

THE CLINICAL VALUE OF THE BLOOD EXAMINATION IN OTITIS MEDIA PURULENTA AND ITS COMPLICATIONS.*

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The condition of the blood is an accurate and delicate barometer of the entrance of pathogenic bacteria and their products. In general the greater the effect on the blood the more radical must be the alleviating procedures. A simple ulcerating surface with no pockets or crannies, other things being equal, will produce less changes in the blood than an equal surface whose discharge is more or less prevented from escaping. A bacterial action on a freshly cut or denuded surface changes the blood more rapidly and more completely than when exerted on tissues whose exposed parts have been walled off by barriers of round celled infiltration.

The kinds, combinations and virulence of the bacteria influence the blood picture: Opinions at present vary as to the pathogenic strength of the different ordinary pus-producing bacteria and combinations of bacteria. The streptococci and streptococcic combinations are the most powerful. Combinations of two or more other pus producing bacteria come next. Pure cultures of the staphylococci and diplococci intracellularis seem to be the weakest. This order, of course, considers the average virulence of the bacteria and the average tolerance of the patients.

The blood picture in purulent diseases of the ear and adnexa is at present made up of the following views:

1. *Haemoglobin*: This is markedly reduced in amount in septicaemia and pyaemia.

2. *Haemocytos*: There is a decrease in numbers in septicaemia and pyaemia, but not so rapid.

3. *Leucocytes*:

a. Leucocyte count: This varies normally from 3000-10500 per cubic millimeter depending upon the nourishment of the patient. Impoverishment of health and leucopenia are coincident. A conception of the normal count of the individual is necessary before the diagnosis of a moderate leucocytosis is possible. In general a count of over 8000 should be viewed with suspicion. On the entrance of septic matter into the blood the leucocytes also rapidly gather there,

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providing the toxæmia is not overwhelming. The amount of the leucocytosis is therefore a measure of the body resistance to the infection. An increasing leucocytosis means a spreading process and may be the only evidence of the fact. (Cabot.) In inflammation, leucocytosis is present as long as the exudation process persists.

b. Differential leucocyte count: Ehrlich's figures for the proportions of the various forms of leucocytes in a healthy adult are as follows:

Lymphocytes	22-25%
Large mononuclear.....	2-4%
Polynuclear neutrophiles	70-72%
Eosinophiles	2-4%
Mast cells	5-2%

In childhood:

Lymphocytes	55-66%
Polynuclear neutrophiles	28-40%

According to Sondern, the polymorphonuclear leucocytes relatively increase according to the severity of the toxic infection. A relative percentage below 70 with a marked leucocytosis excludes the presence of gangrene or pus, while 85% of polymorphonuclears always means pus or gangrene. Several cases are however on record in which the percentage was above 85% and on operating no pus or gangrene were found (Jessup). The average percentage in six mastoids coming to operation at the Manhattan Eye, Ear and Throat Hospital where the percentage count was made did not reach above 80.08%. The lowest was 64% in an acute case.

Sondern sums up, as follows:

1. Slightly increased polynuclear percentage indicates slight infection, irrespective of the leucocyte count.
2. Greatly increased polynuclear percentage indicates severe toxic infection, irrespective of the leucocyte count.
3. Slight leucocytosis with slight polynuclear increase indicates fair resistance and a slight toxic infection.
4. Pronounced leucocytosis with slight polynuclear increase indicates good resistance and a slight toxic infection.
5. Slight leucocytosis with pronounced polynuclear increase indicates poor resistance and a severe toxic infection.
6. Pronounced leucocytosis with pronounced polynuclear increase indicates good resistance and a severe toxic infection.
7. Absence of leucocytosis with pronounced polynuclear increase indicates no resistance and severe toxic infection; and a falling leucocytosis with a rising polynuclear percentage

indicates diminishing resistance and increasing toxic infection.
8. Falling leucocytosis with a falling polynuclear percentage indicates diminishing toxic infection.

Large mononuclear lymphocytes are increased in malaria. This assists the diagnosis when the plasmodium is not found.

4. *Bacteria and protozoa.*

a. The microscope will reveal the protozoa plasmodium malariae, the filaria sanguinis hominis, the schistosoma haematobium (blood flukes), and the typanosome; also the spirochaete of Obermeier (relapsing fever) and other bacteria if in sufficient numbers.

b. Blood cultures of bacteria are becoming more valuable as the technique improves. In obscure septic cases they may clear the diagnosis.

c. The Widal reaction merely needs mention. Its use and value are apparent.

5. Cryoscopy and iodophilia in suppurative ear diseases is not of much importance. Yet a marked iodine reaction without leucocytosis is often present in virulent cases; and no septic condition of any severity can be present without a positive reaction. (Cabot.) Therefore iodophilia with a low leucocyte count and bad clinical symptoms will often complete the understanding of the patient's condition.

