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Intracerebral Hemorrhagic Dissemination of Acute Myelocytic Leukemia

John K. Kelly,¹ Alfredo Lazo, Joseph Metes, Harvey I. Wilner, and Frederick B. Watts, Jr.

Intracerebral hemorrhagic dissemination is a rare complication of acute myelocytic leukemia. We report a case of a boy who presented with minimal clinical abnormalities but subsequently underwent a rapid deterioration. The computed tomographic (CT) and pathologic findings are described.

Case Report

A 10-year-old boy was admitted with left leg pain and fever of 38.9°C. The initial clinical impression was cellulitis. Laboratory findings included hemoglobin of 5 g/dl and white blood cell count of 206,000/mm³. The spleen was enlarged and multiple cervical lymph nodes were palpable. Bone marrow pathology was interpreted as acute myelocytic leukemia. The child was treated with antibiotics, but he soon developed respiratory failure and pericardial effusion. When he suddenly became flaccid and areflexic, cranial CT was performed (fig. 1). He died shortly thereafter.

At autopsy, leukemic infiltration was found in the heart, kidneys, pancreas, hypopharynx, lymph nodes, testes, lungs, diaphragm, thyroid, adrenals, liver, spleen, stomach, esophagus, prostate, bone marrow, and brain. Pathologic sections of the brain showed gross nodules consisting of dense aggregates of leukemic cells accompanied by blood suffusion (fig. 2). Marked leukostasis was noted in the vascular lumina at the periphery of these nodules. In the cerebel-

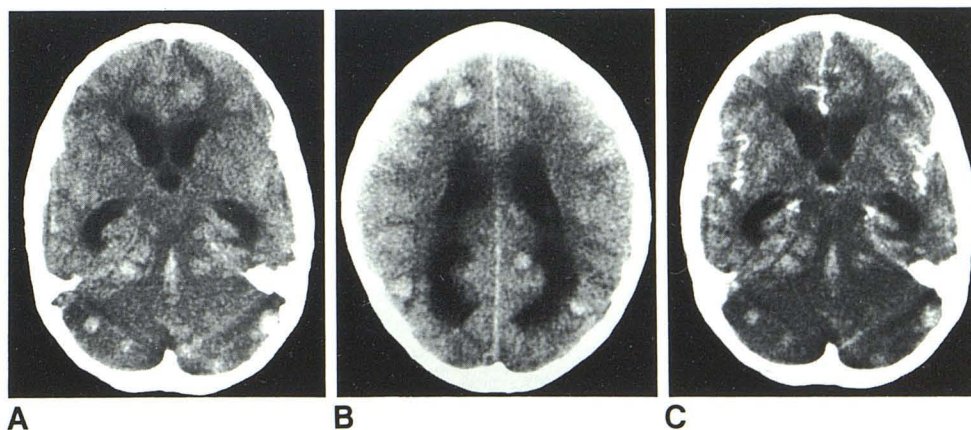
lum the large leukemic nodules ruptured focally into the leptomeninges. Otherwise the leptomeninges were not invaded by the leukemic process.

Discussion

Intracerebral complications of acute leukemia may be infiltrative, hemorrhagic, infectious, parasitic, or iatrogenic [1]. Leukoblastic infiltrations are seen most often in acute lymphocytic leukemia. Moore et al. [2] recorded leukemic infiltration of the dura in 70% of patients with acute lymphocytic leukemia and 50% of patients with acute myelogenous leukemia; 20% of the combined group died as a result of intracerebral hemorrhage.

Infiltration of leukemic cells is seen initially in the walls of the superficial arachnoidal veins [3]. After pia-glial membrane destruction and extension of leukemic infiltration, the brain parenchyma is invaded. Kingsley and Kendall [4] reviewed the CT findings in 41 patients with leukemia. Necrotizing leukoencephalopathy was found in four patients: The acute form appeared as diffuse, central low attenuation with compression of the ventricular system due to brain swelling; the chronic type demonstrated multifocal dystrophic calcifi-

Fig. 1.—Unenhanced (A and B) and contrast-enhanced (C) CT scans show multiple hemorrhagic nodules scattered throughout brain parenchyma. Associated hydrocephalus is probably related to aqueductal obstruction.



