nature of the chemotactic substance or its manner of origin or increase, little that is definite has yet been said. Dealing as this paper necessarily does, with cases of fairly well-advanced disease — for under hardly any conceivable circumstances could we hope to get a case of tubercular disease of the bone in its very beginning — there has been no chance of finding the diminution, the "hypoleucocytosis" as many of the later writers so strangely choose to call it, in the white cells that has been proved to occur at the commencement of so many acute diseases. The leucocytosis of digestion was excluded as far as possible in making these counts by taking the specimen of blood just as the mid-day meal for children was being served;

[3] H. Rieder: Beiträge zur Kenntniss der Leukocytose, Leipzig, 1892, p. 27.

[4] A. Goldscheider und P. Jacob: Zeitschrift f. klinische Medicin, 1894, xxv, p. 373.

they had been fasting between four and five hours. A more serious source of difficulty, however, lies in the leucocytosis arising from the age of the patients, which varied, with a single exception, from two and a half years to twelve years. Not only is there considerable difference of opinion as to what is to be considered a normal number for the total leucocyte count in children, but the proportion of the various kinds of leucocytes is also a matter of some dispute. As this matter of a fixed starting-point is one of much importance in determining the meaning of any given count, it will be well to quote some of the authorities on children's blood. Schiff [5] states it broadly that during "childhood" the normal number of leucocytes is about 10,000. Bouchut and Dubrisay,[6] however, between the ages of two and fifteen years, find only 6,700. Emma Bayer,[7] a pupil of Denis, places the number up to the sixth year at between 9,000 and 10,000; while Gundobin [8] regards children of eight years as practically adults as far as the blood is concerned. When we turn to the percentage of the various forms of leucocytes, although there is still quite a marked variation in the actual figures, yet upon some points all are agreed. It is certain that in the adult the polynuclear forms are greatly in excess of the mononuclear forms, while in childhood the reverse is the case, and as the child develops, the polynuclear variety steadily increases at the expense of the mononuclear elements. For the adult the figures of Klein represent, perhaps, as fair an average as any; he finds that the lymphocytes are represented by about 24 per cent. of the total number of leucocytes, the large mononuclear by 3 per cent., the polynuclear neutrophiles by 66 per cent., the

[5] Schiff: Zeitschrift f. Heilkunde, Bd. xi, 1890.
[6] Bauchut und Dubrisay: Gazette Médicale de Paris, 1878.
[7] Denis: Recherches experimentelles sur le sang humain considéré à l'état sain, Paris, 1830.
[8] Gundobin: Jahrbuch f. Kinderh., Bd. xxv, 1893.

TABLE I. — Cases of Tubercular Arthritis of Hip-Joint without Abscess.

No.	Sex.	Age, yrs.	Duration disease.	Number of leucocytes.	Prop. mono to poly-nuclear forms.	Eve. Tem. on day of count.	Remarks.	Result of culture.
1	F	7	3½ years	6,419	46 to 54	99.° F.	Acute exacerbation produced by a kick.	
2	F	3	(?)	7,224	28 to 72	104.	Very sensitive; 30° permanent flexion; no motion; ½ inch shortening.	
3	M	6	7 months	9,718	42 to 58	99.	Sensitive; no motion; ½ inch shortening.	
4	M	9	(?)	11,110	40 to 60	99.	Not sensitive; ½ inch shortening; no motion; 45° permanent flexion.	
5	F	10	2 weeks	11,609	33 to 67	100.2	Acute case; joint very sensitive; no motion.	
6	F	19	4 months	12,300	41 to 59	99.	Tender on manipulation; some thickening about joint.	
7	M	5½	9 months	12,447	30 to 70	99.4	Slightly sensitive; 45° permanent flexion; obstinate night-cries.	
8	M	7	(?)	13,000	(?)	99.5	Sensitive; no motion; some swelling of soft parts.	
9	F	7	7½ months	13,800	33 to 67	100.2	Traumatic exacerbation; some bony thickening about trochanter.	
10	M	8½	2 months	13,824	25 to 75	98.6	All motions fair; no sensitiveness.	
11	F	9	2 months	14,500	25 to 75	100.	Slight sensitiveness; slight post trochanteric thickening; abscess developed in 6 months.	
12	F	8½	14 months	15,253	28 to 72	99.5	Very sensitive; night-cries; abscess in 6 months.	
13	M	5	1½ months	20,554	17 to 83	100.	Very sensitive; ½ inch shortening; night-cries persistent.	
14	M	5	12 days	24,212	17 to 83	100.	Traumatic case; much superficial swelling that quickly subsided; all motions returned rapidly.	
15	F	5	3½ years	30,980	26 to 74	99.5	Acute exacerbation from a kick, requiring months to relieve pain. Refused to walk when discharged. No sign of abscess. Retd. in 7 ms. with large abs.	

TABLE II. — Cases of Tubercular Arthritis of the Hip-Joint with Abscess.

16	M	6	2½ years	6,756 6,938	40 to 60 39 to 61	99.8 99.7	Five ounces pus. Acetabulum perforated; head of femur nearly separated. Second count taken 2 days after first.	Negative.
17	M	7	2½ years	8,934	57 to 43	101*	Large abscess. Perforation of acetabulum.	Negative.
18	M	6½	10 months	9,900	31 to 69	100.	Focus in great trochanter; abscess under tuberosity of ischium.	Negative.
19	F	13	(?)	13,058	43 to 57	(?)	Out-patient. Sinus from old operation.	None taken.
20	M	6	2½ years	15,253	21 to 79	101.	Pus outside of joint; focus in trochanter.	2 tubes neg. 1 col. aureus in 3d.
21	M	6½	11 weeks	21,300	21 to 79	100.	Abscess pointing behind; small amount of pus in joint.	Staph. aureus.
22	M	7	3 years	21,520 23,387 25,648	16 to 84 37 to 63 (?) 28 to 72	100.3 100.8 101.2	Marked thickening of soft parts. 18 days later, less swelling, some pain. 7 months later, large abscess involving joint.	Negative.
23	M	10	1 year	21,828	13 to 87	99.8	Rim of acetabulum eroded and joint much diseased.	Staph. aureus.
24	F	3	7 months	41,369	19 to 81	103*	Joint much injured, full of pus.	Staph. aureus and albus.
25	M	3½	10 days	31,676 29,753	21 to 79 (?)	102.3 100.	Acute hip, with no sign of fluctuation. Four days later, abscess in back.	Not taken.

TABLE III. — Cases of Vertebral Tuberculosis without Abscess.

