CHLOROMA

A Case Report

M. EDWARD MARTEN, M.D., AND LEO M. MEYER, M.D.

(From The Department of Pathology, Wyckoff Heights Hospital, Brooklyn, N. Y.)

Since Dock and Warthin (1), in 1904, first summarized the 21 cases of chloroma which they had collected from 1893 until that time, there have been several more complete reviews of the literature (2–5). At present no one doubts the relationship of this condition to leukemia, the only controversial point lying in the differentiation of the lymphoid and myelogenous groups. Washburn (5), who reviewed the literature from 1823 to 1929, collected only 162 authentic cases of chloroma. From that date to September 1935, 35 additional cases have been reported. The majority of these have fallen into the myelogenous group, but no accurate estimate can be made because of the difficulty of distinguishing the two types. In all but two instances (5–6), the disease has been fatal.

CASE REPORT

A woman, aged thirty years, was admitted to the service of Dr. Albert Cook, Dec. 20, 1935, because of pain in the left flank of five weeks' duration. The family and past histories were not significant, the patient never having been seriously ill. She was married and had two children living and well. About six weeks prior to admission she suffered a severe "cold," following which she began to have pain in the left flank and lumbar region, which became progressively worse. Because of this, hospitalization was advised. There were no other complaints. The patient was obese and extremely pale. No abnormal clinical findings were observed referable to either the heart or the lungs. No palpable masses were present in the abdomen, but there was costovertebral tenderness in the left lumbar region on heavy percussion. Urinalysis was negative. The temperature was 101° F.; pulse 110; respirations 23. A routine blood count was done on admission (see Table 1) and a diagnosis of acute myeloblastic leukemia with possible renal calculus was made. Flat plates of the kidneys and retrograde pyelography revealed normal kidneys and good function on both sides. Urine from each kidney was negative.

The temperature remained between 100° and 101° F. during the patient's first ten days in the hospital, and then gradually rose to 103° F. shortly before death. Ulceration developed along the gum margins and in both sides of the throat, showing no tendency to heal. Vaginal bleeding was continuous and moderate. A few small discrete nodes were subsequently observed under the skin on both sides of the neck. A paronychium developed in the fifth finger of the right hand and required incision; it cleared up in about ten days. The patient received two blood transfusions of 500 c.c. each. Liver extract, 1 c.c., was administered intramuscularly on alternate days and Fowler's solution was given by mouth. The total number of white blood cells fell to almost a normal level, but the percentage of myeloblasts rose in proportion. The course in the hospital was progressively downward and death occurred on Jan. 20, 1936, thirty-one days after admission.

Autopsy (Limited to Chest and Abdomen): A superficial examination showed necrosis and ulceration of the gums. No enlarged nodes were felt or seen. The left lung was lying free in its cavity; the right was free except for an attachment
TABLE I: Blood Counts on Successive Dates

<table>
<thead>
<tr>
<th>Date</th>
<th>Hemoglobin %</th>
<th>Red cells total</th>
<th>White cells total</th>
<th>Polynuclears %</th>
<th>Stab forms %</th>
<th>Myelocytes %</th>
<th>Myeloblasts %</th>
<th>Small lymphocytes %</th>
<th>Large lymphocytes %</th>
<th>Trans. cells %</th>
<th>Large mononuclears %</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/21</td>
<td>33</td>
<td>1,450,000</td>
<td>20,000</td>
<td>22</td>
<td>4</td>
<td>25</td>
<td>19</td>
<td>13</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>12/23</td>
<td>40</td>
<td>1,700,000</td>
<td>28,000</td>
<td>16</td>
<td>3</td>
<td>40</td>
<td>28</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>12/26</td>
<td>32</td>
<td>1,600,000</td>
<td>26,000</td>
<td>17</td>
<td>5</td>
<td>36</td>
<td>23</td>
<td>14</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12/28</td>
<td>28</td>
<td>1,300,000</td>
<td>24,300</td>
<td>29</td>
<td>4</td>
<td>37</td>
<td>17</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12/31</td>
<td>19</td>
<td>1,000,000</td>
<td>16,800</td>
<td>21</td>
<td>4</td>
<td>15</td>
<td>25</td>
<td>27</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>1/2</td>
<td>19</td>
<td>900,000</td>
<td>14,000</td>
<td>17</td>
<td>5</td>
<td>37</td>
<td>15</td>
<td>15</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>1/4</td>
<td>23</td>
<td>1,100,000</td>
<td>10,200</td>
<td>21</td>
<td>6</td>
<td>33</td>
<td>16</td>
<td>18</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1/8</td>
<td>24</td>
<td>1,050,000</td>
<td>9,800</td>
<td>28</td>
<td>5</td>
<td>36</td>
<td>21</td>
<td>3</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1/14</td>
<td>17</td>
<td>750,000</td>
<td>10,200</td>
<td>14</td>
<td>3</td>
<td>21</td>
<td>50</td>
<td>6</td>
<td>4</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>1/17</td>
<td>17</td>
<td>750,000</td>
<td>14,200</td>
<td>3</td>
<td>1</td>
<td>31</td>
<td>52</td>
<td>9</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