The application of the above principles to otitis media purulenta and its complications is simple. I will make therefore only a few remarks about the leucocyte examination in suppurative diseases of the ear and adnexa.

Otitis Media Purulenta Acuta. In serous cases the leucocytosis rarely reaches 12,000 and the polynuclear percentage above 75%. In the purulent forms the average count is 14,000 and sometimes reaches 36,000. The polynuclear percentage will vary according to the virulence of the infection.

Otitis Media Purulenta Chronica. Low leucocytosis when serious in type; higher as long as active exudation persists and when there is not a free vent for the pus.

Mastoiditis and Bezold's Mastoiditis. Marked leucocytosis, increasing if the process is spreading and the body resistance is good. A high polynuclear percentage with slight leucocytosis and severe clinical symptoms indicates immediate operation. A positive iodine reaction with low leucocytosis also points to a virulent infection and a poor body reaction.

Thrombosis of Lateral Sinus. A positive culture test would demand immediate ablation of the internal jugular, and curettage of the sinus. Unfortunately the test is long and difficult and therefore is not used as often as its value warrants. A microscopical demonstration of pus bacteria in the blood is also difficult. There is always marked leucocytosis in this condition as long as the process is active. A thrombosis engrafted on an old, apparently quiescent running ear has often been mistaken for typhoid. A negative Widal reaction, a high polymorphonuclear percentage and a marked leucocytosis should throw doubts on the latter diagnosis.

Meningitis. In acute cases there is a marked leucocytosis. In tubercular meningitis the leucocytosis is marked in the later stages.

Abscesses: Epidural, Subdural, Cerebral and Cerebellar. Marked and increasing leucocytosis in the early and progressive stages, the polymorphonuclear percentage depending on the virulence of the infection.

CONCLUSIONS.

The main value of the blood examination in suppurative diseases of the ear lies in the leucocyte count, simple and differential. It is necessary to make repeated examinations to determine the progress of the process. Clinical symptoms must be given greater weight than the mere leucocyte determination. In deep suppurations such as lateral sinus thrombosis without mastoid symptoms, blood tests are invaluable. Blood tests will prevent the faulty diagnosis of malaria or typhoid fever in suppurative diseases of the ear. In doubtful cases we cannot afford to neglect any possible source of light and the examination of the blood will sometimes clear the situation.

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DISCUSSION.

DR. PHILLIPS said he believed the field of usefulness of blood examination to be great in suppurative ear diseases, but the clinician should not rely upon such examination for his diagnosis. It should be considered a valuable aid only as it can be substantiated by the actual condition in the ear itself.

DR. KOPETZKY agreed with all the formulae laid down in the paper, but was disappointed that Dr. Hubby did not give a working schedule. He doubted whether blood examination would give any light as to whether the suppuration is confined to the mastoid, or whether it was sinus thrombosis, except in the degree of leukocytosis, evidencing an increase in the suppuration.

DR. FOWLER said that, in a simple catarrhal case or one that is on the border line, it is immaterial whether there is marked leukocytosis or whether there is not, as the treatment is based on the clinical picture presented and not on the blood count, which may be large or small.

In regard to the reduction of hemoglobin, of which Dr. Hubby spoke, Dr. Fowler asked whether it was due to destruction of the hemoglobin by the suppurative process, or to the weakened condition resulting not only from the process going on, but from the diminished food supply. It seemed to him that it might be brought about by the diminished ingestion of food and catharsis. In any event, iron should be used to bring up the hemoglobin.

It would be interesting to experiment as to the production of artificial leukocytosis in connection with the ingestion of certain drugs. Feeding also causes leukocytosis, and pregnancy produces marked leukocytosis. Dr. Fowler asked whether suppurative ear disease is more prevalent in the pregnant than in the non-pregnant; also if irrigation does not produce a local leukocytosis.

DR. THOMSON said he had been particularly interested in blood examination since reading Starr's article about the differentiation between otitis media and its complications, and had begun to have a blood count made whenever possible. While his studies were incomplete thus far, from what he had done he believed the blood count to be of very little value in differentiating mastoiditis from otitis media. In many cases the leucocyte count was increased. In a child it increased to 16,000 and the polymorphonuclears to 79 per cent, without involvement of the mastoid. Dr. Thomson said he was working along this line and hoped to be able to reach valuable conclusions. He was inclined to think, however, that much could be told from the blood count alone.

DR. HUBBY, closing, said that in differential diagnosis blood examination does not seem to be of much value except where there is deep suppuration, as running ear engrafted on sinus thrombosis.

Replying to Dr. Fowler's question, Dr. Hubby said he had not been able to find any data concerning ear disease in pregnancy.