26	M	4	3 years	9,510	46 to 54	99.3	Kyphosis of mid-dorsum. No symptoms of irritation.
27	F	6	10 months	10,350	38 to 62	99.2	Sharp mid-dorsal kyphosis. Slight increase of reflexes.
28	F	8	1 year	12,083	(?)	100.	High cervical. General condition excellent.
29	M	4	18 months	12,100	26 to 74	99.5	Kyphosis from 8th to 10th dorsal vertebræ. Considerable irritability of muscles.
30	F	3	2 years (?)	14,500	35 to 65	100.4	Cervical with lumbar rigidity also. Night-cries.
31	M	3	1 month	20,866	40 to 60	100.2	Low cervical and high dorsal, knee-jerks much increased and ankle clonus present.

TABLE IV. — Cases of Vertebral Tuberculosis with Abscess.

32	M	5	1 year	12,000 10,780 14,940	(?) 28 to 72 12 to 88	99.2 101. 100.2	Dorso-lumbar kyphosis. Psoas abscess. Two weeks later, after operation. Sinus. Three days later. Discharge foul.	Negative. Staph. aureus. Staph. aureus.
33	M	8	1 year	12,800 22,010	27 to 73 15 to 85	100.2 103.2	Large psoas abscess unopened. Lumbar disease. 19 days later, 18 days after operation, sinus.	Negative. Staph. aureus.
34	F	7	2 years (?)	13,252	28 to 72	100.1	Cervical disease. Old sinus in neck.	Staph. aureus.
35	M	11	3 months	16,022	26 to 74	99.2	Low dorsal kyphosis. Abscess absorbed.	
36	F	2½	9 months	21,334	25 to 75	..	Cervical with scar of old abscess. Symptoms of tubercular meningitis and discharge from ears.	Not taken from ears.

TABLE V. — Tubercular Osteomyelitis, etc.

37	M	2½	6 months	6,063	36 to 64	98.4*	Tubercular ostitis tibia, small cavity.	Negative.
38	M	11	6½ weeks	10,047	24 to 76	101.	Multiple arthritis with sinuses, knee and ankle.	Staph. aureus.
39	F	5	2 years	12,100	33 to 67	99.	Old tumor albus. Anchylosis.	
40	M	(?)	(?)	16,700	23 to 77	100.8	Tubercular ostitis femur, involving joint.	
41	M	10	1 year	39,300	16 to 84	97.4*	Osteomyelitis femur, knee-joint disorganized, small sinus.	Staph. aureus and streptoc.
42	F	5	3 months	21,230 19,110	24 to 76 15 to 85	101. 101.	Tubercular peritonitis? Abdominal abscess with [secondary infection. 24 hours later.	Staph. aureus streptococci, ameba coli.
43	F	11½	8 months	11,231	32 to 68	..	Tubercular adenitis of neck.	Negative.

* Temperature taken after operation.

eosinophiles by 2 per cent., and the transitional form by 5 per cent. For children an average must be had for each succeeding year, and this is a matter of much difficulty. Up to the third year, the figures, according to Gundobin, are 50 to 60 per cent. for the lymphocytes and 28 to 40 per cent. for the polynuclear neutrophiles. From the beginning of the third year the neutrophilic cells steadily increase until the eighth or tenth year, when the normal adult proportion should have been reached. In the counts that follow, this normal variation, according to the age of the child, must constantly be borne in mind in estimating the presence and the degree of a neutrophilic leucocytosis.

The technique used in making the counts was as follows: The specimen of blood was taken from the lobule of the ear, and counted by the aid of a Thoma-Zeiss apparatus. In estimating the number of the erythrocytes the blood was diluted in the proportion of 1–200 with "Toison's solution" and five hundred squares upon the stage were counted. For the leucocytes a 0.3 per cent. solution of acetic acid, slightly colored with methylene-violet was used, and the blood diluted in the proportion of 1–100, and 20,000 of the small squares were counted. The cover-glasses, which were taken at the time, were hardened by heat or with benzine and stained with the Ehrlich "triple stain." A differential count of from 500 to 800 cells was then made based upon the classification of Ehrlich. In the following table the temperature taken in the evening of the day on which the count was made has been added, and when the case was operated, between the time of taking the count and taking the temperature, the fact has been noted. In the detailed description of the cases, a fuller account of the temperature range has been given.

In cases of abscess where an operation was per

formed, cultures from the pus were taken directly upon blood serum; some were taken from the first flowing of the pus and, if pockets existed, others were taken from the deeper parts. If, after keeping these at the proper constant temperature for ten days, no growth appeared, the abscess was considered to be due to the action of the bacillus of tuberculosis. It is much to be regretted that the material was not at hand for inoculation of animals in all these cases, but it was not found to be practical at the time. In a few cases there was a microscopical examination of the pus and the walls of the abscess. In the tables that follow, the results of 51 examinations made upon 43 cases are recorded. Finally, it should be stated that these represent consecutive counts and are all the counts made upon this kind of disease, none have been withdrawn from the series to attempt to make it more regular. They are here arranged under the separate headings according to the total number of leucocytes present at the first examination.

Case 1. Girl, seven years old. General condition good. Entered hospital three years ago with symptoms of hip disease dating from six months. No known cause. Hip was sensitive, but admitted motion through whole arc. Discharged in a month without pain. Returned with history of a kick on the joint. Generally very nervous. Hip held rigid by muscular spasm at 35° flexion; very sensitive; somewhat swollen posteriorly. After three weeks' treatment, the hip was not sensitive, and nearly full amount of motion returned.

Erythrocytes	5,464,000
Hemoglobin	70 p. c.
Leucocytes	6,419
Lymphocytes	33 p. c.
Large mononuclear and transitional forms	13 p. c.
Polynuclear neutrophiles	54 p. c.
Eosinophiles	0 p. c.

Case 2. Girl, three years old. Previous history unknown. Examination of chest and abdomen was negative. The left hip was held rigidly flexed at an angle of 30°, and was very sensitive to motion. The temperature ranged at entrance from 99° to 100° F. In a month the permanent flexion had disappeared under a traction of four pounds, and the hip was no longer sensitive. The temperature, however, became irregular; and when the count was taken (a week later), it ranged from normal in the morning to 101.5° or 104° F. in the evening. There were, however, no local or general symptoms; the limb could be abducted about 10° and rotated through one-third of the normal arc. There was one-fourth inch shortening, but no noticeable bony thickening. The blood count showed

Erythrocytes	4,288,000
Hemoglobin	63 p. c.
Leucocytes	7,224
Lymphocytes	11 p. c.
Large mononuclear and transitional forms	17 p. c.
Polynuclear neutrophiles	69 p. c.
Eosinophiles	3 p. c.