of the anterior surface of the right upper lobe to the second and third ribs at the costochondral junction. There was no free fluid in either pleural cavity. The lungs weighed 950 grams. The serosal surfaces were of a pink-gray color, smooth and glistening, except at the point of adhesion to the second and third ribs, where the pleura was thickened and green. On section, this green tissue was found to be firm but it did not invade the parenchyma. The cut surfaces of the lungs were pink and exuded a yellow frothy fluid. The right lower lobe was poorly aerated but no consolidation could be found. There was no evidence of tumor or caseation. At the hilus, the nodes were enlarged, firm, and green, being fused into one continuous mass. On section, the substance was homogeneous and green.

The pericardial sac contained no free fluid. The heart weighed 310 grams. Its musculature was pale brown, with many yellow flecks throughout. No scars were seen. The endocardium was smooth and glistening but of a peculiar yellow-brown color, most evident in the large hypertrophic papillary muscles of the left ventricle. All the valves appeared competent. The coronary arteries were patent. The aorta was normal and had a circumference of 8.5 cm. It was smooth, shiny, yellow, and elastic. On the adventitial surface of the thoracic aorta, just below the arch, was an infiltration of firm green tissue which did not invade the entire thickness of the wall. This substance resembled that on the surface of the right upper lobe of the lung.

The esophagus was normal.

The chest wall contained large, firm green nodules on the under surface of the sternum, under the second and third ribs, on the right side close to the costochondral junction, under the right and left clavicles, and along the vertebral column from the first thoracic down to the third lumbar vertebra. This process was more marked over the thoracic than the lumbar vertebrae. On cutting these masses away, there was no evidence of direct invasion into the bodies of the vertebrae, ribs, clavicles, or sternum. The body of the seventh dorsal vertebra was opened and the contents were found to consist of a cloudy, brown-red, semifluid material. The marrow of the sternum was similar in nature.

The abdominal cavity contained no free fluid. Under the mucosa of the stomach were three small green areas, each measuring about 1.5 cm. in diameter, and not visible from the serosal surface. The lymphoid patches close to the cecum were large and blue. The large bowel showed no abnormal changes. The mesentery of the small intestines contained a large amount of fat but no enlarged nodes.

The liver weighed 1980 grams. The capsule was smooth and glistening. The cut surface of the organ was of a grayish pink color. No nodules were found. The lobular markings were indistinct. The gallbladder was thin-walled and free from the surrounding structures. About 8 c.c. of dark green bile was present. There were no calculi. The flow of bile from the gallbladder to the duodenum was unobstructed.
FIG. 1. **GREEN TUMOR TISSUE.** × 50

FIG. 2. **GREEN TUMOR TISSUE.** × 300
The pancreas weighed 55 grams and was normal in color, consistency, and appearance. The spleen weighed 300 grams. The capsule was bluish gray and wrinkled. On section the tissue was of a dark red color and soft. Scattered throughout were many yellow nodules, about the size of a pin head, resembling the malpighian corpuscles of the normal spleen, except that the latter are larger and more numerous. The adrenals had a combined weight of 10 grams and appeared normal.

