Blood Pictures "ELMoNogram" and "Karyogram" of Japanese Encephalitis in 1948

85th Hematological Paper

By

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The present treatise is the report on the blood picture of 31 child patients of Japanese encephalitis who entered our University Hospital or the Sendai Isolation Hospital in the summer of 1948. The clinical picture is described in another paper of ours.1) As to judging the quantitative blood picture, Sato and Suzuki's Standard Table of Normal Blood Picture for Every Age2) was consulted and, to make the white blood picture clear at a glance, the ELMoNogram and the Karyogram devised by Sato and Hayashi3)4) were used.

Red cells and hemoglobin. Erythrocytes were slightly decreased in number in the acme of disease. The almost same tendency was seen in the periods of abating fever and of convalescence.

Hemoglobin (Sahli's method) showed an increased value in most cases, but in the periods of abating fever and of convalescence a normal value was seen in most cases.

White count. A slight or moderate increase of the count was seen in the acme, except in 3 cases.

ELMoNogram

Type I  Type II  Type III

Fig. 1. ELMoNogram of Japanese Encephalitis.

Type I-Elmonogram in the acme. Neutrophils increased to a count 3 or 4 times the normal, whereas lymphocytes showed a decrease and eosinophiles disappeared. There was no remarkable change of monocytes (Fig. 1, Type I).
Type II-Elmonogram in the fever abating stage. The increase of neutrophils became less remarkable, while a striking increase of monocytes was seen. Lymphocytes showed a though slight increasing tendency compared with the acme stage, and eosinophils had begun to reappear (Fig. 1, Type II).

Type III-Elmonogram in the convalescent stage. Neutrophils showed a smaller number within the normal range. A slight increase of monocytes was seen. Lymphocytes which had thus far decreased and eosinophils which had disappeared in the acme have now begun to show a gradual increase (Fig. 1, Type III).

Now Schilling\(^6\) set up, as is well known, a three-phase theory concerning the blood picture in acute infections. Type I corresponds to his first phase “Neutrophilis Combat Phase,” Type II to his second phase—“Monocytic Combat Phase” or the intermediate phase and Type III to his third phase—“the post-infectious phase.”

As described above, our own cases of Japanese encephalitis have thus shown according to the course three phases corresponding to the three phase theory of blood picture propounded by Schilling in the case of acute infections. Of course there were cases in which the three phases above mentioned did not present themselves quite distinctly.

These cases will be described later (Cf. below).

**KARYOGRAM**

![Karyogram of Japanese Encephalitis](Fig. 2)

In the neutrophilic combat phase of Schilling a remarkable nuclear shift to the left will be seen. In the present disease, however, the left shift not only is not so remarkable, but a strong inclination to early return to the normal Karyogram will be seen. It may thus be characteristic of the present disease that the left nuclear shift is not remarkable in defiance of clinically grave symptoms (Cf. Fig. 2).

Elmonogram and Karyogram in the Acme

Observations were made in 16 out of our cases. The Elmonograms of these may be classed into 3 types-Type I, II and III (Cf. Fig. 3). Of these 16 cases, 12 belonged to Type I, 2 cases to Type II and the remaining 2 to Type III, thus the cases showing Type I being the largest in number. As to the Karyogram, those of the 12 cases belonging to Type I-Elmonogram may be classed into 3 forms (Cf. Fig. 4). To Form I—
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Type I  Type II  Type III

Fig. 3. Elmonogram of Japanese Encephalitis.

the Form with no inclination of left nuclear shift—belong 5 of the 12 cases belonging to Type I-Elmonogram, another 5 cases belong to Form II—the Form with a slight inclination of left nuclear shift—and the remaining 2 cases belong to Form III with a rather remarkable left shift. One of these 2 cases died on the 5th day of disease and the other was a grave case that had still remittent fever in the convalescent stage and further showed a severe spasticity of the limbs.

As to the red sedimentation rate, there was no special relation among the 12 cases belonging to Type I-Elmonogram.

