

— T H E S I S —

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— f o r —

" M. D. "

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THE POLYMORPHO-NUCLEAR LEUCOCYTES IN SUPPURATIVE  
CONDITIONS OF THE MIDDLE EAR.

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J. W. SMITH,

M.B., Ch.B., (1902).

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## — I N T R O D U C T I O N . —

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The British Medical Journal of November 17th. 1906 gives the report of the proceedings of the Otological Section of the British Medical Association, which held its Meeting at Toronto in that year. Several otologists took part in the discussion on "The Indications for ligation of the Internal Jugular Vein in Otitic Pyaemia", and some emphasised the importance of the information which may be gained from routine examination of the blood in these cases.

Dr. George A. Leland (Boston) referred to the value of leucocytosis in determining the amount of septic absorption that was going on in cases of lateral sinus thrombosis.

Dr. J. A. Stucky (Lexington, Kentucky) drew attention to the importance of the daily blood-count in these cases, and added that, as the polymorpho-nuclear leucocytes indicated the condition of body resistance and afforded evidence of septic absorption, not only the number of leucocytes but also the percentage of the polymorpho-nuclear cells should be taken into account.

Dr. J. Dundas Grant (President of the section) remarked that repeated examination of the blood was an important help.

This report induced me, while House Surgeon at the Liverpool Eye and Ear Infirmary, to commence a series of leucocyte counts in cases of Suppurative Otitis Media. Acute and chronic cases were examined with a view to observing exactly what takes place in these cases, so that if a case of septic sinus thrombosis should present itself the changes in the blood might be fully appreciated. During my residence, however, no such case was admitted, but I was permitted to see a case in another hospital and this will be referred to later. This paper therefore deals in the main with Suppurative disease of the middle ear, in some cases with complications.

The leucocyte counts were made with a Thoma-Zeiss counting-chamber and leucocyte pipette. Weak acetic acid, slightly stained with gentian violet, was used for dilution. In many instances two counts were made from different drops of blood from the same patient at the same time, so that the results might check each other. If on any particular occasion two counts made from the same patient at the same time did not approximately agree, the observations were discarded and fresh counts made.

The investigations were conducted with the greatest possible care with regard to exact measurement and cleansing of instruments, etc., and only those cells which had polymorphous nuclei were counted. A Swift's microscope with 1/6" objective was used: by this means a field in which twenty-five squares could easily be counted was obtained. Ten such series of twenty-five squares were counted in each case. Thus, two hundred and fifty squares were counted on each occasion, and, by multiplying the number of cells in so many squares by three hundred and twenty, the number per cubic millimetre was easily arrived at.

For the sake of illustration the following count is given in detail:-

$$\begin{array}{r} \text{No. of polymorpho-} \\ \text{nuclear leucocytes:} \\ \hline \text{No. of squares:} \end{array} \quad \begin{array}{r} \frac{3}{25} - \frac{4}{25} - \frac{3}{25} - \frac{1}{25} - \frac{6}{25} - \frac{6}{25} - \frac{4}{25} - \frac{6}{25} \\ \\ \frac{5}{25} - \frac{5}{25} \end{array} \quad = \quad \frac{43}{250}$$

$$\frac{43}{250} \times 20 \text{ (dilution)} \times 4000 = \text{No. of polymorphs per cubic millimetre.}$$

$$43 \times 320 = 13,760 \text{ polymorpho-nuclear leucocytes per c.m. of blood.}$$

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In order to avoid repetition in the cases to be described, the number of cells is simply multiplied by

three hundred and twenty, but it will be understood that the method as above indicated was employed in every case. A single count occupied on an average from forty to forty-five minutes and any cell which did not exhibit a polymorphous nucleus was excluded from the count.

This method of only counting the cells with polymorphous nuclei lends itself to a certain degree of error in view of the fact that the eosinophile cell has a polymorphous nucleus as well as the polymorpho-nuclear leucocyte: but from a consideration of authentic statistics, this error is proved to be very small: so small that it may be ignored.

First of all, with regard to the total number of leucocytes in normal blood, it may be stated that, although this may vary considerably, most haematologists are agreed that 7,500 is about the average. Professor Muir considers that a fall below 5,000 or a rise above 12,000 rarely occurs without some abnormal condition being present. The same authority states that from 6,000 to 10,000 may be taken as the usual limits.

In the case, however, of the normal proportions of the polymorpho-nuclear and eosinophile leucocytes there is more variety of opinion. The following are some of the percentages given:-

Cabot	(1897)	Polymorphs	62-70%	Eosinophiles	$\frac{1}{2}$ -4%
Copeman	(1898)	,,	75%	,,	2%
Coles	(1898)	,,	70-75%	,,	2-4% ) (Stengel)
Milroy	(1899)	,,	70%	,,	3%
Muir	(1900)	,,	70%	,,	3-4%
Drysdale	(1905)	,,	66%	,,	2%
Ehrlich & Lazarus	(1905)	,,	70-72%	,,	2-4%

The late Von Limbeck (Translation 1901) in quoting the results of Zappert's observations considered that the polymorphs vary from 70 to 80%, and the Eosinophiles from .67% to 11%.

The minimum normal percentage limit of the polymorphs as given by Cabot (62) and the average as given by Drysdale (66) are considerably lower than the proportion as given by most other authorities. Von Limbeck, on the other hand, gave an unusually high limit (80). The figures of the majority would seem to indicate that the more usual condition is a proportion of from 70-75%. Thus, it may be considered reasonable to look upon 72% as an average normal proportion for the polymorpho-nuclear leucocytes.

In the case of the eosinophiles Cabot again gives a lower percentage limit than usual, viz.  $\frac{1}{2}$ . The general rule is to consider anything from 2 - 4% as the usual con-

dition, and for practical purposes it may be considered safe to take 3% as an average proportion for the eosinophile leucocytes in normal blood.

Taking then 7,500 as the average total number of leucocytes in normal blood, and 72% and 3% as the average proportions of the polymorphs and eosinophiles respectively, these cells will average 5,400 and 225 per cubic millimetre.

Now, in almost all ordinary inflammations it is recognised that the polymorpho-nuclear leucocytes alone are the cells which are increased: the eosinophiles may remain unaltered in number, or they may decrease or even disappear. According to Ehrlich and Lazarus (1905), a few instances of ordinary inflammation show, besides a polymorpho-nuclear leucocytosis, an increase in the eosinophiles. Eosinophilia occurs also in certain well known conditions, e.g., Bronchial Asthma, pemphigus and other skin diseases, and sometimes as a post febrile feature in pneumonia and articular rheumatism (Ehrlich), but only exceptionally in ordinary inflammations. If then, in ordinary inflammation (and the cases included in this paper come under this category), the eosinophile cells do not amount to more than from 200 to 300 they will not influence the value of an observation if included in the count, when it is simply a matter of numbers. It may therefore be claimed that, although all the cells with



polymorphous nuclei were included in my counts, the figures given - from a clinical standpoint - may be looked upon as representing the numbers of the all-important polymorpho-nuclear leucocytes, and that the inclusion of the eosinophiles does not materially influence the value of the observations.

From a perusal of my cases it will be evident that the polymorpho-nuclear counts, taken from some of the patients after they had been cured of middle ear suppuration, gave higher figures than those given by authorities for a normal condition. For instance, cases 2 and 4 were the subjects of Chronic Suppurative Otitis Media and were cured by operation. These two patients, at a time when the operation cavity was healed or almost so, gave counts which varied from 6080 to 8000. When these figures were obtained the individuals were, so far as one could see, in a normal condition, and yet the polymorpho-nuclear cells, according to my calculations, amounted to more than the number which I have reckoned to be the normal average, i.e. 5,000 - 6,000. Even keeping in mind the fact that the leucocytes vary in health in the same individual, my counts are somewhat higher than they should be for normal individuals. In order, if possible, to ascertain the cause of this, I made observations on other ten normal persons by exactly the same method as in the routine practice with the patients. Their ages varied

from ten to forty years and the average of the counts came to 7,000: this again is considerably above the average figure given by authorities. I cannot explain the cause of this difference, which I endeavoured repeatedly to account for, but always with the same result. Whatever may be the cause of the error, it is more than probable that the same discrepancy pervades the whole series of counts, so that they may still claim to retain at least some comparative value. All the counts were made by myself, and by considering as leucocytoses only those polymorpho-nuclear counts which exceeded 10,000, I have made due allowance for any personal error.

A paper, by Mr. John M. Darling, in the February issue of the Edinburgh Medical Journal of this year, gives some valuable information on the subject of leucocytosis in Suppurative middle ear infection. In this paper, with which I have just recently been made familiar, the writer makes special reference to the importance of ascertaining the percentage number of the polymorpho-nuclear leucocytes as well as the total number. In my cases only the total number of polymorpho-nuclear leucocytes was ascertained. Unfortunately their percentage was not also calculated as I was not fully aware of the importance which has been recently attached to this matter. Since making my investi-

gations I have learned that such observers as Sondern, McKernon and McCuen Smith have, within the last few years, come to consider that the number of leucocytes per cubic millimetre varies with the body resistance, while the percentage of the polymorpho-nuclear cells varies with the intensity and extent of the infection.

The operations were performed by the aural surgeons of the Liverpool Eye and Ear Infirmary, to whom I am indebted for the liberty to make the investigations.

It is proposed to consider this paper under the following headings:-

- |    |   |                                       |
|----|---|---------------------------------------|
| A. | RECORDS OF CASES.....   | ( In-Patients.<br>(<br>(Out-Patients. |
| B. | ANALYSIS OF THE RESULTS .   | ( In-Patients.<br>(<br>(Out-Patients. |
| C. | SUMMARY in which In-patients and out-patients<br>are considered together. |                                       |
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A. RECORDS OF CASES.

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IN - PATIENTS.

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I. CHRONIC SUPPURATIVE OTITIS MEDIA (Cases 1 to 8.)

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Case I.

JOHN A: age 4 years: admitted 4th January 1907.

History: Had scarlet fever 2 years ago and since then both ears have discharged constantly. According to the mother the discharge has always been copious. Two months ago had "a swelling" behind left ear which burst after lasting several days.

Examination: Discharge from both ears very copious.