The case was sent to the country and improved greatly.

Case 3. Boy, seven years. Apparently spontaneous onset. Right hip sensitive to attempts at motion, but not especially so to pressure. Thigh held flexed at an angle of 45°, slightly abducted and rotated outwards. No motion possible. Under traction in bed the boy did well, and in a month left the hospital wearing a Taylor long-traction splint. There was a slight remission under poor care at home, and the boy was readmitted for malposition. The hip was not, however, sensitive. After two weeks he was again sent out, having 7° permanent flexion; no shortening; one-fourth inch atrophy of calf. There was no

motion at the hip, but likewise no pain or sensitiveness. The temperature was nearly normal.

Erythrocytes	4,916,000
Hemoglobin	65 p. c.
Leucocytes	9,718
Lymphocytes	31 p. c.
Large mononuclear and transitional forms	11 p. c.
Polynuclear neutrophiles	55 p. c.
Eosinophiles	0 p. c.

Case 4. Boy, nine years old. Came under observation five weeks ago, with history of having been roughly treated by father. General condition good. Right hip held rigid by muscular spasm at an angle of 45°. One-quarter inch actual shortening of leg, one-half inch atrophy of calf, and one-quarter inch atrophy of thigh. No pain or sensitiveness about joint. Under eight pounds' traction the deformity proved resistant for three weeks, but under nine pounds' longitudinal and three pounds' lateral traction the leg was brought to the normal position in three weeks more. The deformity showed a marked tendency to return as soon as the child got up, despite a traction splint. There was throughout no rise in temperature over 99°. The blood count showed

Erythrocytes	5,936,000
Hemoglobin	70 p. c.
Leucocytes	11,110
Lymphocytes	22 p. c.
Large mononuclear and transitional forms	18 p. c.
Polynuclear neutrophiles	58 p. c.
Eosinophiles	2 p. c.

It is interesting to note in this case that the count is but very slightly altered from what we should expect to find for a boy of this age, and yet, as shown by the one-quarter inch actual shortening, there must have been some erosion of the bone. The case continued to do well after discharge.

Case 5. Girl, ten years old. Seventeen days before entrance the child began to limp and complain of pain in the hip and knee. Two weeks before she fell in the street, striking on the hip-bone, and since then has suffered constant pain. The left thigh was held rigid and abducted about 10°. There was one-quarter inch atrophy of calf, and a slight amount of post-trochanteric thickening. The count, taken on the day of entrance, showed

Erythrocytes	4,808,000
Hemoglobin	68 p. c.
Leucocytes	11,609
Lymphocytes	24 p. c.
Large mononuclear and transitional forms	9 p. c.
Polynuclear neutrophiles	66 p. c.
Eosinophiles	1 p. c.

There were night-cries at first, but under six pounds' traction they disappeared, and in two weeks the limb was in a normal position and had a fair amount of motion. The child stayed in the hospital for about two months. One-quarter inch bony shortening developed, and there was considerable thickening all about the hip, but no pain. The temperature ranged between 99° and 100° F.

Case 6. Girl, nineteen years old. Hip disease of four months' duration. The onset was insidious; there was limitation of motion to a very few degrees in all directions; some tenderness on manipulation, and slight thickening about the joint. The temperature ranged about 99° F. The count showed

Erythrocytes	4,296,000
Hemoglobin	89 p. c.
Leucocytes	12,300
Lymphocytes	31 p. c.
Large mononuclear and transitional forms	10 p. c.
Polynuclear neutrophiles	59 p. c.
Eosinophiles	0 p. c.

The case was lost sight of and its result is unknown.

CASE 7. Boy, five and a half years old. History of pain in knee and hip for nine months. The left thigh was held rigid at 45° flexion, not very sensitive. Three days after entrance a count showed

Erythrocytes	5,016,000
Hemoglobin	70 p. c.
Leucocytes	12,447
Lymphocytes	16 p. c.
Large mononuclear and transitional forms	14 p. c.
Polynuclear neutrophiles	67 p. c.
Eosinophiles	3 p. c.

The night-cries persisted for nearly three weeks under rest in bed and traction. He stayed in the hospital for a month, when motion had returned for a few degrees and there was no pain on gentle manipulation.

CASE 8. Boy, seven years old. Duration unknown. The hip was held rigid, sensitive, and there was considerable swelling of the soft parts about the great trochanter. The count showed

Erythrocytes	4,828,000
Hemoglobin	74 p. c.
Leucocytes	13,000

No differential count. Subsequent history unknown.

CASE 9. Girl, seven years old. Phthisical family history. Seven and a half months ago complained of pain in hip and knee, and limped on walking. A month later fell down stairs, and since then the symptoms have been acute, with night-cries. On entrance the leg showed one-quarter inch actual shortening and considerable thickening about great trochanter. Tenderness on pressure or attempt at motion. Much muscular spasm limiting motion to a few degrees. In a month, under eight pounds' traction, the motion had returned to more than half the normal amount. The count taken at that time showed

Erythrocytes	5,296,000
Hemoglobin	70 p. c.
Leucocytes	13,824
Lymphocytes	24 p. c.
Small mononuclear or transitional forms	9 p. c.
Polynuclear neutrophiles	65 p. c.
Eosinophiles	2 p. c.

The case progressed steadily, and was discharged ten days after count. The temperature ranged about the 100° F. line.

Case 10. Boy, eight and a half years old. Pain in hip and limping for two months. The leg was held flexed while walking, but straight when the child was lying down. No actual shortening; three-quarters of an inch apparent shortening. Three-quarters of an inch atrophy of muscles in thigh and calf. Hip allowed 70° motion in flexion, 30° abduction, was not sensitive to manipulation. Next day a count showed

Erythrocytes	5,048,000
Hemoglobin	60 p. c.
Leucocytes	13,824
Lymphocytes	20 p. c.
Small mononuclear or transitional forms	5 p. c.
Polynuclear neutrophiles	73 p. c.
Eosinophiles	2 p. c.

The case stayed in the hospital three weeks, and was discharged with all motions somewhat increased and wearing a Taylor splint. The temperature was normal on the day of the count, but varied between 99° and 100° F. for nearly the whole time.

