

## Subarachnoid Spinal Hemorrhage in a Case of Systemic Lupus Erythematosus

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• A 50-year-old woman with an 18-year history of systemic lupus erythematosus (SLE) died after an exacerbation of the illness, characterized by deteriorating mentation and right hemiplegia. Necropsy revealed massive spinal subarachnoid hemorrhage resulting from aneurysmal dilation and rupture of the posterior spinal artery, which was involved by vasculitis. The left parietal lobe and internal capsule contained recent infarcts. To our knowledge, this is the first reported case of SLE with spinal subarachnoid hemorrhage revealed by necropsy.

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Systemic lupus erythematosus (SLE) produces vasculitis in many organs, but involvement of the neuraxis by frank arteritis is uncommon, even in patients with profound neurologic symptoms.<sup>1</sup> We describe a patient with long-standing SLE who died with a clinically undiagnosed neurologic illness. Necropsy showed a massive spinal subarachnoid hemorrhage secondary to aneurysmal dilation and rupture of the posterior spinal artery. Arteritis was the cause of the rupture.

### REPORT OF A CASE

A 50-year-old woman complained of several days of swelling in feet, ankles, and arms, exertional chest pain, dyspnea, and constant frontal headache. The patient had first been seen in 1959 because of intermittent pain and swelling in joints of the upper extremities. A cell preparation was positive for lupus erythematosus. The patient's condition improved after treat-

ment with aspirin and hydroxychloroquine sulfate.

She did well for the next 15 years except for progressive arthritis of the hands, necessitating reconstructive surgery. In August 1975, the serum reaction for antinuclear antibody was 4+, and a 24-hour urine specimen contained 2 g of protein. A renal biopsy analyzed by light and electron microscopy revealed "glomerulonephritis, immune-complex mediated and diffuse, with endothelial, epithelial, and mesangial deposits consistent with lupus nephritis." At this time, serum complement level was 0, and anti-DNA antibody level was 100 units (normal, <30 units). The patient was given prednisone (40 mg/day) and azathioprine (50 mg/day), and her condition improved.

The final admission was in December 1976. She now had a mild erythematous rash involving the face, palms, and neck, and dependent pitting edema. The findings on neurologic examination were normal. The urine reaction for protein was 3+. Protein concentration in the CSF was 31 mg/dL, glucose level was 55 mg/dL, and there were 30 RBCs and no WBCs per high-power field. Stained specimens and cultures were negative for bacteria.

On the second day of hospitalization, the patient had a temperature of 39 °C and nuchal rigidity. Lumbar puncture was refused. Her mental capacities deteriorated steadily. A lumbar puncture performed on the seventh day revealed an opening pressure of 114 mm H<sub>2</sub>O, glucose level of 10 mg/dL, protein concentration of 200 mg/dL, and 84,000 RBCs and 3,500 WBCs per high-power field. Computerized tomogram of the head was normal. Cerebral angiogram showed generalized vascular spasm; a malformation of blood vessels was not identified. Cephalosporin, gentamicin, and chloramphenicol therapy was started. On the tenth day of hospitalization, the patient responded only to pain. A right flaccid hemiplegia was noted. Sensation was thought to be intact, and Babinski's sign was not present. She died on the 12th day of hospitalization.

### NECROPSY FINDINGS

The spinal cord contained a large adherent blood clot dorsally, covering much of the thoracic region and extending to the cervical and lumbar levels, but not including the site of lumbar puncture. Vascular

lesions were not noted macroscopically. The hemorrhage ended abruptly at the foramen magnum. The brain was severely edematous. A recent ischemic infarct in the left cerebral hemisphere involved the white and gray matter in the parietal region, extending into the posterior part of the internal capsule.<sup>2</sup> Other gross lesions were not noted in the CNS.

Multiple sections of the spinal cord around the zone of hemorrhage were examined microscopically. The following methods were used: hematoxylin-eosin, Luxol Fast blue, Verhoeff's elastic tissue stain, PAS, and Masson's trichrome stain. A diffuse subarachnoid hemorrhage was present around the dorsal portion of the spinal cord. Large amounts of hemosiderin were noted throughout the areas of hemorrhage. Several thrombosed degenerating vessels were identified in the position of the posterior spinal artery. One bulging vessel in the midthoracic region was inflamed and almost completely destroyed. Adjacent to and within the wall of this vessel were masses of degenerating cells containing mainly polymorphonuclear leukocytes. The vascular nature of this structure was confirmed by the presence of elastic membranes and smooth muscle cells within the wall (Figure). The spinal cord was intact and was not demyelinated.

Sections of the cerebral cortex in the region of the infarct showed edema, nuclear pyknosis in neurons, irregular cytoplasm, and focal mild hemorrhages. A section from the left visual cortex revealed a thrombus in one meningeal vessel. Additional vascular or perivascular inflammation was not found within the CNS.

Renal findings included interstitial nephritis and glomerular changes similar to those seen in the previous biopsy. Noted also were inactive granulomatous disease of the lungs, bilateral adrenal cortical atrophy, multiple small hepatic angiomas, and cholelithiasis. An acute vasculitis with endothelial proliferation and thrombosis was present in the gallbladder and vagina.