Large perforation in each tympanic membrane: discharging sinus behind left ear leading down to carious bone.

5th Jan.	<u>11 a.m.</u>	4 3 3 1 6 6 4 6 5 5	= 43	
			43 x 320	= 13,760
5th Jan.	<u>7 p.m.</u>	4 10 8 3 6 3 4 5 3 9	= 55	
			55 x 320	= 17,600
7th Jan.	<u>Noon.</u>	Radical mastoid operation was performed on the left side. A sequestrum was removed and what remained of the mastoid was found to be soft and extensively involved in the disease. Antrum and tympanum both full of unhealthy granulations bathed in pus: no ossicles found.		

7th. Jan.	5 p.m.	3	3	4	4	5	3	3	6	6	6	=	43		
													43	x 320	13,760
21st	,,	The operation cavity was grafted and was practically healed in a fortnight.													
24th	,,	Right ear still discharging pus very freely.													
		6	4	3	3	2	8	3	5	7	4	=	45		
													45	x 320	14,400
31st	,,	Radical operation performed on right ear.													
		The conditions found were similar to those in left ear without the sequestrum.													
17th Feb.		Right cavity discharging pus freely.													
		4	5	3	5	8	1	7	6	3	4	=	46		
													46	x 320	14,720
22nd	,,	Right cavity grafted.													
26th	,,	Slight discharge from both ears.													
		3	3	3	6	2	2	3	3	2	5	=	32		
													32	x 320	10,240
		3	4	4	3	5	2	3	1	5	4	=	34		
													34	x 320	10,880

No other counts were made from this case as the little patient very much resented the drawing of blood.

March 3rd Discharged from wards: slight muco-purulent secretion from both ears.

R e m a r k s: Temperature was practically normal all the time. In this case, as in all the cases in which the radical operation was performed, the

cavity was packed with gauze at the time of operation. This was allowed to remain, in most cases, from five to seven days in order to procure a good and easily inspected cavity afterwards. The outer dressing was changed every day or every second day from the beginning. The effect on the leucocyte counts of dressing in this way is dealt with later.

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C a s e    2.

WILLIAM C. age 40 years, admitted 14th January 1907.

History: Discharge from right ear for two years. At present it is considerable in amount and foetid: occasionally has severe pain in the ear.

Examination: Small perforation in the upper part of the membrane: right facial paresis.

On January 7th two counts taken in the out-patient department gave the following:-

2 4 4 4 5 3 2 4 2 3 = 33

33 x 320

10560

3 5 3 4 6 7 2 2 4 0 = 36

36 x 320

11520

Feb. 1	Radical operation performed: the mastoid was sclerosed and the antrum small and deeply situated: antrum and tympanum contained unhealthy granulations: some involvement of the bone in the region of the aditus.	
Feb. 2	1 2 2 1 1 2 4 3 1 2 = 19	
		19 x 320
		6,080
Feb. 17	Copious discharge from the cavity for two or three days, and today there is a red and hard swelling at the upper end of the post-aural wound.	
	2 3 4 2 2 2 2 1 3 4 = 25	
		25 x 320
		8,000
	The swelling was found to be due to a small collection of pus beneath the skin.	
Feb. 26	Small quantity of discharge still coming from the cavity.	
	3 0 4 3 0 4 1 1 1 2 = 19	
		19 x 320
		6,080
	2 1 2 4 3 1 2 1 3 1 = 20	
		20 x 320
		6,400
March 3	Discharged from hospital with cavity practically healed, and the facial paresis passing off.	

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C a s e 3.

GERTRUDE M: age 15 years. Admitted for observation Jany. 19th 1907.

History: Discharge "off and on" from both ears for four or five years. About three months ago the discharge from both ears ceased, but recommenced in the left three weeks ago. This recurrence seemed to come on after Influenza.

Examination: Right meatus free from discharge and membrane has an old perforation.

Slight purulent discharge in left meatus: small perforation below and behind the umbo: pain and tenderness over the mastoid, and skin in this region is red. Temp. 99°.

Patient was admitted in case the condition should prove to be acute mastoiditis.

Jan. 19	5 5 3 4 8 7 5 3 6 5 = 51	51 x 320	16,320
	5 10 5 3 4 5 4 5 7 6 = 54	54 x 320	17,280
,, 20	5 4 2 6 6 3 8 4 4 7 = 49	49 x 320	15,680
	7 8 5 4 4 4 6 4 5 4 = 51	51 x 320	16,320
,, 21	Still complains of severe pain and tenderness behind left ear: still slight discharge from meatus.		



4	7	7	8	4	4	1	3	4	3	=	45	45 x 320	14,400
7	8	4	2	5	6	4	2	3	5	=	46	46 x 320	14,720

Jan. 22

Operation: Antrum deep and small: lined with unhealthy granulations and contained small amount of thin semi-purulent fluid. No definite collection of pus was found, however, and a Heath's operation was performed.

Feb. 2

The posterior wound has suppurated and the cavity discharges freely. Temp. 99.6.

3	9	4	8	5	11	8	6	7	11	=	72	72 x 320	23,040
5	5	6	7	6	8	7	1	5	6	=	56	56 x 320	17,920

,, 16

Cavity still freely discharging pus.

4	4	5	3	6	3	5	4	6	4	=	44	44 x 320	14,080
---	---	---	---	---	---	---	---	---	---	---	----	----------	--------

,, 17

5	4	6	5	5	6	2	6	4	3	=	46	46 x 320	14,720
---	---	---	---	---	---	---	---	---	---	---	----	----------	--------

March 3

Small amount of discharge from cavity.

6	1	5	5	2	3	4	4	4	3	=	37	37 x 320	11,840
5	6	3	4	3	4	5	4	3	4	=	41	41 x 320	13,120

,, 8

Became an out-patient: cavity almost healed.

May 5

The ear on which Heath's operation was performed has remained quite dry since a week after her discharge as an in-patient. Right ear occa-

sionally discharges and there has been a little  
this morning.

2 1 1 3 3 2 3 2 3 3 = 23

23 x 320

7,360

2 5 0 2 1 2 2 3 4 3 = 24

24 x 320

7,680

REMARKS: The temperature never rose above 99.6.  
The condition found at operation was not exactly  
what was expected, and as no actual collection of  
pus was found the case is described with the  
chronic cases. This question is referred to below.

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C a s e 4.

JOHN McC: age 9 years: admitted Jany. 25th. 1907.

History: Discharge from right ear for 2 years.

At the beginning had very severe pain and "a  
swelling" formed behind the ear: this lasted for a  
few days and then "seemed to burst inside." Late-  
ly the discharge has been very great in amount.

Examination: Large perforation of Right tympanic  
membrane, and through this large masses of granu-  
lations can be seen occupying the tympanum.

Foetid pus is discharging from the meatus in  
large quantity. Temp. normal: no tenderness.

Jan. 25	3 7 4 6 6 6 5 6 5 7 = 55	55 x 320	17,600
	8 11 7 6 6 13 9 5 6 6 = 77	77 x 320	24,640
	7 8 8 9 5 8 10 7 5 7 = 74	74 x 320	23,680
,, 29	4 4 6 7 7 9 8 4 3 7 = 59	59 x 320	18,880
Feb. 1	4 5 6 6 5 2 5 9 6 10 = 58	58 x 320	18,560
	6 8 5 3 4 7 5 5 4 7 = 54	54 x 320	17,280
,, 2	<p><u>Operation:</u> The mastoid process was found to be a shell of bone filled with pus; this cavity, the aditus and tympanum, contained abundant unhealthy granulations. The extensive disease of the mastoid rendered it soft and easily removed with the scoop. The radical mastoid operation was performed and the large cavity packed with gauze in the usual way.</p>		
,, 3	7 9 6 8 6 7 4 8 9 5 = 69	69 x 320	22,080
	5 7 9 4 4 7 7 6 8 7 = 64	64 x 320	20,480
,, 5	3 5 5 8 6 6 3 3 4 9 = 52	52 x 320	16,640
,, 6	<p>Temp. 101.2: no pain and on removal of the outer dressing everything looks well.</p>		
	5 8 8 6 6 7 4 4 5 7 = 60	60 x 320	19,200

	5 8 6 5 5 5 6 5 8 6 = 59	59 x 320	18,880
Feb. 9	Post aural wound partly breaking down and discharging pus freely. Temp. 101°.		
	6 7 8 4 5 9 7 6 8 6 = 66	66 x 320	22,120
	8 6 9 6 8 4 6 4 7 9 = 67	67 x 320	22,440
,, 15	Cavity granulating well and being prepared for grafting.		
,, 20	Cavity grafted.		
Mch. 3	2 4 5 4 4 3 7 5 3 2 = 39	39 x 320	12,480
	4 4 2 2 6 4 2 7 1 3 = 35	35 x 320	11,200
,, 15	Patient dismissed from wards: cavity discharging small quantity of semi-purulent secretion. He attended the out-patient department and the cavity was completely healed three weeks after leaving the wards.		
June 24	No discharge: cavity perfect.		
	1 2 4 2 3 1 2 2 3 2 = 22	22 x 320	7,040
	1 2 2 4 4 2 2 1 3 4 = 25	25 x 320	8,000

REMARKS: The amount of the discharge on admission was a striking feature in this case. It constantly poured from the ear. The conditions

found at operation were compatible with a moderately high degree of septic intoxication: hence the considerable leucocytosis. As one might expect, the infection of the post aural wound had a distinct effect on the leucocyte count.

C a s e 5.

SOLOMAN D: age 10 years. admitted Feby. 1st. 1907, for observation.

History: Patient attended first as an out-patient on January 8, complaining of discharge of matter from both ears for three years: came on after an attack of scarlet fever. A blood-count on that date in the out-patient department gave the following:-

2	4	3	7	6	2	2	5	6	4	=	41	41 x 320	13120
4	4	3	4	2	5	4	4	6	2	=	38	38 x 320	12160

On Feby. 1, was admitted to the wards on account of pain and tenderness behind the right ear in the region of the attachment of the sterno-mastoid muscle. The discharge from this ear stopped ten days previous to admission and it was thought that an acute condition might develop. Left ear

still discharging a little pus. Temperature normal.

