**Brief Case Report**

**Syndrome of Erythremia di Guglielmo after Lightning Injury with Autoimmune Antibodies and Terminating in Acute Monocytic Leukemia**

*By Li-Injo Luan Eng and C. Sinnadurai*

**Although Leukemia has been frequently recorded following exogenous influences, there is no conclusive evidence for the direct etiologic relationship of these to leukemia. Damage to the hemopoietic system ranging from total aplasia to different kinds of leukemia has been observed in survivors of atomic bomb explosions, including a case of monocytic leukemia. Leukemia and other hematologic disorders have been described following the medical use of x-radiation. Johnson reported a case of acute myelomonocytic leukemia after radioiodine therapy for hyperthyroidism. Leukemia following chronic exposure to benzene and following trauma has been described. Infectious agents have also been suggested as causes of leukemia. In this paper we present a case in which a patient, after being struck by lightning, developed the syndrome of erythremia di Guglielmo, with autoimmune hemolytic anemia, which terminated in acute monocytic leukemia.**

**CASE REPORT**

An Indian man, 60 years old, was admitted to the General Hospital, Kuala Lumpur on December 17, 1963, with the following history. He had been in good health and was able to work normally until approximately 6 to 7 months prior to his hospital admission, when he was suddenly struck by lightning in the open and fell unconscious. Unfortunately no further details were obtainable about the accident or his condition immediately following it by the time he came for treatment. Following the accident, he was unable to work due to generalized weakness and severe anorexia. After 2 months, he resumed work but did not feel the same as before. His wife noticed that he became progressively pale and developed swelling of the legs. On admission he was found to be very anemic, with generalized edema and ascites. Lymph glands were not enlarged. His temperature was subfebrile. His lungs were normal, heart slightly enlarged and systolic murmur was heard over the entire area. Spleen was enlarged 3 fingers and liver 4 fingers below costal margin. Hemoglobin level was 3.0 Gm. per cent, PCV, 11 per cent; MCHC, 27.3 per cent; reticulocytes, 4.6 per cent; nucleated cells, 9000 per cu. mm. There were nucleated red blood cells in the peripheral blood, some of them resembling megaloblasts. Indirect bilirubin was 2.1 mg. per cent, and liver function tests were normal. He was given a course of daily injections of Imferon, folic acid and vitamin B₁₂; however, there was no response and because of his critical condition, he was given a transfusion with packed red blood cells. Rise of hemoglobin level was soon followed by a drop. Findings on

---

*From the Institute for Medical Research and the General Hospital, Kuala Lumpur, Malaya.

This work was partly supported by the University of California International Center for Medical Research and Training (Hooper Foundation, San Francisco School of Medicine) with Research Grant GM 11329 from the Office of International Research, National Institutes of Health, United States Public Health Service.

Submitted June 29, 1964; accepted for publication Dec. 25, 1964.*

845

**Blood, Vol. 25, No. 5 (May), 1965**
January 6, 1964 were: Hb, 2.2 Gm. per cent; RBC, 0.70 million per cu. mm.; PCV, 7.5 per cent; MCV, 107.1 cu. μ; MCH, 31.4 μg.; MCHC, 29.3 per cent; reticulocytes, 9.5 per cent; platelets 50,000 per cu. mm.; nucleated blood cells, 20,300 per cu. mm.; differential counts, PS 67, Eos. 1, Mono 5, Ly 27. Normoblasts were seen, many of them resembling megaloblasts. No malarial parasites were seen. Alkaline phosphatase activity of the leukocytes showed a scoring of 162 examined by the method of Kaplow. Serum bilirubin of the indirect type was increased. Direct Coombs test was weakly positive. Cold agglutinin at 5 C. using normal blood group O blood cells in saline showed a titer of 32. With trypsinized red cells, the titer was 512. At 20 C., the titer was respectively negative and 128. At 37 C. negative, with normal as well as with trypsinized red cells, hemolysins were not detected. Motulsky test for G-6-PD deficiency was negative. Hemoglobin analysis showed normal Hb A and normal alkali lysis. Kahn test of the serum was negative. The bone marrow showed severe hyperactivity of erythropoiesis with basophilic stages predominating and many resembling megaloblasts. Myelopoesis was relatively depressed and only a few megakaryocytes were seen. Intensive search for malignant tumors was unsuccessful. Because of the presence of autoimmune antibodies, 60 mg. prednisolone daily were tried and blood transfusion given. After a transient rise of the hemoglobin level to 3.6 Gm. per cent, it dropped again, so that another blood transfusion was necessary and prednisolone dosage was increased to 80 mg. daily. Although the hemoglobin level did not drop appreciably, it also did not rise. The blood was studied on numerous occasions with the following hematologic findings on February 3, 1964: Hb 4.2 Gm. per cent; RBC, 1.58 million per cu. mm.; PCV, 13.5 per cent; MCV, 84.8 cu.; MCH, 26.6 μg. per cent; MCHC, 31.1 per cent; nucleated blood cells 5700 per cu. mm.; differential counts, PS 47, Eos 3, Mono 7, Ly 43; 22 normoblasts per 100 WBC. Erythroblastosis of the peripheral blood with bizarre-looking normoblasts and thrombocytopenia were the outstanding features of the disease. Although occasional myelocytes were seen in the peripheral blood, the picture was never leukemic at this stage. On February 24, 2 days before the patient expired, the blood picture was remarkable. There were numerous bizarre-looking normoblasts, some extremely large and many with multiple nuclei; some were difficult to classify (fig. 1). The number of monocytes was much increased so that monocytic leukemia was suspected. A few myelocytes were also present. On February 26, the day the patient died, the peripheral blood picture was that of a full-blown monocytic leukemia (fig. 2), confirmed by the finding of a bone marrow teeming with monocytes and monoblasts. Autopsy was unfortunately refused by the family. Spleen and liver puncture aspirates showed numerous monocytes and monoblasts.
SYNDROME OF ERYTHEMIA DI GUGLIELMO

