

## LEUKEMIA IN A THREE MONTH OLD INFANT

### REPORT OF A CASE SHOWING CHLOROMATOUS FEATURES

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**T**HE PURPOSE of this report is to record a case of myelogenous leukemia with chloromatous tumors in an infant three months of age.

Leukemia in infants is rare. A few cases have been reported which were considered congenital because manifestations of the disease were noted at the time of birth or within two to three days following birth. An appreciation of the rarity of the condition may be gained by reviewing the articles of Cross<sup>1</sup> and Morrison,<sup>2</sup> who report less than 30 cases up to 1944. The incidence of the disease appears to increase with the age of the infant. A greater number of cases have been reported in which the disease did not appear to be present at birth but had its onset prior to the age of three months.<sup>1-3</sup> Most of these have been considered to be of the acute variety, but a few were believed to be chronic.<sup>4</sup> Myelogenous leukemia has been the most frequent in this age group.<sup>1, 2</sup>

Chloroma is considered to be a form of myelogenous leukemia. Literally, the word chloroma means a green-colored tumor. The disease is characterized by the deposition of tumor-like masses of myeloid cells especially in the subperiosteal regions of the skeleton, typically in the orbits and about the cranial bones. On section in the fresh state the tumors present a greenish color which fades on exposure to light. The intensity of the green color varies from case to case. Brannon<sup>5</sup> states that the paler colored tumors are found in the more acute cases. The disease may manifest itself in various degrees. Some cases show only a green coloration of infiltrated organs. Other cases may present tumors which are typical except for the green color. It is because of these variations that Brannon concludes that there is no sharp line of distinction between chloroma, or chloroleukemia, and myelogenous leukemia.

Chloroma is more common in males, and is most frequent in young individuals.<sup>5, 6</sup> It is more than twice as frequent in children as in adults, and nearly twice as frequent in males as females. The youngest cases of chloroma that have been reported were two infants with congenital myelogenous leukemia, one reported by Stransky<sup>7</sup> in 1930, and the other by Morrison<sup>2</sup> in 1939. Autopsy showed green abdominal masses in the second case, and multiple green lesions throughout the body in the first case. However, neither Kandel<sup>6</sup> nor Atkinson<sup>8</sup> include Stransky's case in their reviews of chloroma. The above 2 cases appear to represent the only cases of chloroma in the literature that were younger than that to be described.

#### CASE REPORT

The patient, G. N., a three month old white infant girl was admitted to William Beaumont General Hospital on April 30, 1948. The infant had appeared in good health until two weeks prior to hospitaliza-

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tion when she developed a cold, with some difficulty in breathing through her nose, and small bluish spots on her abdomen. A week before admission the baby began spitting up portions of its formula and three days before admission developed a mild diarrhea.

The baby was normal at birth. She was started on a formula at one month of age because of diarrhea. Development was normal.

Physical examination revealed a markedly pale, well nourished infant whose temperature was 100.2 F. Respirations appeared somewhat difficult. Several small, bluish areas were present in the skin of the abdomen, buttocks and thighs. There were small cervical nodes on the right, and one small node in the



FIG. 1.—The patient shortly before death. Note skin lesions over abdomen and tumors in either breast and over the calvarium.

left inguinal region. The heart and lungs were normal. The abdomen was markedly distended; the liver was palpable.

The red cell count was 2.8 million, hemoglobin 7.3 grams, leukocyte count 48,000 and platelet count 90,000. A differential white cell count showed myeloblasts 10.6 per cent; myelocytes A 7.4 per cent; myelocytes B 1.2 per cent; neutrophilic myelocytes C 1.4 per cent; neutrophilic metamyelocytes 9.2 per cent; neutrophilic polynuclear leukocytes 9.0 per cent; eosinophilic polynuclear leukocytes 0.6 per cent; basophilic polynuclear leukocytes 0.2 per cent; small lymphocytes 40.6 per cent; large lymphocytes 1.0 per cent; monocytes 4.2 per cent; plasmocytes 0.8 per cent; monocytoïd cells 12.2 per cent; unclassified cells 1.6 per cent. There were 13 erythroblasts and 11 normoblasts per 500 leukocytes. Fifty-two per cent

of the leukocytes were peroxidase positive. Subsequent differential counts were essentially similar. X-ray examination of the chest showed no abnormalities.