Feb. 1

2 5 1 4 4 1 2 2 1 3 = 25

25 x 320

8000

2 3 2 2 3 3 2 2 5 2 = 26

26 x 320

8320

,, 4

Tenderness behind right ear diminishing; discharge still absent from this ear but small amount of discharge from left. Temperature normal.

2 4 0 3 2 2 1 2 1 2 = 19

19 x 320

6080

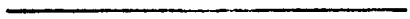
3 2 2 4 4 0 3 2 5 1 = 26

26 x 320

8320

Patient was discharged from the wards on February 4th as it was considered after observation that the pain and tenderness complained of had no relation to the ear.

REMARKS: In this case, as in several others, it was noticed that palliative treatment had a decided effect on the leucocyte count. After treatment, (in most cases consisting of hydrogen peroxide drops and an antiseptic lotion) lower counts were obtained.



C a s e 6.

CHRISTINA G: age 6½ years, admitted March 8, 1907.

History: Been attending as an out-patient off and on since September 1905, for discharge of matter from left ear. The discharge often stops altogether for several weeks and is never very great in amount.

Examination. Perforation of moderate size in upper and posterior part of tympanic membrane: small quantity of pus in the meatus.

Mch. 8

3 3 3 5 2 3 2 3 4 2 = 30

30 x 320

9,600

3 1 2 3 3 3 3 4 3 3 = 28

28 x 320

8,960

,, 9

Operation: It was noticed just before operation that the postero-superior wall of the external meatus was bulging downwards and forwards. In process of the operation it was found that this was caused by a cholesteatomatous mass lying in a cavity in the bone and subjacent to the soft parts of the meatus. The disease had indeed performed the radical operation and the surrounding bone was comparatively healthy. To complete the operation little was required beyond clearing out the mass, making a Ballance's flap, and stitching up

the post aural wound. The cavity of course was packed in the usual way.

Mch. 26 Cavity clean and only a small amount of discharge:

6 4 3 6 5 3 6 1 5 6 = 45

45 x 320

14400

April 6 Patient became an out-patient.

June 17 Three months after operation: Some purulent discharge from the cavity due to a small unhealed patch at upper and posterior part.

1 1 5 4 3 1 2 4 5 3 = 29

29 x 320

9,280

1 2 6 1 2 2 3 5 2 3 = 27

27 x 320

8,640

REMARKS: This case is of interest from the condition found at operation. It may be assumed that the gradually increasing mass of cholesteatoma slowly caused the destruction of the surrounding bone, and the position which the mass ultimately occupied was that usually represented by the antrum, aditus and part of the attic, plus the bony structures external to them. Apparently the process had been slow and was not accompanied by much septic absorption.

The count taken sixteen days after operation was considerably higher than that taken before operation, apparently indicating that some toxins were being absorbed from the healing cavity.



C a s e 7.

MIRIAM McC: age 6 years. Admitted May 11, 1907.

History: Left ear been discharging for 2 years: no history of scarlet fever. Patient attended as an out-patient for a few weeks previous to admission for the radical operation.

Examination: Very profuse and foul-smelling discharge: kidney-shaped perforation of the membrane. Masses of granulation can be seen in the tympanic cavity:-

8 3 4 2 8 4 5 6 5 7 = 52

52 x 320

16,640

2 3 5 8 9 5 4 5 6 3 = 50

50 x 320

16,000

Operation: Antrum deep and small, and contained pus and cholesteatoma: lining membrane thick and unhealthy. The bone at the antro-tympanic passage was extensively involved and only the remains of the ossicles were found. The radical operation was performed.

Remarks: No other observations were made on this patient, owing to my leaving the Infirmary about this time.

C a s e 8.

DAVID J: Age 10 years. Admitted March 1, 1907.

History: For two years has had discharge from the right ear: three months ago a swelling developed behind the auricle and, after lasting a few days, burst through the skin and the opening has discharged a small quantity of matter daily since then.

Examination: Sinus behind the right auricle leading down to carious bone: small perforation in membrane below and behind the umbo. While patient was under observation before operation the discharge was moderate in quantity.

March 1	3	3	5	1	4	1	4	3	2	6	=	32	32 x 320	10240
	2	1	2	3	4	3	6	3	3	3	=	30	30 x 320	9600
,, 3	5	2	3	4	3	4	4	3	3	4	=	35	35 x 320	11200
	3	3	4	4	5	2	3	6	5	3	=	38	38 x 320	12160

,, 15 Operation: A hole in the mastoid communicated with the antrum which had become enlarged by extension of the disease in the bone. This cavity was lined for the most part with granula-

tions but there were also one or two small areas of carious bone. No ossicles were found in the tympanum and this cavity was also full of unhealthy granulation tissue. The radical operation was performed.

Mch. 18

3 3 3 1 2 5 4 1 1 4 = 27

27 x 320

8,640

4 5 4 2 3 4 1 2 4 2 = 31

31 x 320

9,920

,, 29

The old sinus did not heal and the patient left the wards, the friends refusing further operation.



I N - P A T I E N T S (Contd.)

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II. ACUTE MASTOIDITIS (Cases 9 to 12.)

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C a s e 9.

JAMES K: Age 14 years. Admitted January 15, 1907

History: Left ear been running for three months.

A week ago severe pain commenced in the ear and three days ago a swelling developed behind the auricle. There has been no discharge since the swelling commenced.

Examination: Tender and fluctuating swelling behind left ear producing the typical deformity. Small quantity of pus in the meatus: Granulations protruding through the perforation. Temp. 98°.

Jany. 15

11	7	6	3	3	6	4	3	5	2	=	50		
												50 x 320	16,000

4	4	5	10	7	3	9	7	7	4	=	60		
												60 x 320	19,200

,, 16

7 p.m. Temp. 99.2°													
8	8	6	4	3	6	3	6	4	3	=	51		
												51 x 320	16,320

9	3	7	5	3	6	2	3	5	7	=	50		
												50 x 320	16,000

Jany.16	7.30 p.m. As a temporary measure the abscess behind the auricle was opened and drained.		
,, 17	4 8 5 5 4 3 3 3 2 2 = 39	39 x 320	12480
	3 6 4 6 2 7 4 2 4 5 = 43	43 x 320	13760
,, 18	noon. 3 4 3 4 0 4 3 3 3 3 = 30	30 x 320	9600
,, ,,	5.30 p.m. 0 4 2 3 4 6 2 2 2 2 = 27	27 x 320	8640
	3 2 1 3 4 1 4 4 5 2 = 29	29 x 320	9280
	Pus could be seen coming through an opening in the mastoid in the bottom of the wound.		
,, 20	Pus collecting beneath the skin at the upper end of the wound.		
	5 7 5 7 2 3 5 2 1 3 = 40	40 x 320	12800
	4 2 5 3 2 7 3 8 4 2 = 40	40 x 320	12800
	The pus was evacuated.		
,, 21	5 2 3 2 2 5 3 1 2 3 = 28	28 x 320	8960
,, 24	Wound looks clean but free discharge of pus from meatus.		
	3 2 1 5 1 3 4 4 3 2 = 28	28 x 320	8960

Feb. 2. Still free flow of pus from meatus.

4 2 4 2 4 2 3 4 6 0 = 31

31 x 320

9,920

3 1 5 2 5 5 1 0 5 1 = 28

28 x 320

8,960

,, 15. Radical mastoid operation performed: the hole in the mastoid communicated with a cavity which had presumably been the antrum. This cavity was filled with granulations bathed in pus and the surrounding bone was unhealthy and easily removed. The aditus and tympanum were also affected.

March. 10. Cavity almost healed: there is a small amount of moisture coming from the tympanic end of the cavity.

1 3 3 1 2 3 2 1 4 1 = 21

21 x 320

6,720

2 5 3 0 1 2 0 3 2 5 = 23

23 x 320

7,360

Remarks: While this patient was waiting for the radical operation, the opportunity was taken of observing the variations in the leucocyte count. The temperature was normal all the time except as recorded above on January 16th. when it was 99.2

C a s e 10.

JANE C. age 11. Admitted January 31st. 1907.

HISTORY: Left ear been running since early childhood. Five days ago a swelling began behind the left ear and has been increasing gradually since then.

Examination: Typical mastoid abscess deformity. Small fluctuating and tender area behind the auricle. Temperature 100°.

Jan. 31. Immediately before operation. Temp 100.4°

7 3 7 5 4 4 6 5 5 4 = 50

50 x 320

16000

5 7 3 5 6 3 5 4 7 4 = 49

49 x 320

15680

,, , Operation. A hole in the mastoid communicated with a large cavity in the interior filled with pus. The radical operation was performed.

Feb. 1. noon. Temp. normal.

5 4 2 3 6 2 6 8 3 5 = 44

44 x 320

14080

6 5 3 2 2 6 3 5 3 4 = 38

38 x 320

12160

,, , evening. Temp. 99.2°

7 4 6 4 4 5 4 5 7 4 = 50

50 x 320

16000

Feb. 1.	7 5 5 4 4 3 7 5 4 3 = 47		
		47 x 320	15,040
„ 3.	noon. Temp 100° patient comfortable.		
	8 6 4 6 4 2 7 4 8 5 = 54		
		54 x 320	17,280
	6 4 4 5 7 4 9 7 4 2 = 52		
		52 x 320	16,640
	at 6 p.m. temp. 105° but no complaint of uneasiness in the ear.		
	At midnight temp. 101° and a count gave the following.		
	5 6 5 5 8 4 5 7 4 8 = 57		
		57 x 320	18,240
„ 4.	noon.		
	Packing removed from cavity which was rather foetid: otherwise nothing unusual found to account for the high temperature on 3rd.		
„ „	8 p.m. Temp. 101.4°		
	6 4 3 3 10 4 4 4 7 6 = 51		
		51 x 320	16,320
	4 6 7 5 7 6 4 4 4 3 = 50		
		50 x 320	16,000
„ 6.	Temp. 99° Cavity Dressed: copious discharge.		
	7 7 9 4 6 6 5 6 10 6 = 66		
		66 x 320	21,120
	6 6 5 8 2 6 2 7 7 5 = 54		
		54 x 320	17,280



Feb. 9.	Temp. 99.	Conditions same as on 6th.	
	3 5 6 6	3 10 6 8 8 7 = 62	
			62 x 320 19,840
	8 7 5 5	6 7 5 11 5 5 = 64	
			64 x 320 20,480
,, 15.	Temperature normal: cavity getting much cleaner every day.		
	2 3 3 5	1 5 4 1 6 3 = 33	
			33 x 320 10,560
	3 3 4 4	6 4 3 3 1 3 = 34	
			34 x 320 10,880
,, 24.	Cavity being prepared for grafting.		
	3 4 1 3	6 3 5 0 3 2 = 30	
			30 x 320 9,600
March. 7.	Cavity which was grafted on 25th February now almost healed.		
	1 3 2 1	2 0 2 4 5 3 = 23	
			23 x 320 7,360
	2 2 3 0	3 1 1 1 5 2 = 20	
			20 x 320 6,400
,, 13.	Patient discharged: cavity dry.		