Case 11. Girl, nine years old. Six years before entrance fell, striking upon hip; was lame for two months. Entered hospital a month before count with history of having become suddenly lame two months previous. The hip was then held rigid by muscular spasm, and there was a permanent flexion of 45°. There was some tenderness on pressure over joint and slight post-trochanteric thickening. The treatment

was rest in bed with six pounds' traction. Temperature 99° to 99.5° F. Count

Erythrocytes	5,120,000
Hemoglobin	80 p. c.
Leucocytes	14,500
Lymphocytes	11 p. c.
Small mononuclear or transitional forms	14 p. c.
Polynuclear neutrophiles	75 p. c.
Eosinophiles	5 p. c.

The child remained in the hospital three weeks longer, but at the time of discharge there was scarcely any motion at the hip. Despite careful use of a splint and constant attendance at the out-patient department, the case developed an abscess in six months.

Case 12. Girl, eight and a half years old. Fourteen months ago was taken with pain in hip and knee following a fall. Pain grew worse for a month and was followed by night-cries. When the child was first admitted to the hospital, the hip was held rigidly by muscular spasm and was very sensitive; thigh atrophy was one-quarter of an inch, calf one inch. After treatment for nearly a month, the child had scarlet fever. When readmitted to the surgical ward, ten weeks later, the thigh was still held rigidly by spasm, and there were 30° of permanent flexion. Traction and counter-traction were used, but the deformity yielded slowly. The temperature ranged between normal and 100° F. A count taken two months after admission the second time showed

Erythrocytes	6,664,000
Hemoglobin	65 p. c.
Leucocytes	15,253
Lymphocytes	19 p. c.
Large mononuclear and transitional forms	9 p. c.
Polynuclear neutrophiles	70 p. c.
Eosinophiles	2 p. c.

The case was discharged with a little permanent abduction and no motion, wearing a Taylor splint. She

came regularly to the out-patient department, but had to be readmitted in six months for a large abscess.

Case 13. Boy, five years old. Six weeks ago began to show lameness and had pain in knee. Night-cries soon developed. On entrance the hip was markedly sensitive to pressure, held quite firmly by spasm after an arc of 15° motion in flexion, but allowing no abduction or rotation. There was 10° permanent flexion, an actual shortening of half an inch, three-quarters of an inch atrophy of the calf, and half an inch of thigh, with marked bony thickening behind the trochanter. The temperature was irregular; 100° on the day of the count, it ranged between 98.8° and 101° F. at other times.

The count taken a week after entrance showed

Erythrocytes	5,072,000
Hemoglobin	80 p. c.
Leucocytes	20,554
Lymphocytes	12 p. c.
Large mononuclear and transitional forms	5 p. c.
Polynuclear neutrophiles	81 p. c.
Eosinophiles	3 p. c.

The night-cries persisted for nearly two months, though the motion was slowly returning. He was unfortunately lost sight of after discharge.

Case 14. Boy, five years old. Twelve days before entrance was kicked in the hip, and in a few days developed a high temperature and held hip flexed. The soft parts around this joint were much swollen and very painful on pressure or attempt of motion. It could, however, be put through 18° in flexion and 20° in abduction. The temperature on entrance was 102° F., but fell to normal on the third day. Count taken the day after entrance showed

Erythrocytes	4,336,000
Hemoglobin	63 p. c.
Leucocytes	24,212

Lymphocytes	13 p. c.
Large mononuclear and transitional forms	4 p. c.
Polynuclear neutrophiles	80 p. c.
Eosinophiles	3 p. c.

In three weeks the motions were nearly normal, and there was no pain. The case has continued to do well for eight months.

Case 15. Girl, five years old. Hip disease dates back over three years. Had been in the hospital about a year ago for pain and malposition of joint, staying two and a half months and having 90° flexion and 20° abduction at the time of discharge. Readmitted three months ago with an acute exacerbation said to have come from taking cold. The hip was very sensitive and admitted no motion. Longitudinal traction gave no relief, and even seemed to increase the pain. Lateral traction increased up to two pounds, finally gave some improvement. After two months' bed treatment, she was gotten up with a combination double splint on. At the time of the count, three months after entrance, there was no motion, and although she was apparently free from pain, she refused all attempts to make her walk. The temperature ranged between 98.4° and 100°, being 99.4° at the time of the count.

Erythrocytes	4,874,660
Hemoglobin	63 p. c.
Leucocytes	30,980
Lymphocytes	12 p. c.
Large mononuclear and transitional forms	14 p. c.
Polynuclear neutrophiles	72 p. c.
Eosinophiles	2 p. c.

Case returned to the house in seven months with a large abscess.

Case 16. Boy, six years old. The symptoms of hip disease were said to date back two and a half years. It began with pain in the knee and lameness,

and was followed in about four months by night-cries. Two years ago he was treated in the wards of the hospital. On entrance the hip was held rigidly by muscular spasm, there was half an inch actual shortening, and the tip of the great trochanter was found to be a little higher than it should be. The joint was somewhat sensitive on manipulation. In a month he was discharged in good condition, and with all motions possible through about one-quarter of the normal arc. After an absence of six weeks he returned with a large fluctuating area in front of the joint and a smaller one behind the trochanter; no superficial heat or redness. The count taken on the second day after entrance showed

Erythrocytes	6,096,000
Hemoglobin	75 p. c.
Leucocytes	6,756
Lymphocytes	28 p. c.
Large mononuclear and transitional forms	12 p. c.
Polynuclear neutrophiles	58 p. c.
Eosinophiles	2 p. c.

A second count taken the next day gave

Erythrocytes	5,823,000
Hemoglobin	74 p. c.
Leucocytes	6,938
Lymphocytes	32 p. c.
Small mononuclear and transitional forms	7 p. c.
Polynuclear neutrophiles	59 p. c.
Eosinophiles	2 p. c.

The case was operated on the following day, and five ounces of greenish pus were evacuated. The head of the femur was found nearly separated at the epiphyseal line, and much of the surrounding bone was denuded of periosteum. The wound was nearly healed in a month and the boy was discharged to the out-patient department with three-eighths of an inch shortening, free motion up to 20°. Cultures taken from the pus showed no growth upon blood serum at

the end of a week. The temperature here was between 99° and 100° before the operation and had returned to the same level on the fifth day after it. The subsequent history has been good.

Case 17. Boy, seven years old. Hip disease for two and a half years following a fall. Nine months before he was treated in the hospital for two weeks. The hip was then acute, and the child had night-cries. He was discharged in fair condition wearing a traction splint. The parents did not keep the splint in place, and he returned with a painful joint admitting but a few degrees of motion and showing deep fluctuation. The count taken the day after entrance showed

Erythrocytes	5,712,000
Hemoglobin	70 p. c.
Leucocytes	8,932
Lymphocytes	49 p. c.
Large mononuclear and transitional forms	8 p. c.
Polynuclear neutrophiles	40 p. c.
Eosinophiles	3 p. c.

