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CT of Lightning Injury

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A man was admitted to the hospital after having been rendered unconscious by a direct lightning strike to the occiput. Computed tomographic (CT) examination on the day of admission revealed subarachnoid, intraparenchymal, and intraventricular hemorrhage. To our knowledge, this is the first published report of CT demonstration of intracranial injury due to a lightning strike.

Case Report

A 20-year-old man was on a fishing trip in a boat on Delaware Bay. At one point during an ensuing storm, he raised his head above the rigging and was immediately struck by a lightning bolt that also momentarily stunned his companions. They recovered to find him unconscious on the bottom of the boat with blood-tinged fluid emanating from his left ear. After a brief examination at a nearby hospital where his vital signs were found to be stable, he was transferred to our institution.

Physical examination revealed movement of all four limbs to painful stimuli; the right extremities showed a diminished range of motion. A small, circular burn with associated soft-tissue swelling was noted over the occipital area, and a second area of burned skin was over the right anterior chest. Routine skull radiographs revealed no abnormality. A CT examination showed evidence of subarachnoid hemorrhage and intraparenchymal hemorrhage in the left basal ganglia with extension into the left ventricular system. Mild midline shift to the right was noted (fig. 1).

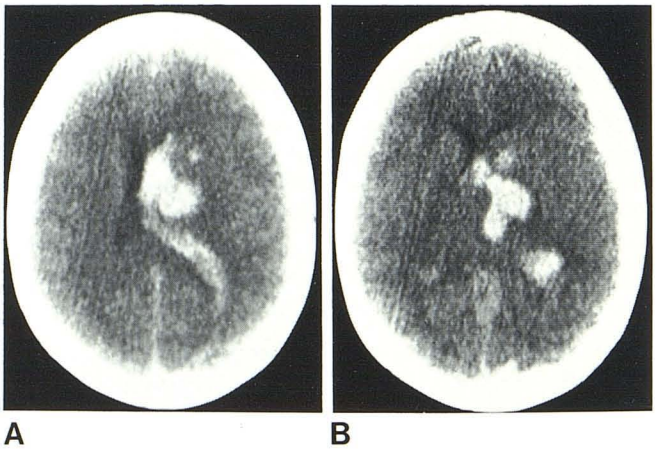
The subsequent hospital course was characterized by progressive neurologic and cardiorespiratory deterioration; ventilator support and vasopressor infusion was instituted on hospital day 6. A persistent cerebrospinal fluid leak from the left ear was noted. Repeat CT on hospital day 5 revealed minimally increased midline shift, with no other change. An electroencephalogram on hospital day 11 showed electrocerebral silence. Cardiac arrest occurred 13 days after admission.

An autopsy was performed. This showed the brain surface to be blood-stained, with the brain itself described as soft and mushy in consistency. Two small, irregular areas at the base of each middle cranial fossa were interpreted as skull fractures. Brain sectioning confirmed basal ganglia hemorrhage with involvement of the anterior rim of the internal capsule and intraventricular extension.

Discussion

A lightning strike represents a cloud-to-earth electrical discharge after water particles in clouds become negatively charged and a sufficiently positive potential is induced on the earth's surface [1]. Distinction should be made between a direct strike and injury due to a stride potential. In the latter, a potential difference develops between the legs; current enters through one leg and exits through the other, thus bypassing the heart and brain. Panse [1] believes that death from a lightning strike to the head is probably of cerebral origin in most cases; very high temperatures and electromechanical forces are involved. In other cases associated with primary cardiorespiratory arrest, recovery may be possible with prolonged artifical cardiopulmonary support [2]. Overall, it appears that the nature of the neurologic injury largely determines the extent and quality of survival [3].

CT provides an ideal noninvasive means of evaluating these patients; the examination may reveal the nature of both primary lightning and secondary traumatic injuries to the cranial contents. For example, a case of traumatic epidural hematoma complicating a lightning injury has been reported [4]; CT is obviously well suited for evaluation of such an abnormality. Complications such as communicating hydrocephalus secondary to subarachnoid hemorrhage are readily evaluated. If no surgically correctable lesion is found, CT may still be helpful in attempting to predict future clinical



A B

Fig. 1.—Contiguous sections show subarachnoid blood, basal ganglia hemorrhage, and blood in ventricular system. **B** shows a small hematoma in region of anterior limb of internal capsule.

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course. Follow-up examinations may be of value in management as well.

For these reasons, we believe that CT has a definite place in the management of lightning victims thought to have sustained intracranial injury.

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