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C a s e 11.

FRED J. Age 9 years: admitted March 16th. 1907.

History: Both ears have discharged since an attack of scarlet fever four years ago. A fortnight ago a schoolfellow pulled patient's left ear and ever since then it has been painful. Six days ago a swelling commenced behind this ear and has been increasing gradually since then.

Examination: Oedema and tenderness over the left mastoid and the surrounding area, but no fluctuation detected. Large perforation in each membrane. Temperature 100.4

March.16.

Before operation.

3 8 8 4 4 10 6 4 6 7 = 60

60 x 320

19200

5 7 5 7 6 8 6 8 6 3 = 61

61 x 320

19520

Operation: A condition of acute mastoid empyoema was found and drained. The completion of the operation was postponed.

,, 18.

4 3 2 3 4 4 8 3 3 5 = 39

39 x 320

12480

7 3 4 6 4 2 5 6 2 6 = 45

45 x 320

14400

March 23. Radical mastoid operation performed.

,, 25. Active suppuration in the post aural wound.

Temp. 99.4.

8 8 4 3 5 3 11 5 7 9 = 63

63 x 320

20160

8 5 5 7 7 4 5 5 8 7 = 61

61 x 320

19520

April 7. Post aural wound still discharging pus freely.

Cavity not making much attempt to heal

2 4 3 2 4 2 4 2 2 4 = 29

29 x 320

9280

2 6 4 3 2 4 3 4 4 4 = 36

36 x 320

11520

Remarks: No other observations were made owing to the patient's dread of the needle. There was slight purulent discharge from right ear all the time patient was in hospital.

---

C a s e 12.

WILLIAM R: Age 16 years. Admitted April 4, 1907.

History: Copious discharge from Right ear for over twelve months. A week ago the discharge became less than usual and he began to have pain behind the ear. A swelling has formed behind the ear within the last four or five days and for this patient came for treatment.

Examination: Red, painful and fluctuating swelling behind right ear. Small perforation in posterior half of the membrane through which a bead of pus is coming.

April 6,

10 a.m.

7 3 3 6 1 4 5 5 5 3 = 42

42 x 320

13440

7 1 4 6 4 5 5 5 3 4 = 44

44 x 320

14080

,, 6,

10.30 a.m.

Operation: A hole in the mastoid communicated with the interior of the process which was full of pus. The outer wall of the mastoid process was extremely thin: this was removed and the large cavity drained through the post aural wound. It was intended to do the complete operation later.

,, 8

An erysipelatous rash was noticed round the wound: temperature 101. Patient was removed to the Isolation Hospital and was not seen again.

———— IN - P A T I E N T S (Contd.) ————

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III. ACUTE MASTOIDITIS WITH EXTRA-DURAL ABSCESS

(Cases 13 - 19.)

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C a s e 13.

Mrs. J: Age 36 years: admitted January 23, 1907.

History: Had influenza six weeks ago and when recovering her right ear commenced to discharge and has done so up to the present. Has had severe pain all round the ear for a week.

Examination: Small mammillated perforation in the upper and posterior part of the right tympanic membrane; ear discharging freely. Distinct tenderness over the mastoid but very slight redness and no appreciable swelling. Temp. 100·5.

Jan. 23	Temp. 100·5. 4 4 4 6 3 7 4 6 6 4 = 48	48 x 320	15360
,, 25	Condition similar to that on 23rd. Temp. 100. 6 5 7 4 5 4 3 5 2 4 = 45	45 x 320	14400
	5 3 4 4 7 4 3 2 4 6 = 42	42 x 320	13440
,, 26	10 a.m. <u>Operation.</u> When the parts were shaved		

and prepared for operation an oedematous condition of the skin over the mastoid was apparent. The process was found to be a mere shell filled with pus which was lying in contact with the sigmoid sinus for three quarters of an inch of its length. The sinus was covered with granulations and pus oozed from the lower end of the sinus groove. It was considered that the interior of the sinus had so far escaped infection and the cavity was drained through the post-aural wound. The wound was dressed daily.

Jan. 26	11.p.m.														
		4	2	6	7	4	4	4	4	6	8	=	49	49 x 320	15,680
		7	4	2	3	4	2	4	4	5	3	=	38	38 x 320	12,160
,, 27		3	3	3	4	6	4	5	6	1	4	=	39	39 x 320	12,480
,, 29	Wound clean and draining well.														
		4	3	3	2	3	2	5	4	0	4	=	30	30 x 320	9,600
Feb. 1		3	5	4	3	4	1	2	5	2	2	=	31	31 x 320	9,920
		2	3	3	5	4	2	2	1	2	2	=	26	26 x 320	8,320
,, 2		6	1	1	3	4	4	2	0	6	6	=	33	33 x 320	10,560
		5	1	6	3	3	3	2	3	5	6	=	37	37 x 320	11,840

Feb. 7	Wound healthy and draining well.		
	1 4 2 0 2 3 3 1 4 3 = 23	23 x 320	7,360
	2 1 1 3 3 5 2 4 3 3 = 27	27 x 320	8,640
Feb. 9	2 2 3 3 6 4 2 5 3 5 = 35	35 x 320	11,200
	2 3 1 2 3 2 3 5 6 4 = 31	31 x 320	9,920
,, 13	Left the wards and attended as an out-patient.		
Apl. 18	Wound has been healed for five weeks and there has been no discharge from the meatus since leaving the wards. The tympanic membrane appears normal and shows no sign of perforation.		
	1 4 1 0 2 2 0 1 2 3 = 16	16 x 320	5,120
	1 0 3 2 4 2 1 1 4 0 = 18	18 x 320	5,760

REMARKS: The temperature as taken on admission (viz. 100.5) was the highest recorded during the whole time patient was in hospital. The routine examination of the blood after operation indicated by the steady decline in the leucocytosis that the infection was at least not progressing, and that the interior of the sinus kept free from infection.

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C a s e 14.

GERTRUDE R: age 8 years. Admitted February 15, 1907.

History: Right ear has been discharging for three weeks. Had very severe pain in the ear for a few days before the discharge came on: has had pain behind the ear for about a week, and five days ago a swelling developed behind the ear and has been gradually increasing in size.

Examination: Small amount of purulent discharge in the meatus: small perforation in posterior half of the membrane. Fluctuating and tender swelling behind the auricle producing the typical deformity. Temp. 99.4.

Feby. 15

Temp. 99.4.

6 4 4 4 3 5 3 6 1 5 = 41

41 x 320

13120

3 3 7 7 9 2 4 2 3 4 = 44

44 x 320

14080

,, 16

Operation: The usual skin incision was made and liberated pus. A small opening was found in the mastoid immediately behind the bony meatus. This opening lead into the interior of the mastoid which had been converted into a large cavity filled with pus. The disease had exposed the sigmoid sinus as well as the dura mater of the



middle fossa. There was no reason to suppose that the infection had penetrated into the sinus or brain and the radical operation was performed. From the condition of the tympanum found at operation, it was evident that the ear had discharged longer than three weeks, as given by the patient's friends.

Feby.21

Temp. 102°.

2 4 6 5 6 7 4 3 6 2 = 45  
45 x 320 14400

5 8 1 7 4 4 6 3 6 3 = 47  
47 x 320 15040

March 3

3 4 5 2 1 3 4 4 2 4 = 32  
32 x 320 10240

4 4 4 1 2 2 5 5 4 3 = 34  
34 x 320 10880

,, 27

Patient left the wards with the cavity healed.

May 11

2 3 3 4 1 3 0 1 4 3 = 24  
24 x 320 7680

REMARKS: Except on February 21st. when it rose to 102° the temperature was practically normal after operation.

C a s e 15.

JOHN H: age 52 years. Admitted March 7, 1907. Patient attended the out-patient department from February 28 to March 7, when he was admitted for

operation. When he attended first on February 28th patient complained of pain in the right side of the neck behind the mastoid process, of two months' duration. Two days ago his right ear commenced to discharge but previous to that his only symptom was pain in the neck.

Examination: Redness and tenderness high up in the right side of the neck over an area about an inch and a half in diameter, immediately behind the mastoid process. There was no tenderness over the mastoid process but the skin was slightly oedematous in that region. No note was made on this date of examination by the meatus.

On March 4 a large brawny and painful swelling was found in the region above indicated and the skin over the mastoid was more oedematous than formerly: Copious discharge from the meatus and the tympanic membrane had a small perforation just behind the tip of the handle of the malleus.

Temp. 98.4

March 7

Patient was admitted. Temp. 98.6: local condition same as above.

4 p.m.

3 3 4 5 3 5 3 4 3 7 = 40

40 x 320

12800

6 1 3 3 7 4 4 0 5 5 = 38

38 x 320

12160

4.30 p.m. Operation:

The whole interior of the mastoid was a large abscess cavity which did not extend to the soft parts in the neck. The dura mater of the posterior fossa was exposed over an area half an inch in diameter: this appeared healthy and the radical mastoid operation was performed.

Mch. 17	Considerable discharge from the operation cavity:		
	4 2 2 4 3 3 4 3 2 5 = 32	32 x 320	10240
	5 4 1 2 4 4 1 4 4 3 = 32	32 x 320	10240
,, 25	Cavity clean and being prepared for grafting.		
	0 3 2 4 2 3 3 4 2 0 = 23	23 x 320	7360
	3 3 2 1 3 1 3 1 2 3 = 22	22 x 320	7040
,, 28	Cavity grafted.		
April 9	Discharged cured.		