During the fifty-three days that the patient was under observation she was febrile and, although the diarrhea and respiratory difficulty improved, she showed an increasing number of manifestations of leukemia. The liver and spleen enlarged, the latter becoming palpable 5 cm. below the left costal margin. Lymph nodes became palpable bilaterally in the cervical, axillary and inguinal regions. On May 15 a nodule was felt in each breast, and these enlarged progressively to a diameter of 2.5 cm. (fig. 1). Four days later subcutaneous tumors became palpable in the scalp. These were fixed to the calvarium and slowly enlarged so as to distort the contour of the head (fig. 1). A cellulitis developed over the occiput, but re-

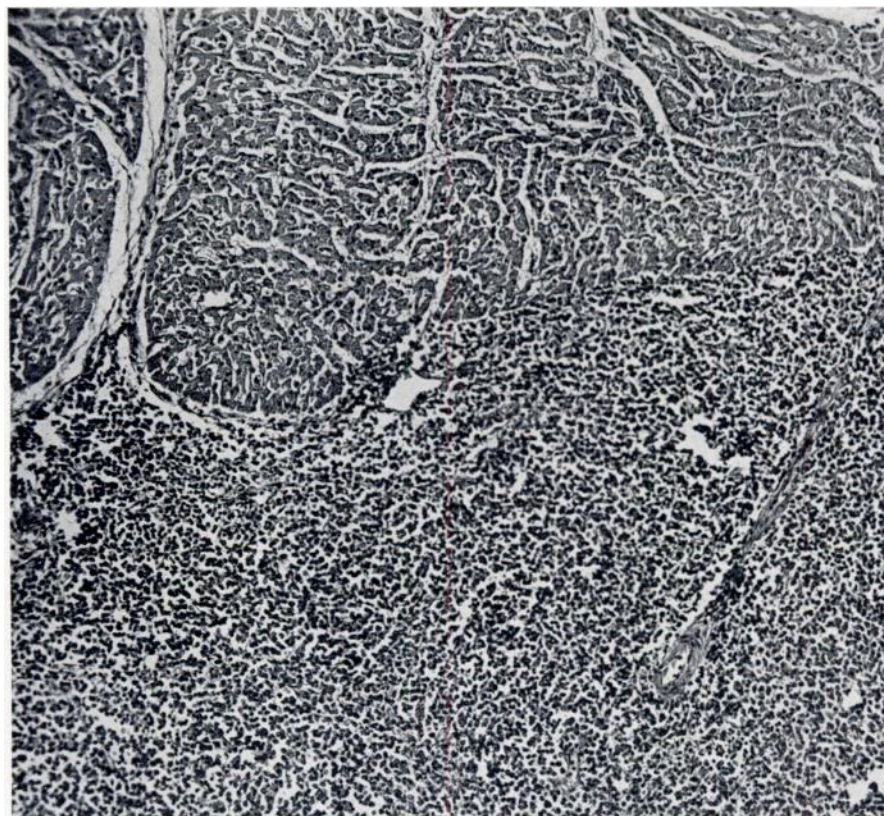


FIG. 2.—Photomicrograph of the heart showing the dense subepicardial infiltrate.  $\times 100$ .

gressed under penicillin therapy. Anemia and thrombocytopenia persisted. The leukocyte count continued to increase to a terminal level of 500,000 per cu. mm. Supportive therapy was of no apparent benefit and the patient expired on June 22, 1948.

Autopsy showed a poorly nourished infant weighing 10½ lb. The peritoneal and pleural cavities contained a few cc. of brownish red fluid. Abdominal distention was due to gaseous dilatation of the stomach and bowel, and the enlarged liver and spleen. The heart presented an extensive greyish white subepicardial infiltration especially prominent along the atrio-ventricular sulcus and branches of the coronary arteries. This infiltrate extended along the external surfaces of the proximal portions of the aorta and pulmonary artery. The spleen was markedly enlarged, weighing 65.5 Gm. The liver was enlarged, weighed 390 Gm., and showed greyish white infiltrates in the periportal areas. The cecum and, to a lesser extent the ascending colon and terminal ileum, showed many submucosal, greyish white, longitudinal ridges of



infiltrate, scattered along which were many bright red punctate hemorrhages. The appendix was slightly enlarged with infiltrate. The right kidney weighed 70.5 Gm., the left 61.5 Gm. They were markedly enlarged and greyish white with many bright red petechiae. On section, nearly the entire parenchyma was involved by masses of greyish white, poorly circumscribed infiltrate. Lymph nodes generally were enlarged, the largest measuring 1.5 cm. in diameter. The tumor in the left breast measured 2.5 x 2.0 x 1.0 cm., and that in the right 2.8 x 2.3 x 1.0 cm. Each revealed a cut surface which was greyish white with a vague greenish tint. On reflection of the scalp the nodular masses external to the calvarium were confluent, markedly adherent to the underlying bone, and also showed a vague greenish tint.