Fig. 2.—On the day the patient died the peripheral blood picture was that of a full-blown monocytic leukemia.

DISCUSSION

The symptoms in this patient resembled those found in the di Guglielmo syndrome, especially toward the end of the disease before it changed into acute monocytic leukemia—pronounced erythroblastosis, thrombocytopenia and hepatosplenomegaly. Megaloblastic changes in bone marrow and peripheral blood resistant to folic acid and vitamin B₁₂ seen in this patient have also been noticed by others in di Guglielmo disease.

Although it has not been proved that lightning caused or precipitated the blood changes, it is thought not to be improbable, since a striking change in the patient’s condition was noticed by himself and his family only after he was struck by lightning.

The presence of autoimmune antibodies with hemolytic anemia in our patient is unusual. It might be explained, that injury to the patient’s hemopoietic system resulted in the formation of blood cells which became foreign to his own body and led to the formation of autoimmune antibodies which acted against his own red blood cells.

The sudden change from a severe erythroblastosis with bizarre-looking nucleated red blood cells to a full-blown acute monocytic leukemia is noteworthy. The idea that the di Guglielmo syndrome is merely a phase in a myeloproliferative disease usually ending in leukemia is gaining more and more ground. If no blood examination had been carried out the last few days before the patient expired, the case would have been classified simply as erythremia di Guglielmo and the true nature of the disease would not have been discovered. A transition from erythremia di Guglielmo to myelo- or monoblastic leukemia has also been observed by Block et al.

SUMMARY

A case of lightning injury is described associated with changes of the hemopoietic system resembling di Guglielmo’s syndrome. Megaloblasts were found
in the peripheral blood and bone marrow, resistant to folic acid and vitamin B₁² treatment. The presence of auto-immune antibodies in this patient was accompanied by a hemolytic condition not responding to treatment with high doses of prednisolone. Towards the end of the disease the most bizarre-looking erythroblasts were seen in the peripheral blood. Shortly before death the condition suddenly changed into an acute monocytic leukemia. Although it was not proved that the lightning injury caused or precipitated the blood changes, it is thought not to be improbable.

**SUMMARIO IN INTERLINGUA**

Es describite un caso de traumatismo per fulmine. Illo esseva characterisate per alterationes del systema hematopoietic resimilante le syndrome de di Guglielmo. Megaloblastos esseva trovate in sanguine periphenic e in medulla ossee. Illos se monstrava resistente contra tractamento con acido folico e vitaminas B₁². Le presentia de anticorpore auto-immun in iste patiente esseva accompaniate de un condition hemolytic que non respondeva al tractamento con alte doses de prednisolona. Verso le fin del maladia, erythroblastos de bizarrissime apparentia esseva trovate in le sanguine peripheric. Brevemente ante le morte del patiente, su condition transiva subitemente ad in un acute leucemia monocytic. Ben que il non esseva provate que le traumatismo fulminal causava o precipitava le alteraciones in le sanguine, un tal nexo causal non pare improbabile.

**REFERENCES**

SYNDROME OF ERYTHEMIA DI GUGLIELMO

Lie-Injo Luan Eng, M.D., Ph.D., D.T.M.&H., Research Officer, Institute for Medical Research, Kuala Lumpur, Malaya. Present address: Hooper Foundation, University of California Medical Center, San Francisco, Calif.

C. Sinnadurai, M.D., State Physician, General Hospital, Kuala Lumpur, Malaya.
Brief Case Report: Syndrome of Erythremia di Guglielmo after Lightning Injury with Autoimmune Antibodies and Terminating in Acute Monocytic Leukemia

LIE-INJO LUAN ENG and C. SINNADURAI