The case was operated immediately after the count was taken. About eight ounces of tubercular pus was found under considerable tension. On removal of a sequestrum from the floor of the acetabulum, an opening was found into the pelvis and a second pocket of pus existed there. Cultures from the pus failed to grow. The temperature previous to operation was normal in the morning and 99° in the evening.

Case 18. Boy, six and a half years old. Hip disease of ten months' duration following a fall. On entrance the general condition of the child was poor; the left thigh was held flexed at an angle of 40° and the joint was very sensitive upon manipulation. There was no sign of abscess, but the joint was somewhat enlarged by fibrous or bony thickening, mostly behind the great trochanter. Three weeks later an abscess

began to show itself in the ischio-rectal fossa, the hip continuing sensitive all the time. The temperature was not markedly irregular, being 100° on the evening the count was taken, which was twenty-two days after entrance and three days after the detection of the abscess.

Erythrocytes	7,288,000
Hemoglobin	68 p. c.
Leucocytes	9,900
Lymphocytes	24 p. c.
Large mononuclear and transitional forms	7 p. c.
Polynuclear neutrophiles	68 p. c.
Eosinophiles	1 p. c.

The operation, performed the following day, evacuated a moderate amount of pus and showed a sinus leading to the great trochanter, but apparently not involving the joint. The culture tubes from this case were unfortunately broken, but microscopic examination showed no large quantity of leucocytes. The wound, however, became secondarily infected, and the temperature ran at 105° for several evenings. He was discharged a month later with a firmly healed cicatrix, no pain in the joint, and motion of 30° in flexion and 20° in abduction.

Case 19. Girl, thirteen years old. Hip disease for several years, and previous operation for abscess. There was little or no motion at the hip, and a slight discharge from one of the old sinuses. Girl was being treated as an out-patient.

Erythrocytes	4,800,000
Hemoglobin	68 p. c.
Leucocytes	13,058
Lymphocytes	35 p. c.
Large mononuclear and transitional forms	8 p. c.
Polynuclear neutrophiles	54 p. c.
Eosinophiles	3 p. c.

No cultures were taken.

Case 20. Boy, six years old. Disease dated from

a fall over three years ago. A year after onset was treated in the hospital. At the time the joint was in a very sensitive condition, but yielded to traction; and he was discharged wearing a long traction splint. Three months before second entrance, deep fluctuation was found, which steadily increased. On entrance his general condition was fair and the hip in good position and not very sensitive. Anteriorly and over the great trochanter was a large abscess. The temperature ranged between 90° and 101° F. The count taken the day after entrance showed

Erythrocytes	6,136,000
Hemoglobin	63 p. c.
Leucocytes	15,253
Lymphocytes	16 p. c.
Large mononuclear and transitional forms	5 p. c.
Polynuclear neutrophiles	77 p. c.
Eosinophiles	2 p. c.

The case was operated the next day, and six to eight ounces of pus found under much tension. The sinuses went up in front of the joint, and on the side had burrowed half-way to the knee. Of tubes inoculated with this pus, two were sterile and a third developed a single colony of the staphylococcus aureus.

Case 21. Boy, six and a half years old. Hip disease following a fall from a ladder; symptoms began eleven weeks ago. Entered hospital with very acute hip held rigidly at 40° permanent flexion. There was marked tenderness and some thickening behind the trochanter. Under bed treatment the sensitiveness diminished somewhat, but an abscess was found pointing behind the tuberosity of the ischium, with considerable reddening of the skin. The count taken three weeks after entrance showed

Erythrocytes	3,008,000
Hemoglobin	63 p. c.
Leucocytes	21,300
Lymphocytes and transitional forms	21 p. c.
Polynuclear neutrophiles	79 p. c.

The temperature ran about in the 100° line. The case was operated the day following the count, and a small amount of cheesy pus found. Cultures of this pus showed the presence of the staphylococcus pyogenes aureus in large numbers.

Case 22. Boy, age seven years. Hip disease for three years, treated part of the time with a modified Thomas splint. On entrance the thigh was firmly held by muscular spasm, slightly abducted and rotated outwards. Permanent flexion 10°, half an inch actual shortening of limb, half an inch atrophy of thigh, joint sensitive to all manipulation, marked thickening and doubtful fluctuation behind and outside the great trochanter. Temperature, 99° to 101° F. Count taken three days after entrance showed

Erythrocytes	5,016,000
Hemoglobin	73 p. c.
Leucocytes	21,520
Lymphocytes	10 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	84 p. c.
Eosinophiles	0 p. c.

Under rest in bed the swelling of the soft parts subsided. In eighteen days there was little or none to be felt and the count showed

Erythrocytes	5,048,000
Hemoglobin	70 p. c.
Leucocytes	23,387
Lymphocytes	29 p. c.
Large mononuclear and transitional forms	8 p. c.
Polynuclear neutrophiles	60 p. c.
Eosinophiles	2 p. c.

There were occasional paroxysms of pain, but the boy was discharged in fairly good condition to get built up in the fresh air. He returned in six months with a large superficial abscess occupying the upper third of the outside of the leg. The count then showed

Erythrocytes	5,296,000
Hemoglobin	72 p. c.
Leucocytes	25,648
Lymphocytes	21 p. c.
Large mononuclear and transitional forms	7 p. c.
Polynuclear neutrophiles	71 p. c.
Eosinophiles	1 p. c.

On operation the joint was found to be involved. Cultures from the pus failed to give a positive result.

Case 23. Boy, ten years old. Hip disease for a year, treated with long traction splint. On entrance the hip was very sensitive, held flexed at an angle of 45°, and all motion prevented by muscular spasm. In front of the joint was an abscess as large as the palm of the hand. The temperature varied between 99° and 100° F. A count taken the day after entrance showed

Erythrocytes	5,008,000
Hemoglobin	73 p. c.
Leucocytes	21,828
Lymphocytes	6 p. c.
Large mononuclear and transitional forms	7 p. c.
Polynuclear neutrophiles	85 p. c.
Eosinophiles	2 p. c.

Operation four days later evacuated about four ounces greenish pus, and showed a disintegrated hip-joint with a portion of the upper rim of the acetabulum carious. Cultures taken from the pus showed it to be thoroughly infected with the staphylococcus aureus. The case was discharged in six weeks with one-half inch actual shortening, but no motion.