C a s e 16.

VICTOR H: Age 6 years. Admitted March 25, 1907.

History: Had pneumonia four or five weeks ago: three weeks ago the right ear commenced to be painful and, soon after, to discharge. When the

discharge came the pain was relieved for a few days and then had severe pain radiating from behind the ear all over the side of the head. For five days has had a swelling behind the ear: during the last two or three days there has been very little discharge and in that time the swelling has increased rapidly.

Examination: Red, oedematous and tender swelling behind right auricle producing the typical deformity. Some purulent discharge in the meatus: medium sized perforation in the upper and posterior part of the membrane. Temp. 100.5. pulse 150. Patient looks very ill.

Mch. 25

Count taken just before operation:

5 8 4 9 5 4 9 8 7 3 = 62

62 x 320

19840

Operation: After liberation of the collection of pus beneath the skin by the usual incision, a hole was found in the bone which led into a large cavity in the mastoid. The conditions found were very similar to those of the above cases. The sinus was lying in foetid pus: it was covered with granulations but pulsated freely. The complete operation was performed.

April 7

Considerable amount of semi-purulent discharge

from the cavity. which, however, shows signs of healing.

2 3 3 8 2 4 3 2 3 2 = 32

32 x 320

10240

4 2 1 5 4 3 3 3 5 3 = 33

33 x 320

10560

Apl. 14

Cavity clean and almost healed: slight moist discharge.

4 2 0 5 1 2 0 1 5 0 = 20

20 x 320

6400

1 5 4 0 4 0 3 3 1 2 = 23

23 x 320

7360

,, 17

Patient discharged: condition similar to that on 14th.

---

C a s e 17.

ELIZA R: age 25 years. Admitted April 4, 1907.

History: Seven weeks ago had an "influenza attack" accompanied by sore throat: five weeks ago left ear began to discharge matter. A week ago she experienced severe pain behind the left ear and a swelling formed in that region. The onset of the swelling behind the ear has been associated with a distinct diminution in the quantity of the discharge.

Examination: Large fluctuating swelling behind

the left auricle. Temp. 100°.

April 4

9 a.m. Temp. 100°.

6 3 4 8 3 4 4 2 3 2 = 39

39 x 320

12480

, ,

10 a.m. - Operation: A condition similar to that in

the above cases was found. The sinus pulsated freely and had the appearance of being healthy in its interior: the cavity was simply drained through the post aural wound.

, 15

Cavity clean, granulating quickly and very slight discharge. No discharge from the meatus.

5 1 3 0 0 2 2 1 4 4 = 22

22 x 320

7040

2 2 3 0 2 3 0 4 1 3 = 20

20 x 320

6400

, 18

Became an out-patient.

, 30

Wound quite healed: no discharge from the meatus for over a fortnight.

### C a s e 18.

KATE B: age 14 years. Admitted April 8 1907.

History: Two months ago had influenza with sore throat, after which she began to have pain in right ear. Patient says she never has had any discharge from the ear. A swelling commenced behind the ear a week ago and for five days her

"face has been deformed."

Examination: Right facial paresis. Large boggy and tender swelling behind right auricle but no fluctuating area is detected.

In spite of the patient's statement regarding discharge, there is pus in considerable amount in the meatus. Perforation in the postero-superior segment of the membrane. Patient is very anaemic and looks ill. Temp. 99.4.

April 9

Temp. 99.8.

6 6 3 7 4 5 4 5 6 4 = 50

4 10 2 3 7 2 4 5 5 5 = 47

50 x 320

47 x 320

16,000

15,040

,, 11

Operation:

Pus was not reached till the periosteum was cut. A small aperture in the bone communicated with a large pus-containing cavity in the mastoid. The sinus formed part of the wall of this cavity but it was healthy and the radical operation was performed. In doing this it was evident from the condition of the tympanum that the ear had been discharging for a considerable time. The patient and her friends stated that they had never seen any discharge from the ear.

,, 14

5 4 3 5 5 8 3 5 7 2 = 47

47 x 320

15,040

3 3 6 4 3 4 6 3 6 6 = 44

44 x 320

14,080

Apl. 23	Cavity clean and being prepared for grafting.		
	3 3 2 6 4 3 2 3 3 4 = 33	33 x 320	10560
	1 4 4 3 4 5 2 3 3 5 = 34	34 x 320	10880
,, 25	Cavity grafted.		
May 11	Patient discharged with cavity healed.		
	No other counts were made from this patient.		

C a s e 19.

PRIMARY MASTOIDITIS WITH EXTRA-DURAL ABSCESS.

JOSEPH H: age 8 years: admitted March 20, 1907.

History: Has had pain in left ear since yesterday, March 19th: never had any discharge from the ear.

Examination: Slight swelling and marked tenderness over the mastoid: no fluctuation.

The tympanic membrane and the meatus look absolutely normal; no sign of perforation can be seen and no reaction with Hydrogen peroxide.

Temp. 101.6.

Temp. 101.6°.

March 20	8 6 6 2 4 4 3 7 8 6 = 54	54 x 320	17280
	5 7 4 1 6 5 4 8 5 7 = 52	52 x 320	16640



Mch. 21

When the parts were shaved for operation a small area of fluctuation could be made out at the summit of the swelling. It was noticed just before operation that the wall of the meatus was slightly swollen. The tympanic membrane was again examined and seemed perfectly normal.

Operation: The incision through the soft parts liberated thick pus and exposed a hole in the mastoid, about quarter of an inch in diameter, through which the pus exuded. The bone was very soft and easily removed. During the use of the bone scoop sudden and very alarming haemorrhage took place. This was considered to come from the sinus. The cavity was at once tightly packed with gauze and patient put back to bed.

The outer dressing was changed every day, but the plug which controlled the bleeding was not removed till the eighth day after operation.

The temperature was normal on the 22nd. and remained so. The cavity was allowed to granulate from the bottom.

,, 24

Patient been comfortable since operation: temp. normal.

1 2 3 1 3 2 2 2 1 3 = 20

20 x 320

6400

3 1 1 1 1 1 1 5 2 3 = 19

19 x 320

6,080

Apl. 17

Wound healed.

1 3 1 3 1 4 2 0 0 2 = 17

17 x 320

5,440

2 1 1 3 1 4 2 1 1 2 = 19

19 x 320

6,080

REMARKS: In this case there was no history of discharge from the ear. The patient, a very intelligent lad, was emphatic on this point, and the mother was also strongly of opinion that the ear had never discharged. The normal condition of the parts when examined by the meatus supported the history. I therefore look upon this as a case of primary mastoiditis with extra-dural abscess.

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— I N - P A T I E N T S    C o n t d .    —

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III.    M E N I N G I T I S    A N D    S E P T I C    S I N U S    T H R O M B O S I S ,    ( C a s e s  
20 and 21. )

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C a s e        20.

M E N I N G I T I S.

DENNIS W:    age 17, admitted February 9, 1907.

History:    In November 1904 patient was in the Liverpool Eye and Ear Infirmary under the care of Mr. Hugh E. Jones, and the case is reported in the Journal of Otology 1906.    At that time the patient was suffering from septic thrombosis of the lateral and sigmoid sinuses and the internal jugular vein, complicated by an acute temporo-sphenoidal abscess.    On November 1, 1904, Mr. Jones ligatured the left internal jugular vein, performed the complete post-aural operation and removed the clot from the sigmoid and lateral sinuses: a temporo-sphenoidal abscess was opened on November 11th. 1904.    Fourteen days after this it was found necessary to open the sinus right up to the torcular herophili and remove more clot.    The patient made a perfect recovery.



Feb. 9

On February 9th 1907, patient came to the out-patient department complaining of headache of several days duration, and a discharge of clear fluid from the left ear of two days' duration. While sitting in the out-patient department about 5 p.m. patient had a rigor: this was immediately followed by a fit involving the face, arm and leg on the right side. The fit lasted about 5 minutes and patient was immediately transferred to the ward, where he afterwards lay in a semi-conscious condition: temp.  $100^{\circ}$ ; paresis of face, arm and leg on the right side: pupils equal and reacted to light.

At 7.15 p.m. patient had another fit exactly similar to the first and the temperature registered  $104^{\circ}$ .

At midnight patient was still in a semi-conscious condition, and a leucocyte count gave the following result:

7	7	10	10	13	10	8	15	11	12	=	103		
												103 x 320	32,960
10	8	8	14	13	9	6	7	9	11	=	95		
												95 x 320	30,400

Feb. 10

1 a.m. Mr. Jones opened up the old post-aural scar with a view to finding out if any recurrence of temporo-sphenoidal abscess had taken place. On cutting through the soft parts the dura-mater was at once exposed, showing that the bone which had been removed at the operation two years previously

had not been entirely reformed. A small opening was found in the dura: this was enlarged, and the temporo-sphenoidal lobe was explored, but no collection of pus was found.

Four hours after operation patient regained consciousness.

In the forenoon of the 10th. he was conscious and perfectly rational and expressed himself as feeling comfortable.

Feby.10

noon.

11 8 11 13 9 6 7 7 7 8 = 87

87 x 320

27840

9 12 11 11 7 8 8 4 11 6 = 87

87 x 320

27840

In the evening patient had a slight rigor and registered a temperature of 102.2. Later on he became delirious and difficult to manage.

,, ,,

midnight. Temp. 101°.

11 9 9 6 5 8 8 11 10 10 = 87

87 x 320

27840

10 9 6 7 13 8 14 10 11 10 = 98

98 x 320

31360

,, 11

Condition similar to that on 10th., being rational and feeling well in the forenoon and becoming delirious and violent towards the evening.

,, ,,

11 p.m. Temp. 100°.

8 6 9 8 6 6 6 11 13 9 = 82

82 x 320

26240

11 9 10 12 11 9 10 9 5 10 = 96

96 x 320

30,720

Feb. 12

Paresis of face arm and leg on right side more marked: no knee reflex on right side: Kernig's symptom well marked: plantar reflex on right side uncertain, on left flexor reflex. Lumbar puncture was performed and about an ounce of cerebro-spinal fluid drawn off for examination. The fluid was turbid and escaped under considerable pressure.