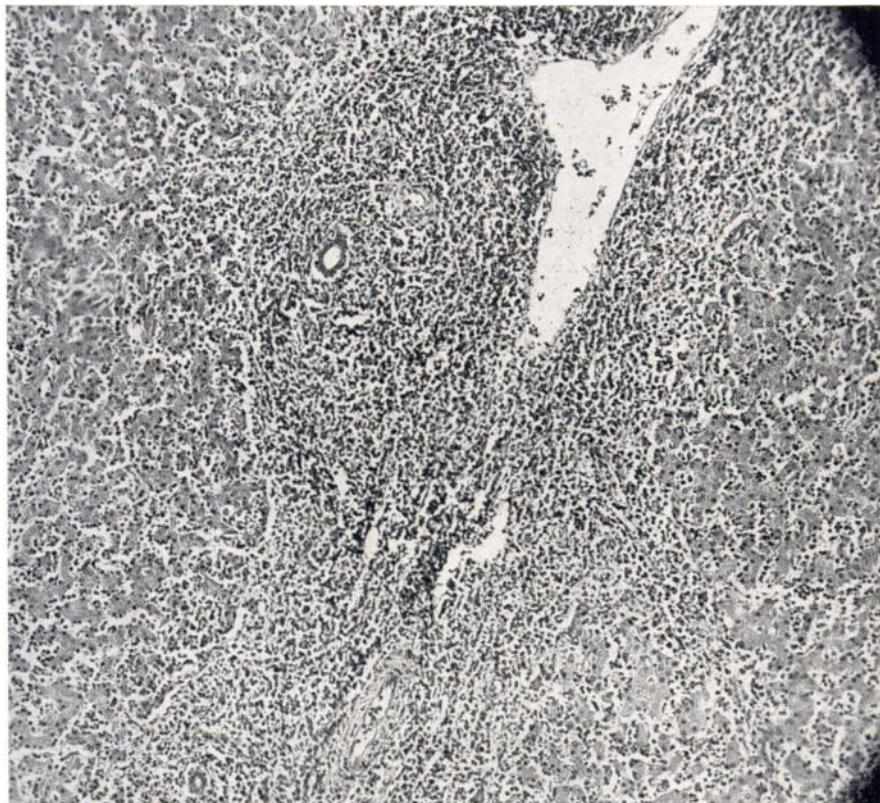


FIG. 3.—Photomicrograph of liver to show dense periportal infiltrate.  $\times 100$ .

Microscopically, sections from the heart, lungs, spleen, liver, pancreas, stomach, small and large bowels, appendix, adrenals, kidneys, uterus, ovary, thymus, pituitary, lymph nodes, bone marrow, breast, skin and calvarium showed involvement by leukemic cells. The cellular infiltrate was pleomorphic and was similar in all sections. With the Giemsa stain many of the cells were blasts, but moderate numbers of cells morphologically characteristic of neutrophilic and eosinophilic metamyelocytes and polymorphonuclear leukocytes were present. There were frequent mitotic figures. Generally, infiltrations of the tissues were perivascular in distribution. In the heart, subepicardial infiltrations were massive (fig. 2) and extended into the myocardium in a few places. There were severe interstitial infiltrations in the lungs. Spleen, lymph nodes and thymus showed their parenchyma to be largely occupied by leukemic cells. The periportal infiltration in the liver was extensive (fig. 3). The pancreas showed diffuse infiltration of the interlobular septa. Stomach, small, and large bowel (cecum) showed foci of submucosal infiltrate; the lymph follicles appeared enlarged and replaced by leukemic cells with hemorrhage and

ulceration of the overlying mucosa in some sections. The appendix was diffusely infiltrated. Focal infiltrations were noted in the adrenal medullae. Massive tumor-like infiltrations occupied the greater portion of each kidney (fig. 4). Hemorrhage and necrosis were found in the largest cell masses. Uterus, ovary and pituitary showed small perivascular infiltrates. The breast tumors showed cells similar to those present elsewhere. Masses of tumor cells were found on both inner and outer aspects of the calvarium. The vertebral bone marrow was hyperplastic, but showed only a few erythroid cells. Megakaryocytes were fairly frequent, but many were undergoing phagocytosis by polynuclear leukocytes. The microscopic picture was that of a myelogenous leukemia.