Case 24. Girl, three years old. Hip disease for seven months treated with Taylor splints in the out-patient department. There had been considerable free motion and very little thickening. Two months ago deep fluctuation was detected over the anterior part of joint and the great trochanter. On entrance the hip was held rigidly by muscular spasm. A large abscess with considerable reddening of skin and super-

ficial rise of temperature covered the upper part of the thigh. The temperature was 99.8° on entrance, 100° the next morning, 101° in the evening, 99.8° the following morning, and 103° that evening. The count taken on the third day showed

Erythrocytes	3,744,000
Hemoglobin	65 p. c.
Leucocytes	41,369
Lymphocytes	14 p. c.
Large mononuclear and transitional forms	5 p. c.
Polynuclear neutrophiles	81 p. c.
Eosinophiles	0 p. c.

Operation the same day evacuated eight ounces of thick pus, and showed a joint opened and beginning to be disorganized. Cultures showed the presence of the staphylococcus pyogenes aureus and albus in large numbers.

Case 25. Boy, three and a half years old. Well until ten days previous to entrance, when he began to limp and complain of pain in knee. On entrance the left hip was held rigidly by muscular spasm, permanent flexion at an angle of 85°, joint hypersensitive, some thickening of soft parts about joint, possibly some bony thickening. Under traction the case appeared to do well. Three weeks later the temperature began to go up, and a count was taken, which showed

Erythrocytes	5,064,000
Hemoglobin	65 p. c.
Leucocytes	31,676
Lymphocytes	12 p. c.
Large mononuclear and transitional forms	9 p. c.
Polynuclear neutrophiles	76 p. c.
Eosinophiles	3 p. c.

Temperature 102.3° F.

The abdomen was found to be distended and tympanitic. After free purgation the abdominal symptoms subsided and the temperature came down to 99.5° on morning of same day. A count was then taken.

Erythrocytes	4,704,000
Hemoglobin	70 p. c.
Leucocytes	29.753

Four days after this a boggy spot was found on the back on a level with the tenth and eleventh dorsal vertebræ, about four inches from the spinous processes. This was opened, and several ounces of pus evacuated; but on account of the poor condition of the child, no search for its relations was made.

When the case was discharged a month later, there was no pain in the hip, which allowed an arc of flexion of 50°, of abduction 35°, and normal rotation. No cultures were taken.

Case 26. Boy, four years old. Had had Pott's disease for three years, and had worn a Taylor back-brace. Deformity said not to have increased for eighteen months. On entrance the child was in poor general condition, no increase of patella reflexes, unsteady gait, back held rigid, marked prominence of fifth to eighth dorsal vertebræ. Temperature 99° to 99.5°. Count taken a week after entrance showed

Erythrocytes	4,776,000
Hemoglobin	60 p. c.
Leucocytes	9,510
Lymphocytes	40 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	50 p. c.
Eosinophiles	4 p. c.

The case progressed favorably.

Case 27. Girl, six years old. Had been under treatment in out-patient department with a Taylor brace for nine months. On entrance general condition poor, sharp kyphosis involving fifth to seventh dorsal vertebræ, considerable spasm of dorsal muscles. Knee-jerks slightly increased. Much pain referred to abdomen. Temperature 99.8° to 100° F. Count taken after a month's treatment in bed showed

Erythrocytes	4,288,000
Hemoglobin	68 p. c.
Leucocytes	10,350
Lymphocytes	28 p. c.
Large mononuclear and transitional forms	10 p. c.
Polynuclear neutrophiles	62 p. c.
Eosinophiles	0 p. c.

Case 28. Girl, eight years old. General condition fair. Has had a high cervical caries for a little over a year, treated with a brace combined with head support. Only entered hospital for repairs to apparatus. Temperature 99° to 100° F. Count showed

Erythrocytes	5,652,000
Hemoglobin	82 p. c.
Leucocytes	12,083

Case 29. Boy, four years old. Boy in good general condition. A prominence of several spines at level of eighth dorsal vertebra, said to have appeared suddenly after a period of nearly eighteen months' stiffness of back and malaise. Muscles of back in state of tonic spasm. Knee-jerks not increased. Temperature 99° to 100° F. Count taken four weeks after entrance showed

Erythrocytes	6,808,000
Hemoglobin	70 p. c.
Leucocytes	12,100
Lymphocytes	18 p. c.
Large mononuclear and transitional forms	8 p. c.
Polynuclear neutrophiles	73 p. c.
Eosinophiles	1 p. c.

Case 30. Girl, three years old. Duration of trouble indefinite. Admitted to hospital seven months ago with sharp kyphosis involving the spines of the first and second dorsal vertebræ. Motions of head partially restricted, and marked night-cries. Treated by rest in bed with traction and later with a Thomas collar. Discharged in three weeks. Returned in ten weeks, having neglected to wear collar.

At this time the kyphosis in cervical region was gone and its place taken, or obscured, by a marked running forward of the head. All the posterior cervical muscles were in a state of spasm, and the lumbar region was also carried stiffly. The general condition was poor and the temperature varied from 98.4° to 102° F. Count taken four weeks after entrance the second time showed

Erythrocytes	5,768,000
Hemoglobin	78 p. c.
Leucocytes	14,500
Lymphocytes	29 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	65 p. c.
Eosinophiles	0 p. c.

The case was discharged ten days later somewhat improved and wearing a Taylor brace with head splint.

Case 31. Boy, three years old. Entered hospital with history of having held his head and shoulders stiffly for a month, and being unable to walk for at least five days. General condition was good. Stood with trunk pushed forward and all the dorsal muscles tense; head retracted and right sterno-mastoid contracted. The spine was prominent in the upper dorsal and lower cervical regions, but there was no definite kyphosis. The knee-jerk was increased on both sides, and there was an ankle clonus. The temperature varied in long waves from normal to 101.3° F. The count taken a week after entrance showed

Erythrocytes	5,176,000
Hemoglobin	70 p. c.
Leucocytes	20,866
Lymphocytes	29 p. c.
Large mononuclear and transitional forms	11 p. c.
Polynuclear neutrophiles	59 p. c.
Eosinophiles	1 p. c.

Case 32. Boy, five years old. Entered hospital with history of pain in abdomen for a year, with

dragging of feet for four months. He had been treated by plaster jackets. At entrance there was a well-marked kyphosis involving the twelfth dorsal and first two lumbar vertebræ; there was a feeling of resistance in the left iliac fossa and slight psoas contraction. The temperature was 98.8° to 99.5°. The first count was taken two weeks after entrance; it showed

Erythrocytes	4,824,000
Hemoglobin	72 p. c.
Leucocytes	12,000

Two days later the case was operated, and nearly a pint of pus evacuated from sheath of the psoas muscle. The pus proved sterile on blood serum. Two weeks later the second count was made, the abscess draining well; temperature 100° to 101°.