,, 12

noon.

14 12 17 15 10 13 5 7 9 11 = 113

113 x 320

36,160

10 10 13 8 5 9 17 9 14 12 = 107

107 x 320

34,240

,, ,,

Patient's condition becoming gradually worse.

,, 13

In the forenoon periods of comparative lucidity alternated with longer periods of semi-coma, accompanied by muttering delirium, carphologia and subsultus tendinum.

During the afternoon patient became more comatose, and at 6 p.m. Mr. Jones again explored the temporo-sphenoidal lobe with a knife in three different directions and again without result. The dura was found bulging down into the mastoid cavity, pushing its epithelial lining downward and

forward. A minute portion of the epithelial lining and the dura had ulcerated through, leaving a small area of the pia-arachnoid exposed. This was probably the track of infection to the meninges and the explanation of the escape of "clear" (cerebro-spinal) fluid which the patient complained of.

At 9 p.m. temperature rose to 105° and pulse to 130 per minute.

Patient gradually sank and died on 14th.

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REMARKS:

The skull was opened post-mortem and the following condition was found:-

The brain was in a condition of venous engorgement; minute streaks of purulent material were scattered all over the brain under the pia-mater, but there was no special mischief on the surface of the left hemisphere to account for the fits and paresis on the right side of the body, except that it was more hyperaemic than the rest of the brain. On section no collection of pus was found and no trace of the previous abscess could be detected.

Dr. Warrington of the Northern Hospital, Liverpool, reported that by experimental inoculation the cerebro-spinal fluid was found to contain the pneumo-coccus.

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C a s e 21.SEPTIC SINUS THROMBOSIS.

WILLIAM M: age 37, was admitted to Wigan Infirmary on April 27, 1907, suffering from the symptoms of septic sinus thrombosis with general infection, following chronic otorrhoea. There was a history of two rigors previous to admission and on April 29 the internal jugular vein was ligatured by the House Surgeon.

On May 5 at 10 a.m. I had the opportunity of seeing this patient, and on that occasion the temperature was 98° and the pulse 72 per minute. There had been no rigors since the operation but examination of the chest suggested the likelihood of septic pneumonia. The temperature chart showed typical oscillations.

The following is the result of the leucocyte count on 5th May.

8	7	6	5	8	3	6	6	8	5	=	62	62 x 320	19840
13	7	9	10	6	8	4	5	6	5	=	73	73 x 320	23360

No other opportunities of making further observations on this case were possible: patient died on May 14th.

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RECORDS OF CASES, (Contd.)

OUT-PATIENTS.

These cases were all examined in a busy external department and in most of the cases only the duration of the discharge is mentioned in conjunction with the leucocyte count. With a few exceptions each case was only examined once.

I. ACUTE SUPPURATIVE OTITIS MEDIA, (Cases 22 and 23.)

Case 22.

EDWARD A. age 12 years.

March 4. Complained of pain in the left ear of ten days' duration.

Examination: No discharge in meatus: tympanic membrane red and bulging at its upper part.

Temp. 101°.

8 3 5 5 12 4 8 9 7 5 = 66  
66 x 320

21120

10 7 9 7 5 5 4 4 7 7 = 65  
65 x 320

20800

4.30 p.m. Tympanic membrane incised.

5 p.m. Patient has had no pain since operation on 4th.  
7. Free discharge of pus since incision of the membrane.

March 8

4 5 4 6 3 1 3 5 3 4 = 38

38 x 320

12160

4 3 5 2 8 2 3 4 2 6 = 39

39 x 320

12480

Patient did not attend again.

C a s e 23.EDGAR S: age 10 years.

Apr. 10

History: Pain and discharge from right ear for three weeks. For two or three days before discharge came the pain in the ear was very severe.

Examination: Small perforation in the lower part of the membrane through which pus freely escapes.

4 7 4 6 6 6 5 4 8 4 = 54

54 x 320

17280

4 5 7 5 5 5 2 3 5 5 = 46

46 x 320

14720

Not seen again.

O U T - P A T I E N T S      Continued.

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II.    CHRONIC SUPPURATIVE OTITIS MEDIA, (Cases 24 to 47.)

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C a s e    24.

WILLIAM A:    Age 6 years.

Jany. 2

History:    Discharge from right ear for twelve months: followed an attack of scarlet fever.

Examination:    Large perforation in lower half of tympanic membrane of right ear.

2   4   5   5   4   3   3   2   3   2   =   33

33 x 320

10560

C a s e    25.

Jany. 4.

SARAH B:    Age 23 years.

History:    Discharge from right ear for two years: sometimes very copious but at present it is slight.

3   2   3   4   4   4   5   4   4   5   =   38

38 x 320

12160

C a s e    26.

Jany. 5.

ETHEL J:    Age 9 years.

History:    Discharge from right ear for eighteen months.

4   3   0   3   1   2   3   3   3   3   =   25

25 x 320

8000

C a s e 27.

Jany. 8 ROSE W: Age 14 years.

History: Discharge from both ears for two years. At present there is slight discharge from each ear.

2 3 3 5 3 3 2 3 3 3 = 30

30 x 320

9600

2 4 4 5 3 5 3 3 3 3 = 35

35 x 320

11200

C a s e 28.

Jany. 9. VIOLET B: Age 13 years.

History: More or less continuous discharge from left ear for eight years; began with an attack of scarlet fever.

1 2 1 0 3 0 2 0 3 4 = 16

16 x 320

5120

2 1 0 3 0 2 3 1 3 1 = 16

16 x 320

5120

C a s e 29.

Jany. 11 WILLIAM T: Age 9 years.

History: Had scarlet fever nine months ago and since then has had discharge from both ears.

4 4 2 3 3 4 4 3 3 2 = 32

32 x 320

10240

2 7 3 2 4 2 1 4 3 5 = 33

33 x 320

10560

C a s e 30.

Jany.12

MAY W: Age 17 years.

History: Discharge from left ear for seven or eight years.

Examination: Considerable amount of pus in the meatus and granulations can be seen in the tympanum through a large perforation in the membrane in its lower and posterior quadrant.

2 5 4 4 2 3 3 3 0 3 = 29

29 x 320

9280

C a s e 31.

Jany.14

NORMAN R: Age 4½ years.

History: Discharge from both ears for about six months.

4 4 7 6 3 2 1 4 7 2 = 40

40 x 320

12800

C a s e 32.

Jany.15

LOUISA K: Age 20 years.

History: Discharge from left ear for two years.

4 2 4 1 0 2 0 4 2 4 = 23

23 x 320

7360

C a s e 33.

Jany.17 JOHN E. S: age 8 years.

History: Discharge from both ears for four years following scarlet fever. The discharge is copious and foetid.

0	1	3	1	2	1	1	6	2	3	=	20	20 x 320	6400
3	2	3	4	1	2	3	3	2	0	=	23	23 x 320	7360
3	2	1	2	1	2	1	5	4	2	=	23	23 x 320	7360
2	1	2	2	5	2	3	2	7	2	=	28	28 x 320	8960

C a s e 34.

Jany.22 JOHN R: age 36 years.

History: Discharge from both ears off and on for twelve years: at present slight in amount.

5	2	2	2	3	0	4	2	5	2	=	27	27 x 320	8640
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C a s e 35.

Jany.22 WILLIAM C: age 23 years.

History: Discharge from left ear since early childhood.

Examination: Membrane looks normal but a drop of

thick pus can be seen coming from a small opening in the upper wall of the meatus. When a probe is passed through the opening it passes into a cavity, presumably the attic, and when the probe is withdrawn the discharge comes freely.

3	4	2	2	3	2	3	3	1	3	=	26	26 x 320	8320
3	2	3	2	1	3	5	1	3	2	=	25	25 x 320	8000

---

C a s e 36.

Jany. 23

ANNIE W: Age 23 years.

History: Had a radical mastoid operation on the right ear at another hospital five years ago.

The ear still continues to discharge.

Examination: Large polypus in the meatus.

2	2	3	1	4	4	1	4	2	0	=	23	23 x 320	7360
1	1	4	2	3	4	3	4	1	2	=	25	25 x 320	8000
3	1	2	1	5	2	3	2	5	3	=	27	27 x 320	8640

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C a s e 37.

Jany. 24

THOMAS M: Age 30 years.

History: Discharge from left ear for ten years;



sometimes the discharge ceases for a few weeks at a time.

Examination: A probe can be passed into the attic through a small perforation in upper wall of the meatus; when this is done a bead of pus appears.

No perforation of the membrane.

2 3 2 7 4 2 4 1 6 2 = 33

33 x 320

10560

C a s e 38.

Jany.24

ALBERT S: Age 7 years.

History: Copious discharge of matter from right ear for "a long time," but the mother can give no definite indication as to the period during which the ear has run.

4 4 4 3 2 6 4 5 3 7 = 42

42 x 320

13440

C a s e 39.

Jany.27

GLADYS P: Age 14 years.

History: Discharge from right ear for two years; has frequent attacks of "dizziness."

Examination: Granulations in the tympanum seen through a large perforation.

4	4	0	1	4	2	5	3	3	2	=	28	28 x 320	8,960
2	2	1	6	3	0	3	0	4	2	=	23	23 x 320	7,360

---

C a s e 40.

Feb. 23 ARTHUR B: Age 30 years.

History: Discharge from both ears for twenty years.

2	2	3	3	2	1	3	1	2	3	=	22	22 x 320	7,040
2	2	2	3	3	2	3	2	3	1	=	23	23 x 320	7,360

---

C a s e 41.

Feb. 26 EMILY W: Age 13 years.

History: Discharge from both ears for 9 years following diphtheria.

1	1	6	1	6	2	1	1	2	2	=	23	23 x 320	7,360
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C a s e 42.

Mar. 15

CISSY R: Age 13 years.History: Discharge from both ears for twelve months.

3 3 3 3 3 5 3 4 1 2 = 30

30 x 320

9,600

4 5 1 1 2 4 1 3 3 3 = 27

27 x 320

8,640

C a s e 43.

April 4

ALICE T: Age 30 years.History: Discharge from left ear for "many years."