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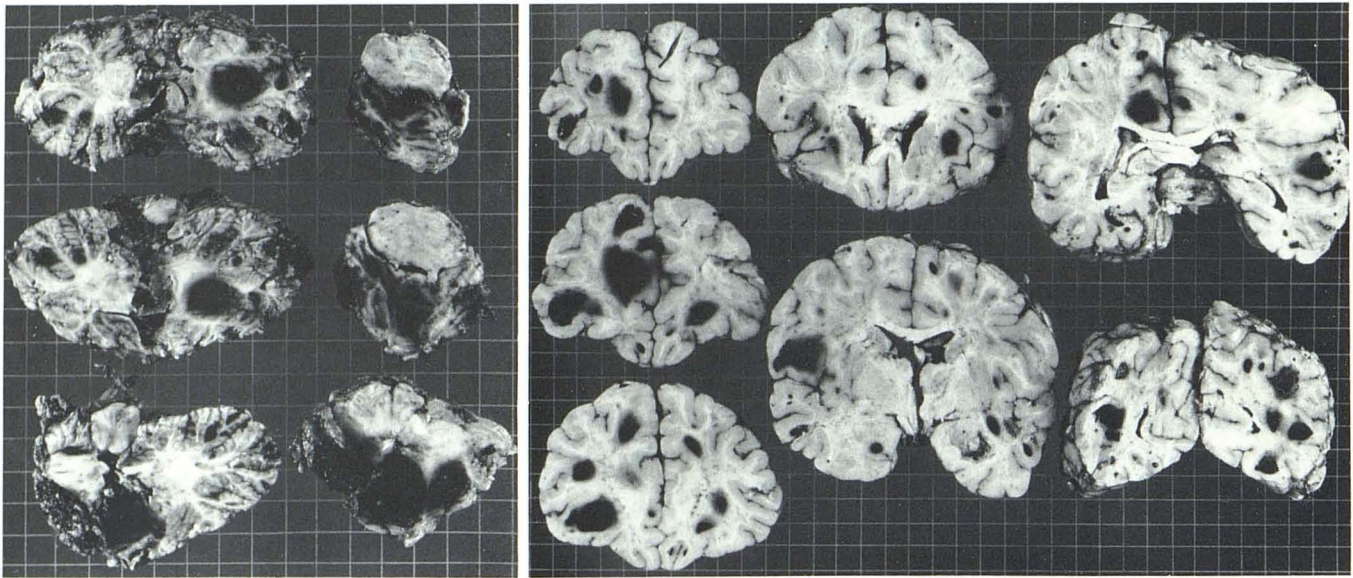


Fig. 2.—Gross pathologic specimens of brain in cross section. Multiple hemorrhagic nodules contained dense aggregates of leukemic cells accompanied by suffused blood.

cation in the necrotic brain tissue. These authors reported diffuse cerebral leukemic infiltration in only two patients. In a study of 91 children with acute leukemia, Crosley et al. [5] found that 85 exhibited central nervous system involvement. Cerebral atrophy was the most common lesion noted, occurring in 65% of their series. Leukoencephalopathy was noted in only two patients, whereas leukemic infiltrations of the central nervous system were found in 33%. Wendling et al. [6] described the CT findings in four patients with acute intracerebral leukemia. All cases demonstrated masses of equal or increased density relative to normal brain.

Gastaut et al. [1] observed that only two of their 88 patients developed hematomas, although they stated that the frequency of intracranial hemorrhage is variable. Price and Johnson [3] examined 126 brains; hemorrhage was present in the cortical gray matter in nine cases. These focal hemorrhages were associated with bacterial or fungal arachnoid vasculopathy in five cases and with adjacent arachnoid leukemia in two. Crosley et al. [5] found hemorrhage in many locations, including subdural, subarachnoid, and intracerebral, in 20 of 91 cases with leukemia. Most of their patients exhibited minimal clinical abnormalities related to the hemorrhages. Massive intracerebral hematoma with acute and fatal neurologic decompensation occurred in only one child.

Moore et al. [2] reported 23 deaths from intracranial hemorrhage in a postmortem study of 117 patients with acute leukemia. Characteristically, multiple areas of hemorrhage were seen in the brain or meninges of these 23 patients. The hemorrhage often extended into the ventricles or into the subarachnoid space, and massive subarachnoid hemorrhage often extended into brain substance. These authors state that intracerebral hemorrhage in patients with acute leukemia is

often located in the cerebral white matter. These hemorrhagic lesions were shown to be associated with blastic crisis and were directly related to intracerebral leukostasis and leukemic nodules.

Our patient demonstrated diffuse hemorrhagic areas scattered throughout the brain parenchyma (fig. 2). Within these hemorrhagic lesions were dense aggregates of leukemic cells, and at the periphery of the nodules there was marked leukostasis of the vascular lumina. The CT findings (fig. 1) correlate well with the pathologic sections. Multiple hemorrhagic nodules are seen throughout the brain parenchyma with associated obstructive hydrocephalus. The obstruction is at the level of the aqueduct with obliteration of the fourth ventricle.

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