Now for Type II of Elmonogram. Type II ought to be such an Elmonogram as will be seen in the stage of abating fever. The 2 cases belonging to this type showed such an Elmonogram in the acme of disease. They were both of a mild case. It may be imagined that these cases had shown Type I-Elmonogram for a very short time in order to relapse into Type II-Elmonogram very soon, the clinical symptoms being correspondingly mild and not severe.

Type III is similar to Type II, the main difference being a more striking monocytosis. The clinical picture of the cases belonging to the type was not severe one. Or in severity type ranked between the cases of Type I and those of Type II.

The Elmonogram and the Karyogram in the Stage of Fever Abatement

The Elmonogram in this stage may be divided into 3 types: Types IV, V and VI (Cf. Fig. 5), 5 cases belonging to Type IV, another 5 cases to Type V and the remaining 4 cases to Type VI.

Type IV is the type in the Convalescence and of clinically mild course. This will be seen in the total white counts in the cases belonging to this Type (Cf. Type II and Type III). Type V is the Elmonogram quite typical of the stage of fever abatement of acute infectious disease correspond-
Fig. 5. ELMoNo gram of Japanese Encephalitis

Type IV  Type V  Type VI

Fig. 5. ELMoNo gram of Japanese Encephalitis

Type VI, an Elmonogram in the fever abating stage, is similar to Type I in the acme stage, the difference being of occurrence of eosinophils. Cases belonging to Type VI were clinically very severe. Fever was high and continued for a long time, showing the remittent type again for a long time in the stage of fever abatement. Disturbance of consciousness and meningitic symptoms were severe. The Elmonogram in these cases seems to change very slowly. As to the Karyogram in this stage, it is like Fig. 6 (A, B). There is not a great difference between these two. B being of a slight left shift inclination. No special relation was seen between these two kinds of Karyogram and the Types IV, V and VI of Elmonogram.

The Elmonogram and the Karyogram in the Convalescent Stage

The Elmonograms in this stage were divided into 3 types, Types VII, VIII, and IX (Cf. Fig. 7). Of all the 29 cases, 26 (a great majority)

Type VII  Type VIII  Type IX

Fig. 7. ELMoNo gram of Japanese Encephalitis.

belonged to Type VII, which is an Elmonogram quite typical of the convalescence of an acute infection almost a normal Elmonogram. 2 other cases belonged to Type VIII, and the remaining case to Type IX. Type VIII is characteristic of eosinophilia and the cases belonging to this type took a clinical course similar to the ones belonging to Type VII. Type IX
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remains one of Type I in the acme and the cases belonging to this type were severe clinically.

Review of the Elmonogram of Japanese Encephalitis

Here we desire to make a general review of the Elmonograms above explained. In Fig. 8, the change of Elmonograms is shown by continuous dotted or broken lines. The changes shown by continuous lines indicate the cases in which the stage of disease and the Elmonogram were typical of an acute infection in general. Most of our own cases belonged to this form.

Now the changes of the Elmonogram shown by dotted lines. In the cases belonging to this form of change, the change of the Elmonogram was always ahead of the stage of disease, so that in the acme of disease and Elmonogram corresponding to the fever-abatement stage and in this stage one corresponding to the convalescent stage would appear. In other words, these cases were mostly clinically mild.

Now, as to the change of the Elmonogram as shown by broken lines. In the cases belonging to this form, the Elmonogram fell behind the stage of disease. In the fever abating stage the Elmonogram corresponded to that in the acme and in the convalescent stage to that in the fever abat-

Fig. 8. Review of the Elmonogram of Japanese Encephalitis.
ing stage. They were mostly clinically serious cases. The Karyogram showed a change generally corresponding to the stages of disease (Cf. Fig. 9).

**SUMMARY AND CONCLUSIONS**

The blood picture of 31 Japanese child patients who suffered from Japanese Encephalitis in 1948 was shown by way of ELMoNogram and Karyogram.

In most cases the three phases of Schilling were applicable to the blood picture of Japanese Encephalitis.

As to white blood picture in the remaining few cases, the restoration of blood picture to normal was always ahead of clinical improvement in mild cases, while in severe cases white blood picture lagged behind clinical manifestation.

**References**

5) Schilling, V., Das Blutbild u. seine Klinische Verwertung, 1933.