1 2 2 1 3 2 2 4 4 2 = 23

23 x 320

7,360

2 1 5 2 3 1 2 1 2 3 = 22

22 x 320

7,040

C a s e 44.

Apl. 27

ARTHUR G: Age 14 years.History: Discharge from left ear for five years.

2 2 3 4 6 1 4 5 6 3 = 36

36 x 320

11,520

2 1 3 7 3 4 4 4 2 4 = 34

34 x 320

10,880

C a s e 45.

May 2

JOHN J: Age 16 years.

History: Discharge from right ear for six years.

Has occasional attacks of giddiness.

Large polypus in meatus.

5 5 1 5 3 3 2 5 2 3 = 34  
34 x 320 10,880

4 5 4 3 3 2 7 3 4 2 = 27  
27 x 320 11,840

Polypus removed.

May 5

3 1 3 2 4 4 2 1 3 0 = 23  
23 x 320 7,360

1 1 2 5 3 2 2 0 3 2 = 21  
21 x 320 6,720

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C a s e 46.

April 23

JOSEPHINE C: Age 4 years

History: Discharge from right ear for twelve months.

3 7 4 6 5 4 5 3 5 3 = 45  
45 x 320 14,400

7 2 4 4 5 6 4 3 2 6 = 43  
43 x 320 13,760

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Case 47.

April 25 MAGGIE D: Age 15 years.

History: Discharge from left ear for three years.

3 4 2 3 4 2 2 0 3 2 = 25  
25 x 320

8,000

2 3 1 3 2 2 2 3 2 3 - 23  
23 x 320

7,360



## B. ANALYSIS OF THE RESULTS.

It will be convenient to consider the results of the Inpatients and Outpatients separately as most of the inpatients were operated on, and the result of the operations can be studied along with the previous condition.

### ANALYSIS of INPATIENTS.

I. CHRONIC SUPPURATIVE OTITIS MEDIA,  
(Cases 1 to 8).

II ACUTE MASTOIDITIS (Cases 9 to 19).

III MENINGITIS AND SEPTIC SINUS THROMBOSIS,  
(Cases 20 and 21).

I. The Inpatients with chronic Suppurative Otitis Media were eight in number. Of these, six were admitted for operation: the other two (cases 3 and 5) were admitted for observation because of threatening acute symptoms.

Case 3 was operated upon after several days observation but no definite acute condition was found. In view of the threatening acute symptoms it may be questioned whether it is justifiable to include this with the chronic cases. (The opportunity may be taken here to state that doubtful cases, such as this one and case 5, are excluded from statistics from which conclusions are drawn below).

In Case 5 the acute (?) symptoms passed off and the patient was discharged without operation. It was difficult to determine in this case whether the symptoms complained of were referable to the aural condition or not, as the pain and tenderness were below and well behind the mastoid process. Although this case is also doubtful it has been described for convenience along with the chronic cases.

THE OTHER SIX were, so far as their symptoms went, cases of Chronic Suppurative Otitis Media. Of these six cases, five (cases 1, 2, 4, 7, 8) gave counts over 10,000 and three (cases 1, 4, 7) gave counts over 15,000 before operation.

The three latter are particularly interesting because of the amount of the discharge and the high counts obtained and because also of the conditions which were found at operation.

CASE I was the subject of double Suppurative Otitis Media, of two years standing and had a history of scarlet fever. Both ears discharged very profusely. At operation on the left side a sequestrum was found which was probably the result of the acute exacerbation two months previous to admission; what remained of the mastoid process was extensively diseased; the cavity resulting from the diseased process was filled with pus. The conditions found on the left

side were somewhat similar but of course without sinus, and there was no sequestrum. Here then, on both sides, were conditions peculiarly favourable for a considerable amount of toxic absorption and good cause for a high leucocyte count.

CASE 4 : The quantity of purulent discharge from the ear was a feature of this case. The condition was of two years standing and apparently had commenced with an acute attack in which the mastoid process was involved. This patient was under observation in the wards for a week prior to operation and during that time the pus poured constantly from the ear. At operation the mastoid process was found in a condition of chronic empyoema with very extensive disease of bone. Here again were suitable conditions for a high degree of toxic absorption which resulted in a high leucocyte count: this reached as high as 20,000 on more than one occasion.

CASE 7 : Was also noted for the amount of purulent discharge, and gave counts over 16,000. At operation extensive osseous disease was found in the region of the antro-tympanic passage: the antrum was full of pus but the mastoid process was not so extensively diseased as in cases 1 and 4. The conditions in this case also favoured considerable toxic absorption.



Only one of the inpatients with chronic Suppurative Otitis Media gave a count below 10,000 before operation. In this patient (case 6) a comparatively dry cholesteatomatous mass was found, so to speak, to have performed the radical operation. The bone in the immediate neighbourhood was comparatively healthy and except for a few diseased mastoid cells the whole bony structure both looked and felt fairly sound. The conditions were therefore not such as to occasion much toxic absorption. The discharge from the ear was moderate in amount.

IN CASE 2 the mastoid process was found sclerosed and the antrum small and deeply placed. The antro-tympanic passage was involved to a moderate degree and the diseased process was apparently slow. The amount of discharge was considerable and the average count previous to operation was 10,000.

CASE 8 was of two years standing and three months before coming under observation apparently had acute mastoiditis which resulted in a sinus. This case, unlike the other cases with extensive disease of the mastoid, gave only a slight leucocytosis (9,600 - 12,000,). The discharge in this case was not great in amount and it is probable that the sinus and the meatus between them drained the diseased parts efficiently and thus lessened the amount of septic absorption.

The following is a resumé of the chronic cases which came to operation, tabulating some of the above mentioned points:-

Case	Amount of Discharge.	Condition found at operation.	Results of Counts taken before operation.	
			Minimum	Maximum
1	Very profuse from both ears.	Extensive disease of the mastoid on both sides.	13760	17,600
2	Considerable.	Sclerosis of mastoid. Caries in the region of the aditus but limited in amount.	10560	11,520
4	Very profuse.	Extensive disease of the mastoid.	17,280	23,680
6	Moderate.	Limited osseous disease.	8,960	9,600
7	Very profuse.	Extensive disease of bone in antro-tympanic region; antrum full of pus and cholesteatoma.	16,000	16,640
8	Considerable.	Extensive disease in mastoid, but diseased parts well drained.	9,600	12,180

CASE 5 was not operated on and Case 7 was a doubtful chronic case: they are therefore excluded from the above table.

The above results seem to indicate the following:-

- A. Leucocytosis occurs in a certain number of patients with chronic Suppurative Otitis Media. (The actual proportion is dealt with later).
- B. When the disease in the bone (generally in the mastoid and called by Dr. Milligan "Chronic Endomastoiditis") is extensive and the diseased parts badly drained, the leucocytosis is moderately high. Such cases in the above series were associated with very profuse discharge.
- C. When the involvement of bone is slight or nil, a normal count or a slight leucocytosis is present.
- D. The leucocyte count would seem to vary with the degree of efficiency of the drainage of the diseased parts.

## II.                    ACUTE MASTOIDITIS (Cases 9 to 19)

These cases, (called by Dr. Milligan "acute Suppurative Endomastoiditis") were eleven in number; seven were complicated by the existence of extra-dural abscess. None of the latter showed signs of infection beyond the dura so that they may conveniently be considered along with the uncomplicated cases. All the patients with acute mastoiditis gave counts over 12,000 previous to operative interference. The minimum was 12,160 (Case 15) and the maximum 19,520 (case 11). In every case the mastoid process was a mere shell of bone filled with pus;

in most the mastoid was perforated externally and in some of these pus was sub-periosteal and in others it was beneath the skin.

From my observations mere enumeration of the polymorpho-nuclear leucocytes does not seem to afford any help in determining whether pus in the mastoid is, or is not, extra dural. The average count of the cases without extra-dural abscess was 15,500 and that for the extra-dural cases was 14,800.

In the case of patients also, in whom the pus had extended to the soft parts, the leucocyte counts did not differ constantly from those taken from cases in which the pus was still within the bony confines of the mastoid. According to the observations of Sondern (1907) suppurative bone lesions show lower counts than suppurations in soft parts, probably on account of slower toxic absorption. This statement is not supported by my cases, in which little difference was observed when the suppuration involved the soft parts.

It is generally recognised that in children there is a tendency to a higher leucocytosis than in adults under similar conditions. Seven of the eleven patients under consideration were under fifteen years of age. With two exceptions (cases 12 and 14) all the counts from these young patients were over 15,000 i.e. 71.4% of the cases under fifteen years of age gave counts over 15,000.

Of the four patients over fifteen years of age, only two gave counts over 15000: the other two gave slightly over 12,000 each, i.e. 50% of the patients over fifteen years of age gave counts over 15,000.

The following is a Summary of these facts in tabulated form:-

Case	Nature of Case.	Age	Polymorpho-nuclear Count.	
			Minimum	Maximum
9	Acute mastoiditis	14 yrs.	16,000	19,200
10	„ „	11 „	15,680	16,000
11	„ „	9 „	19,200	19,520
12	„ „	16 „	13,440	14,080
13	Acute mastoiditis with extra dural abscess	36 „	13,440	15,360
14	„ „	8 „	13,120	14,240
15	„ „	52 „	12,160	12,800
16	„ „	6 „		19,840
17	„ „	25 „		12,480
18	„ „	14 „	15,040	16,000
19	"Acute Primary Mastoiditis" with extra dural abscess.	8 „	16,640	17,280

The relation of the temperatures to the leucocyte counts before operation in these acute cases is worthy of special mention. The temperatures varied from 98.4 (case 15) to

101.6 (Case 19). In case 12 a note of the temperature at the time of making the count was omitted. Had the cases been seen earlier in the acute attack, in all probability higher temperatures would have been found, at least in some instances; but by the time these patients had reached hospital the acuter period had probably passed off, with a resulting fall in temperature: this in some cases reached the normal.

Case 19 was first seen on the second day of the acute symptoms and had the highest temperature of all. In all the other cases the symptoms were of more than five days duration.