The kidneys had a combined weight of 330 grams. The capsule stripped easily, leaving a pale yellow-pink surface on which were many dilated capillaries. The cut surface showed a normal architecture. There was no increase of pelvic fat. Scattered throughout both organs were small, green, well circumscribed nodules measuring 0.5 in diameter, which in structure and general appearance seemed to be exactly similar to the green masses previously described. No abnormal changes were present in the renal pelves. The bladder contained about 4 ounces of clear yellow urine. The mucosa was moderately injected. The ureters were normal.

The uterus was small. On the superior surface of the fundus, close to the insertion of the left tube, was a raised green nodule 1.5 cm. in diameter, and raised an equal distance above the surface. It was of the same appearance and structure as the masses under the sternum and over the bodies of the vertebrae. The wall of the uterus was firm and pink. There was moderately advanced necrosis of the mucosal lining of the vagina and uterine cavity. Both tubes appeared normal. The ovaries were of normal size but contained green masses, similar to those previously described, which seemed to have compressed and pushed aside the normal ovarian tissue.

The green color of the tumors disappeared within twenty-four hours after removal from the body, the tissue becoming yellowish brown. The green hue could be only partially restored by the application of hydrogen peroxide and dilute sodium hydroxide (9).

**Histological Data:** Microscopic examination of the green tissue disclosed a large number of large round and polyhedral cells, about twice the size of the red blood cells. These cells in many instances were almost completely filled with a round hyperchromatic nucleus. The cytoplasm was in some instances clear; in others there were definite granules producing a resemblance to myelocytes. In some of the cells the nuclei were eccentrically placed, suggesting plasma cells. The cells were laid down in a loose connective-tissue stroma with no tendency to orderly formation. Occasional nucleated red blood cells were seen. (Figs. 1 and 2.)

![Fig. 3. Section from Liver with Green Tumor Nodule to the Left](image-url)
FIGS. 4 AND 5. LIVER SINUSOIDS FILLED WITH IMMATURE WHITE BLOOD CELLS. × 50 and × 300
In the liver there were two processes. One portion showed complete destruction and invasion of the parenchyma by tissue like that of the green tumor just described (Fig. 3). In addition, the liver sinusoids were filled with cells of the myelocytic series in various stages, such as are usually seen in myelogenous leukemia (Figs. 4 and 5). In the ovaries was an invasion of tissue similar to the green tumor tissue. The lungs showed edema, emphysema, and leukemic infiltration in the capillaries of the alveoli. The marrow of the vertebrae and sternum disclosed a marked overgrowth of cells of myeloblastic and myelocytic series with a preponderance of the former. Here there was no tissue histologically resembling that seen in the green tumor masses. The spleen was invaded by cells like those seen in the tumor masses. The lymph nodes showed hyperplasia of myeloblastic and myelocytic cells, completely destroying the normal architecture. In the adrenals edema of cortical cells was present. The gastric mucosa was invaded by myeloblasts and myelocytes. The pancreas showed moderate fatty changes. Marked cloudy swelling and localized areas of leukemoid infiltration were seen in the kidneys. The heart muscle and aorta were normal. In the uterus was a myelogenous invasion into the connective tissue of the endometrium. Under the serosa was a nodule of the same structure as the green tumors described above.

Diagnosis: Acute myeloblastic chloroleukemia.

Comment

Histologically the picture of the green masses under the sternum, along the spinal column, and in the liver, ovaries, and spleen, bore a strong resemblance to that described by Reddick and Brandes (7) and Swanson (8). The former suggest that the large polyhedral cells are the precursors of the myeloblasts and myelocytes. In our case the tumor did not involve the bone marrow, the latter showing the typical picture of an acute leukemia rather than the one seen in the green tumor mass. The whole process is strongly suggestive of a malignant process involving some potential hematopoietic centers, metastasizing to distant organs, associated with an acute myeloblastic leukemia. Whether these foci are vicariously concerned in the production of immature white blood cells or are simply local metastases from a primary undetermined site cannot be ascertained from the material at hand. There was nothing to suggest that the green growth either began in or invaded the bone marrow.

Bibliography