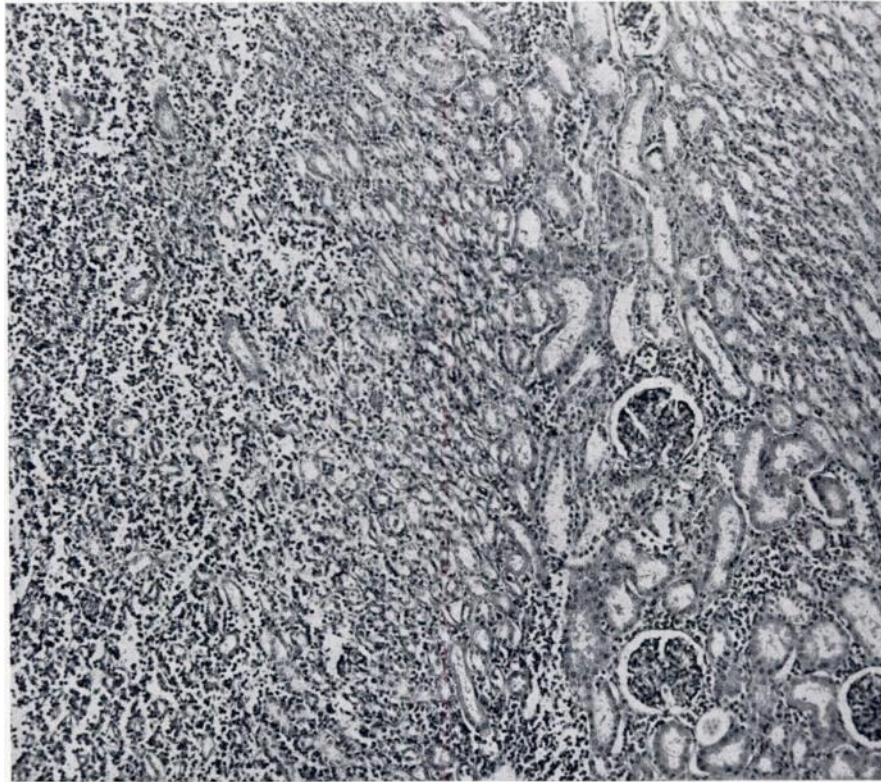


FIG. 4.—Photomicrograph to show the extensive infiltration and destruction in the kidney.  $\times 100$ .

#### COMMENT

The diagnosis of leukemia was made in this case after examination of the initial blood smears. However, the type of leukemia remained in doubt until autopsy. Monocytic leukemia was considered on the basis of the many large mononuclear cells with bluish cytoplasm containing a few granules. This is interesting in that others have noted many monocytoïd cells in cases of chloroma.<sup>2, 3</sup> This feature may account for the occasional cases of "monocytic" chloroma which are still being reported,<sup>9, 10</sup> even though most authorities agree that chloromata occur only in myelogenous leukemia. With the development of the tumor nodules which externally had a bluish color, the diagnosis of chloroma was entertained. This bluish color externally has previously been mentioned by Kemp and Williams.<sup>11</sup>

At autopsy the color of the tumors was not as green as was expected. Only a slight tinge of green was seen in the tumors over the cranial bones and in the breasts. The occurrence and prominence of the breast tumors is interesting. Atkinson in his review mentions their occurrence in 3 cases. Huber<sup>12</sup> and Simon<sup>13</sup> record cases of malignant tumors of the breast which at operation were found to be chloromata.

The occurrence of skin lesions in this case is also of interest. Skin infiltrations in myelogenous leukemia are uncommon.<sup>1, 14</sup> However, skin lesions in myelogenous leukemia of infants have been reported not infrequently.<sup>1, 2, 4</sup> In several cases, as in ours, the skin manifestations were the first to be noted.

Also worthy of comment were the gastro-intestinal lesions that grossly involved the submucosa so extensively, especially in the cecum. Kelsey and Anderson<sup>16</sup> described a case of leukemia in an infant one month old with lesions similar to those of our case. Similar lesions have been described more frequently in cases of adults with chronic lymphatic leukemia.<sup>17</sup>

Considering the duration of the disease, this case must be classed as acute. Yet in a number of respects there is some resemblance to chronic leukemia, i.e., the high white count, the widespread infiltration of organs and the lack of hemorrhagic phenomena.

#### SUMMARY

A case of myelogenous leukemia with chloromatous tumors in a three month old female infant is described and briefly discussed. Search through the literature revealed only 2 cases of chloroma which occurred in infants younger than the case presented.

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