The following table shows the relation of the temperatures to the counts taken before operation: the temperatures were taken at the time of making the counts:-

Case	Temperature	Polymorpho-nuclear Counts.	
		Minimum	Maximum
9	98°	16,000	19,200
	99.2°	16,000	16,320
10	100.4°	15,680	16,000
11	100.4°	19,200	19,520
12	Temperature omitted	13,440	14,080
13	100.5°	13,440	15,360
	100°		
14	99.4°	13,120	14,240
15	98.6°	12,160	12,800
16	100.5°		19,840
17	100°		12,480
18	99.8°	15,040	16,000
19	101.6°	16,640	17,280

It is agreed by most authorities that the temperature is no reliable index of the degree of leucocytosis, and these cases, as well as the chronic cases, support that contention.

In this connection Cabot (1897) in speaking of Inflammatory leucocytosis says "there is no correspondence between the daily variations in temperature and the leucocyte count."

Ewing (1904) says that in pneumonia the grade of leucocytosis has been found to vary often with the height of the temperature, more closely with the extent of the exudate, but as may be expected from its recognised significance, measures more the reaction of the system to the infecting agent.

In the Medical Annual (1906) attention is drawn to some observations made by Cazin and Grus on appendicitis. These writers consider that there is no relationship between temperature and leucocytosis. When the question of operation arises in cases of appendicitis, greater importance should be placed on the daily variations of the leucocytes than on the temperature.

Von Limbeck (Trans. 1901) considered that inflammatory leucocytosis often but not always declines with the fever: sometimes it outlasts the fever, sometimes falls before it.

For a considerable time after operation several of my cases continued to give leucocyte counts somewhat higher than normal. It has already been stated that in the treatment of most of the cases the operation cavity was packed with gauze at the time of the operation. This pack was allowed to remain, generally speaking, for from five to seven days, the outer dressing being changed every day or every second day according to circumstances. It cannot be supposed that a cavity treated in such a way, after a more or less septic operation, is in an aseptic condition and this fact is forced upon those who dress such cases at the end of, say, a week: the foetor is often overpowering. These conditions necessitate some degree of septic absorption, and there is no wonder that the above cases showed in many instances a considerable leucocytosis during this period. It may be mentioned also that these leucocytoses were seldom associated with any rise in temperature, unless when some fresh collection of pus took place, e.g. beneath the lips of the post-aural wound.

Undoubtedly a certain amount of this increase in the leucocytes was due to the operative procedure, but in several of the cases it was noticed that even a fortnight or more after operation a slight leucocytosis was present, and that in patients whose cavities were following a normal healing course.



Post operative leucocytosis, in uncomplicated cases,  
is not supposed to last longer than a few days. H.M.King  
(American Journal of Medical Science 1902) found that an  
increase of from 5000 to 6000 following operation was a  
normal post operative condition, provided it did not last  
longer than forty-eight hours. Ewing (1904) quotes other  
American writers, in whose cases the duration of post-  
operative leucocytosis varied from twenty-four hours to  
five days. He mentions Cabot as giving thirty-six hours.  
In Mr. Darling's cases (1908) the average duration of rise  
in the polymorpho-nuclear leucocytes was 2.6 days and the  
maximum 4 days. It is not likely, therefore, that leucocy-  
tosis occurring a week or more after operation, can be attrib-  
uted to the surgical interference, or to the effect of the  
anaesthetic.

The following five cases gave a slight leucocytosis  
a fortnight after operation, without any complication to  
account for it:-

Case 10	15 days	after operation	gave count of	10560-10880
,,	13 16	,,	,,	11200
,,	14 16	,,	,,	10240-10880
,,	16 14	,,	,,	10240-10560
,,	18 14	,,	,,	10560-10880

These results suggest that when the operation cavity

is undergoing the ordinary process of healing, an amount of toxic absorption may occur sufficient to produce leucocytosis. It is worthy of mention that four of the above five patients were under fifteen years of age. With reference to the persistence of leucocytosis, Von Limbeck (translation 1901) instanced a case of scarlet fever in which the leucocytosis out-last-ed the fall in temperature by more than fourteen days.

The following statements, for the most part generally recognised, are supported by the results in the cases of acute mastoiditis:-

- A: In acute suppurative inflammation of the mastoid, considerable leucocytosis - as one might expect - is generally present, but a mere enumeration of the polymorpho-nuclear leucocytes affords no help in finding out whether or not extra dural abscess exists.
- B: Variations in the number of polymorpho-nuclear leucocytes bears no relation to variations in temperature, and considerable leucocytosis is often associated with a normal temperature.
- C: Under similar conditions children give higher leucocyte counts than adults.
- D: A slight polymorpho-nuclear leucocytosis (not "post-

operative") was observed in some cases to persist for a considerable time after operation, even when they were following a normal healing course.

Of these cases of acute inflammation of the mastoid, three (Cases 13, 17 and 18) had a distinct history of influenza associated with the beginning of the attack. In this connection Dr. Barr (1901) says: "purulent otitis media, associated with epidemic influenza, seems often to be followed by this condition."

Case 19 is of interest as being apparently a case of acute primary abscess of the mastoid. This condition, according to Dr. Hunter Todd (1907), is almost unknown, unless as a metastatic abscess in the course of pyaemia. The same author states that true primary otitis or caries of the mastoid process may occur as the result of syphilis or tuberculosis. In this case there were no reasons for supposing that the patient had syphilis or tuberculosis, and pyaemia was out of the question.

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### III. MENINGITIS AND SEPTIC SINUS THROMBOSIS.

(Cases 20 and 21.)

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It would be superfluous to draw conclusions from the results in these two cases.

The case of meningitis is interesting from the point

of view of the history and from the probable mode of infection to the meninges by ulceration occurring in the old operation cavity.

So far as the leucocytosis is concerned the patient seemed to react well, but the approaching unfavourable termination was not associated with any marked alteration in the number of the leucocytes: moreover the leucocyte counts did not vary with the temperature.

In the case of septic sinus thrombosis very little information can be gained from a single examination, and it is regretted that opportunities for repeated examination were impossible.

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———— ANALYSES OF OUT-PATIENTS. ————

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- I. ACUTE SUPPURATIVE OTITIS MEDIA (Cases 22 and 23).  
 II. CHRONIC       ,,       ,,       ,, (Cases 24 to 47.)
- 

I. ACUTE SUPPURATIVE OTITIS MEDIA: (Cases 22 and 23.)

Both patients with this condition were children.

Case 22 was seen before rupture had taken place and the counts at this examination were 20,800 and 21,120: temperature 101°.

Three days after paracentesis the count fell to 12,000: temp. normal.

Case 23 was not seen till three weeks after rupture had occurred and the leucocytes number 14,720-17,280. One might conclude from the leucocytosis that in this case the perforation did not drain the middle ear efficiently.

II. CHRONIC SUPPURATIVE OTITIS MEDIA: (Cases 23 to 47.)

In dealing with the out-patients one had to depend on the evidence of the patient or friends for important points in the history of the case and the features of the discharge. As this cannot be relied upon I have refrained from drawing conclusions from the relation of such points to the leucocyte counts. What I did make sure of was that the purulent discharge had been of such a duration in all in-

stances as to designate them cases of a chronic nature.

Of the twenty-four cases ten gave counts over 10,000: these varied from 10240 (Case 29) to 14400 (Case 46.)

Thirteen of the twenty-four were under fifteen years of age, and seven of these young patients gave counts over 10,000, viz: Cases 24, 27, 29, 31, 38, 44 and 46.

Of the other eleven patients who were over fifteen years of age, three gave counts over 10,000, viz: Cases 25, 37 and 45, -

i.e. 53.8% of patients under fifteen years of age gave counts over 10,000.

27% of patients over fifteen years of age gave counts over 10,000.

Case 45 shows the effect on the leucocyte count of removing a polypus which had evidently prevented free drainage.

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## C. S U M M A R Y.

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So far as I have been able to ascertain, very little has been written in English which gives actual statistics regarding the leucocytosis of suppurative disease of the middle ear.

Dr. J. ORME GREEN (New York Medical Record 1899) found that leucocytosis in Chronic Tympanic Suppurations was very common, viz. 79.5%: no other statistics are given. Of the chronic cases detailed in the present paper, 50% gave counts over 10,000. (This excludes cases of a doubtful nature.)

Dr. SUCKSTORFF (Archives of Otology, Vol. 35, No. 2) found that of eight cases of acute purulent otitis media, four under ten years of age gave an average of 20,150. The others were adults and gave an average of 12,900. In six cases of Chronic Suppurative Otitis Media, all occurring in adults, the leucocytes were 10,700 in number. Suckstorff has summarized his average results in tabular form, and for comparison I have worked out my cases to a somewhat similar table, viz:-

(In my cases it is to be remembered that the lymphocytes were not counted.)

— SUMMARY OF SUCKSTORFF'S RESULTS. —

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Nature of the disease.	Patients up to 10 years of age.	Patients over 10 years of age.
Otitis media purulenta acuta	20,150	12,900
Otitis media purulenta chronica ...	-	10,700
Mastoiditis without intra- cranial complication	16,400	12,740
Mastoiditis with intra- cranial complication	17,000	16,450

— SUMMARY OF THE CASES DESCRIBED IN THIS PAPER. —

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Nature of the disease.	Patients up to 15 years of age.	Patients over 15 years of age.
Otitis media purulenta acuta (2 cases) ...	16,500	
Otitis media purulenta chronica, (30 cases)	11,130	8,870
Acute Mastoiditis without intra-cranial compli- cation (4 cases)	17,300	13,700
Acute Mastoiditis with extra- dural abscess (7 cases)	16,500	13,120
Meningitis following Suppura- tive otitis media (1 case)	-	30,560
Sinus thrombosis following Suppurative Otitis Media (1 case.)	-	21,050



Mr. DARLING'S paper is, I believe, the latest publication on the subject, and gives - along with the leucocyte counts - the percentages of the polymorpho-nuclear cells. Actual comparison is impossible owing to differences in classification: generally speaking, however, my results appear to compare favourably with Mr. Darling's so far as the numbers of the polymorpho-nuclear leucocytes are concerned.

In conclusion it may be said, that the routine enumeration of the polymorpho-nuclear leucocytes in suppurations of the middle ear, if it does not assist much in diagnosis, gives important information in the course of a case after operation, when considered along with other signs and symptoms.

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