### COMMENT

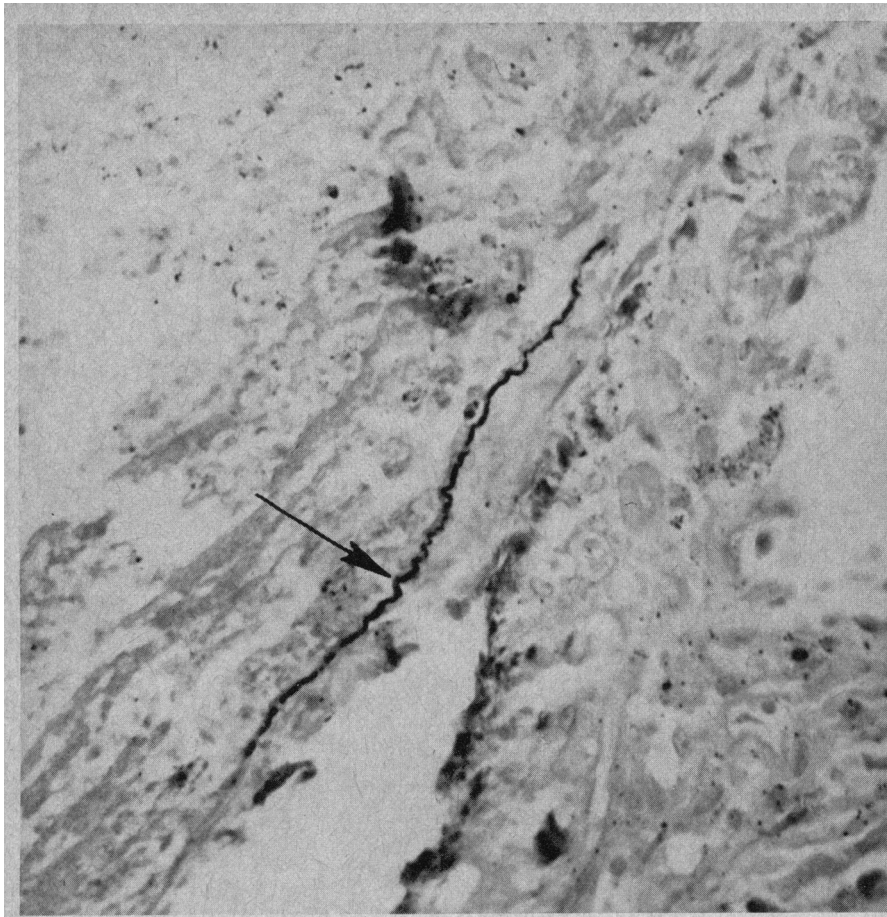
Neurologic problems are common in cases of SLE, affecting up to 75% of patients.<sup>1</sup> The symptoms include seizures, cranial nerve disorders, paralysis, peripheral neuropathy, and mental changes; the difficulties may wax

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Portion of wall of aneurysm revealing disrupted internal elastic membrane (arrow) and necrotic smooth muscle cells at site of aneurysmal rupture. Some degenerated leukocytes are scattered through this section. (Verhoeff's elastic tissue,  $\times 125$ ).

and wane during the course of the disease. In one large series involving 249 fatal cases of SLE, the primary cause of death was CNS damage in 13%.<sup>3</sup> Feng et al stated that 11 of 30 deaths in patients with SLE were related to neurologic involvement.<sup>4</sup> By contrast, examination of the brain at necropsy in cases of SLE is often disappointing. Acute necrotizing arteritis may occur in the brain, but is uncommon. Perivascular infiltrates of lymphocytes are more frequent.

Symptomatic involvement of the spinal cord in SLE usually results from transverse myelopathy. In a comprehensive review of this entity, Andrianakos et al<sup>5</sup> found the complication to be fatal in 13 of 26 cases. Necropsy findings in the spinal cord differed, but included thromboses of small blood vessels, myelomalacia and necrosis, perivascular infiltrates, arteritis, and subdural hematoma. Subarachnoid hemorrhages were not reported.

A fatal subarachnoid hemorrhage in the cranium occurred in one instance of SLE, but this complication has not been encountered in the spinal cord.<sup>1</sup>

Other causes of spontaneous subarachnoid hemorrhage of the cord include angioma and telangiectasis, solitary aneurysm, coarctation of the aorta, mycotic aneurysm of a spinal artery, various tumors (ependymoma, schwannoma, neurofibroma, glioblastoma multiforme, meningeal sarcoma), and anticoagulant therapy.<sup>6-10</sup> In addition, various infections and blood dyscrasias are said to produce spinal subarachnoid hemorrhage, although specific cases have not been documented.<sup>11</sup>

Spinal angioma is the most common cause of spontaneous spinal subarachnoid hemorrhage, occurring in 13%.<sup>6</sup> Women are affected more than men; signs and symptoms are usually related to irritation of the meninges. The mortality is 15%, and rebleeding is common.

The CSF findings in our patient are similar to those previously reported in cases of involvement of the cord by SLE, producing transverse myelopathy.<sup>3</sup> It has been suggested that decreased CSF glucose level is characteristically associated with SLE-induced transverse myelopathy, but

spinal subarachnoid hemorrhage also may produce this finding.

In our patient, SLE caused a vasculitis of a spinal artery with secondary aneurysm formation, rupture, and hemorrhage. Such an event is rare in the CNS, although it has occurred in the brain in cases of polyarteritis nodosa, poststreptococcal glomerulonephritis, and SLE, and in the spinal cord in instances of polyarteritis nodosa.<sup>12,13</sup> Evidence of infection was absent in our case, hence we assume that the vasculitis was mediated immunologically. We believe this is the first reported case of SLE with spinal subarachnoid hemorrhage revealed by necropsy. A nonfatal case has been reported from Japan.<sup>14</sup>

Ronald J. Gregory took the photomicrograph.

#### Nonproprietary Name and Trademark of Drug

Azathioprine—Imuran.

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