Erythrocytes	5,312,000
Hemoglobin	70 p. c.
Leucocytes	10,780
Lymphocytes	21 p. c.
Large mononuclear and transitional forms	7 p. c.
Polynuclear neutrophiles	69 p. c.
Eosinophiles	3 p. c.

A third count was taken three days later. There was then a free discharge of pus in which the staphylococcus aureus was abundant.

Erythrocytes	4,691,500
Hemoglobin	50 p. c.
Leucocytes	14,940
Lymphocytes	7 p. c.
Large mononuclear and transitional forms	5 p. c.
Polynuclear neutrophiles	85 p. c.
Eosinophiles	3 p. c.

The case subsequently developed a second abscess on the other side, and did very poorly.

Case 33. Boy, eight years old. Entered hospital with history of kyphosis in lower dorsal region for about two years, coming on after a fall. For three months had walked much bent over, treated with

plaster jacket. On entrance the general condition was poor, both thighs were held flexed and there was a feeling of resistance in the left iliac fossa. The temperature was between 99° and 100° F. A count made a week after entrance showed

Erythrocytes	4,624,000
Hemoglobin	70 p. c.
Leucocytes	12,800
Lymphocytes	16 p. c.
Large mononuclear and transitional forms	11 p. c.
Polynuclear neutrophiles	73 p. c.
Eosinophiles	0 p. c.

The following day the case was operated. Cultures taken from the pus were sterile.

There was a free discharge from the opening, which later became foul, and the temperature ran as high as 104.2° F. with marked morning and evening differences. Cultures from the pus showed it to be inoculated with the staphylococcus aureus. A count taken nineteen days after the first showed

Erythrocytes	4,852,000
Hemoglobin	58 p. c.
Leucocytes	22,010
Lymphocytes	9 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	84 p. c.
Eosinophiles	1 p. c.

Freer drainage was furnished later, and the case improved.

Case 34. Girl, seven years old. Doubtful history of two years' duration. On entrance the girl was in good general condition; she showed a marked knuckle in lower cervical and upper dorsal regions; the head was held stiffly by a spasm of the deep muscles at the back of the neck. There was a decided lateral curvature of the spine, and on the left side of the neck was a discharging sinus, as though from an old prevertebral abscess. There was no increase in the knee-jerks or

ankle clonus, yet the child had incontinance of both urine and feces. The temperature was irregular, between 98.8° and 101.2° F. Staphylococcus aureus found in the discharge. A count taken two days after entrance showed

Erythrocytes	4,056,000
Hemoglobin	47 p. c.
Leucocytes	13,252
Lymphocytes	20 p. c.
Large mononuclear and transitional forms	8 p. c.
Polynuclear neutrophiles	72 p. c.
Eosinophiles	0 p. c.

Case 35. Boy, eleven years old. Entered with history of general loss of strength and locomotion for three months. There was a kyphosis of tenth and eleventh dorsal vertebræ, a fluctuated area a little over two inches in all diameters situated between the lower ribs and the brim of the pelvis. There was no sense of resistance in the iliac fossæ or increase in the knee-jerks. The child was treated by recumbency with pads under the deformity. The temperature was very regular, between 99° and 99.7° F. A count taken a week after entrance showed

Erythrocytes	4,976,000
Hemoglobin	70 p. c.
Leucocytes	16,022
Lymphocytes	21 p. c.
Large mononuclear and transitional forms	5 p. c.
Polynuclear neutrophiles	72 p. c.
Eosinophiles	2 p. c.

The abscess slowly absorbed and in three weeks only a small dull area, without fluctuation, remained. The polynuclear count is interestingly low in connection with the result.

Case 36. Girl, two and a half years old. A very poorly nourished child, with symptoms of tubercular (?) meningitis. Said to have had trouble in breathing and to have held head rigidly for nine months. Four

months ago had a retropharyngeal abscess opened in another hospital. No kyphosis, all the deep cervical muscles in tense contraction, any motion causing great pain. Knee-jerks much increased and ankle clonus marked. Puriform discharge from both ears. Temperature 99° to 100° F. A count taken the day after entrance was as follows:

Erythrocytes	5,112,000
Hemoglobin	60 p. c.
Leucocytes	21,334
Lymphocytes	17 p. c.
Large mononuclear and transitional forms	8 p. c.
Polynuclear neutrophiles	73 p. c.
Eosinophiles	2 p. c.

The child died of meningitis six days later.

Case 37. Boy, two and a half years old. Six months before entrance fell, striking on chin, but apparently made a perfect recovery. Six weeks before entrance there began to be swelling of the feet and legs as far up as the knee. There were no subjective symptoms and the temperature did not go above 99° F.

A count was taken, and the case operated upon the second day after entrance.

Erythrocytes	6,616,000
Hemoglobin	75 p. c.
Leucocytes	6,063
Lymphocytes	30 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	64 p. c.
Eosinophiles	0 p. c.

At the operation a cavity was found in the head of the tibia at epiphyseal line that contained half a drachm of pus. Cultures failed to grow upon blood serum.

Case 38. Boy, eleven years old. A case of acute arthritis of the ankle and knee, with multiple abscesses

and caries of the metatarsal bones, of a little over six weeks' duration. The temperature was irregular, and at the time the count was taken there were several discharging sinuses at the knee, ankle and on the dorsum of the foot. The staphylococcus aureus were abundant in these discharges. The boy was anemic and generally in very poor condition.

Erythrocytes	2,468,000
Hemoglobin	56 p. c.
Leucocytes	10,047
Lymphocytes	14 p. c.
Large mononuclear and transitional forms	10 p. c.
Polynuclear neutrophiles	76 p. c.
Eosinophiles	0 p. c.

Case 39. Girl, five years old. A case of tumor albus of two years' duration following a fall. The joint was in a subacute condition, with some elevation of superficial temperature and tenderness. The knee was held flexed at an angle of 45°. The temperature ran nearly normal. The count taken a week after entrance showed

Erythrocytes	5,378,000
Hemoglobin	70 p. c.
Leucocytes	12,100
Lymphocytes	27 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	67 p. c.
Eosinophiles	0 p. c.

Case 40. Boy, (?) age. A case of tubercular ostitis of the femur with secondary involvement of the joint in a run-down and tuberculous boy. The disease was quite acute, and the knee much swollen, hot and painful. Pressure on the internal condyle of the femur gave rise to acute pain. The temperature ranged between 100° and 101.5° F.

The count showed

Erythrocytes	4,976,000
Hemoglobin	67 p. c.
Leucocytes	16,700
Lymphocytes	17 p. c.
Large mononuclear and transitional forms	6 p. c.
Polynuclear neutrophiles	76 p. c.
Eosinophiles	1 p. c.

Case 41. Boy, ten years old. Entered with history of what seem to have been successive attacks of osteo-myelitis, that have left depressed and adherent scars over several of the long bones. A year ago fell and bruised knee, which has steadily enlarged. On entrance the external condyle of the femur was found very sensitive to pressure and somewhat enlarged. The joint was full of fluid, much distended, hot and tender, parts surrounding it boggy. On the inner side was a small, discharging sinus. The knee was held flexed at a right angle. The temperature varied between 99° and 102° F. The count taken a month after entrance showed

Erythrocytes	4,232,000
Hemoglobin	68 p. c.
Leucocytes	39,300
Lymphocytes	6 p. c.
Large mononuclear and transitional forms	10 p. c.
Polynuclear neutrophiles	85 p. c.
Eosinophiles	0 p. c.

The case was operated on the same day, and the joint found to be thoroughly disorganized. The original focus seemed to have been in the end of the femur. Cultures showed presence of the staphylococcus aureus and the streptococcus pyogenes.

Case 42. Girl, five years old. Came to the hospital with diagnosis of possible typhoid fever, and a bad superficial burn of abdomen. On this being healed, the abdomen was found to be still large and there was marked resistance felt in the right iliac fossa. The

temperature was subject to periodic variations in which for a week it would run at 100° in the morning and 104.5° F. or so in the evening; then for ten days the swing would be between 99° and 100° F. Both the pulse and respiration sympathized accurately with the variations of the temperature. Six weeks after entrance the diagnosis of probable tubercular peritonitis having been made, the case was transferred to the surgical side. A count was taken which showed

Erythrocytes	3,960,000
Hemoglobin	54 p. c.
Leucocytes	21,230
Lymphocytes	14 p. c.
Large mononuclear and transitional forms	10 p. c.
Polynuclear neutrophiles	76 p. c.
Eosinophiles	0 p. c.

On the following day, there being a distinct increase in the abdominal tenderness and an inclination on the part of the temperature to take another of its irregular periods, a second count was taken :

Erythrocytes	3,790,000
Hemoglobin	53 p. c.
Leucocytes	19,110
Lymphocytes	8 p. c.
Large mononuclear and transitional forms	7 p. c.
Polynuclear neutrophiles	85 p. c.
Eosinophiles	0 p. c.

A week later the case came to operation. The peritoneum over the tumor was found thickened and adherent all around ; a deep cavity, walled off sharply everywhere, was opened, contained purulent material and cheesy flakes. It extended as high as the umbilicus in the median line and higher on the sides. Cultures from this pus showed the presence of the staphylococcus aureus, the streptococcus, and bacillus coli communis, while portions of the abscess wall showed

tubercle bacilli. The case progressed favorably and ultimately recovered.

Case 43. Girl, eleven and a half years old. She had had a slowly growing glandular enlargement for about eight months on the right side of the neck at angle of jaw and following the anterior edge of the sterno-mastoid. The trouble began without known cause in a child of feeble constitution and anemic appearance. At the time of entrance the pocket of glands numbered some six or eight, the largest the size of a horse-chestnut. There was no fluctuation to be felt, and no involvement of the skin. Temperature about the 99° F. line. Count showed

Erythrocytes	5,104,000
Hemoglobin	72 p. c.
Leucocytes	11,251
Lymphocytes	22 p. c.
Large mononuclear and transitional forms	10 p. c.
Polynuclear neutrophiles	68 p. c.
Eosinophiles	0 p. c.

Upon operation, two days later, the largest of the glands was found to have degenerated in the centre and already contained purulent material. The wound healed *per primam.* Cultures from the liquid portion gave a negative result upon blood serum.

SUMMARY.

Although in the foregoing series the number of counts is in many places too small for us to feel certain that they represent a fair average; in many a bacteriological examination is wanting where it would have been most interesting; and in others even the approximate result could not be seen on account of the child failing to report at the out-patient clinics, and the parents to answer any letter of inquiry;

nevertheless, in reviewing the series as a whole, certain points seem to be indicated with sufficient clearness to warrant some deductions being drawn. These seem to be:

(1) Most cases of tuberculosis of the bones and joints do not decrease the number of the red corpuscles in the blood.

(2) They do, however, affect the percentage of hemoglobin, giving rise in fact to a mild degree of chlorosis.

(3) The leucocyte count seems to bear no direct relation to the temperature (see Cases 2, 15 and 23).

(4) High counts, especially in hip disease, point to the probability that there is or shortly will be an abscess formation; but low counts do not preclude the presence of abscess, especially in cases of long standing (see Cases 11, 12, 13 and 15).

(5) Where, in connection with a low leucocyte count an abscess is found to exist, the pus from it is sterile, and the case is generally one of long-standing (see Cases 16, 17, 18, 32 and 37).

(6) In the presence of an abscess, a low leucocyte count generally indicates the absence, and a high count the presence, of a secondary infection with pyogenic organisms (compare Cases 16, 17, 18, with 21, 23, 24).

(7) Cases where, at the primary operation, the pus has proved sterile, show an increase in the leucocyte count where the wound becomes infected with pyogenic organisms (see Cases 32 and 33).

(8) High leucocyte counts do not always affect the differential count (see Cases 15 and 22).

(9) Cases with a traumatic origin are generally accompanied by a high leucocyte count and run a more severe course. This is especially shown in cases of hip disease, where Cases 5, 9, 11, 12, 14, 15, 17, 18 and 21 gave a fairly clear history. Case 13 is inter-

esting in this connection, for it breaks into the series of cases with a high leucocyte count that failed to produce an abscess, but even here the severity of the disease was shown by the stubborn persistence of the night-cries under the recumbent form of treatment. That more of the cases which entered with a developed abscess did not give a definite history of trauma is due no doubt to the fact that the length of time the disease had been progressing had caused a lack of accurate detail at the beginning being remembered. The clinical side of this is alluded to by Watson Cheyne[9] in his latest work.

[9] W. Watson Cheyne: Tuberculous Disease of Bones and Joints, London, 1895, p. 105.