Surgically Correctable Lesions Solely Detected by CT Scan in Adult-Onset Chronic Epilepsy

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A prospective study of 162 patients with adult-onset chronic epilepsy revealed 4 in whom computed tomographic scanning was the only diagnostic test that detected the presence of a surgically correctable cerebral lesion. These patients had suffered from seizures for 1 to 14 years and at the time of operation demonstrated no clinical neurological deficits except organic mental changes.

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A previous communication [5] reported on the effectiveness of computed tomography (CT) as the sole neuroradiological detector of surgically correctable brain lesions in a group of patients with the onset of chronic epilepsy in childhood. This paper describes similar findings in patients in whom chronic seizure disorders developed after 16 years of age.

Materials and Methods

Between January, 1975, and January, 1979, a total of 162 patients with adult-onset chronic epilepsy had CT scans as a part of their evaluation in our institution. A seizure disorder was considered chronic when it occurred repeatedly over a period of six months or longer. Forty-two patients had abnormal CT studies. Thirty-six of these patients, because of the nature of their CT findings or good control of their seizures, did not have an operation; the CT diagnoses in these patients included focal or generalized cerebral atrophies, porencephalic cysts, residuals of old cerebral infarcts, and traumatic encephalomalacias. Among the 6 operated patients, 2 are not included in this report since they had an abnormal radionuclide brain scan originally (normal angiograms). In the remaining 4 patients, CT was the only neuroradiological test that demonstrated the presence of a surgically correctable cerebral lesion. It should be noted that in none of these 4 patients was pneumoencephalography carried out. These patients had experienced seizures over periods ranging from 1 to 14 years. Besides organic mental changes, none demonstrated any major neurological findings on repeated examinations.

Case Reports

Patient 1

A 32-year-old man developed frequent episodes of confusion and automatic behavior 3 years prior to admission. The attacks usually lasted several minutes, seldom ended in a fall, and on many occasions were preceded by a musical aura. The medical and neurological examination revealed no abnormality. Routine laboratory studies were normal. An electroencephalogram (EEG) with nasopharyngeal recording showed sharp waves in the medial aspect of the left temporal lobe. The patient was treated for 3 months with diphenylhydantoin and carbamazepine without improvement. He was readmitted to the hospital, where bilateral carotid and vertebral arteriograms were performed and interpreted as normal. (In retrospect, the films demonstrated a slight elevation and stretching of the M1 segment of the left middle cerebral artery.) A radionuclide brain scan was normal. CT scan revealed a lesion in the pole of the left temporal lobe that enhanced after infusion of contrast medium (Fig 1).

At operation the anterior 4 cm of the left temporal lobe was found to be occupied by a vascular mass. Microscopic examination of this tissue revealed a thrombosed arteriovenous malformation with surrounding reactive gliosis. The patient had no deficit after the operation and experienced no recurrence of seizures during a 14-month postoperative period.

Patient 2

A 40-year-old man had developed brief episodes of "disorientation and lapses of consciousness" at the age of 26.

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Fig 1. (Patient 1) Contrast-enhanced CT scan shows a roundish abnormal area in the anterior part of the left temporal lobe.



Fig 2. (Patient 2) An area of low density surrounded by a calcified posteromedial rim is seen in the left frontal lobe impinging in the anterior left lateral ventricle (enhanced study).

Six months before that, a severe head injury had resulted in fracture of the left orbit and frontal bone and several days of unconsciousness. Over the ensuing 4 years he had a few similar attacks while taking diphenylhydantoin and phenobarbital. At the age of 30 he suffered a generalized tonic-clonic seizure. At 34, focal motor seizures of the right upper extremity started and his wife noticed progressive "mental dullness" and "inattentiveness." Five years later, radionuclide brain scan and bilateral carotid and vertebral angiograms showed no abnormality. CT scanning, however, demonstrated a large radiolucent lesion in the left posterior frontal area with a dense (calcium density) posteromedial rim and peripheral enhancement after contrast injection (Fig 2). A year later, increasing seizures and progressive mental deterioration necessitated a new hospitalization. Neurological examination revealed moderate dementia but no other abnormalities. A radionuclide brain scan was now abnormal, with increased uptake in an area corresponding to the CT abnormality. The CT scan was unchanged; repeat bilateral carotid and vertebral angiograms were normal.

At operation a large cystic mass was found high posteriorly in the frontal lobe. The cyst contained 30 ml of yellow-brown fluid and had dense, fibrotic walls, but it contained no tumor nodules. The surgeon removed the cyst's walls (except the one attached to the motor strip) and decompressed its contents into the adjacent ventricle. Microscopic examination of the tissue revealed a low-grade glioma. The patient received 5,000 R of radiation postoperatively. Over the next 18 months he had one right focal motor seizure and demonstrated moderate improvement in cognitive function.

Patient 3

A 41-year-old man had had generalized seizures since the age of 28. He had no neurological deficits and was reported to have a normal EEG, brain scan, and bilateral carotid arteriograms. At 39 years of age, his seizures became more frequent and he developed focal motor seizures of the left lower extremity. He complained of mental slowness and impotence, and his neurological examination revealed a flat affect with impairment of judgment and recent memory. An EEG and radionuclide brain scan were normal. CT scanning showed periventricular hypodensity around both frontal horns with no contrast enhancement (Fig 3). Over the next 2 years he showed progressive impairment of mental function but no focal neurological deficits. During this time, bilateral carotid and vertebral arteriograms and a brain scan were repeated and were normal. An EEG showed focal spikes in the right frontal region, and CT scans suggested enlargement of the areas of periventricular radiolucency.

A right prefrontal lobectomy was performed, and microscopic examination of the tissue revealed a grade II astrocytoma. The patient received a 6-week course of radiation therapy postoperatively. Over the ensuing 12 months his affect and cognitive functions improved slightly. He experienced no seizures, however.

Patient 4

A 27-year-old man was admitted to the hospital for a right adversive seizure progressing to grand mal. During the preceding 12 months he had had two episodes of "stiffness and elevation" of the right upper extremity which lasted several minutes. The patient's general medical examination was normal. The neurological examination showed only mild right central facial weakness. Skull roentgenograms, EEG, and brain scan were normal. CT scanning revealed a discrete, nonenhancing radiolucent area in the left posterior frontal region (Fig 4). Bilateral carotid and vertebral



Fig 3. (Patient 3) Nonenhanced CT scan shows areas of periventricular hypodensity surrounding both frontal horns. These areas did not enhance after injection of contrast medium.

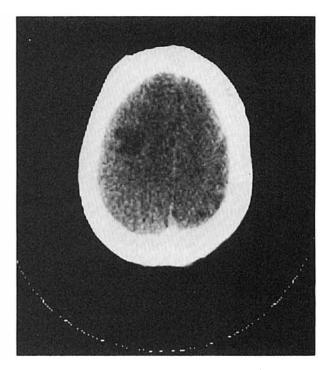


Fig 4. (Patient 4) CT scan following infusion of contrast shows a discrete nonenhancing area of decreased attenuation in the left posterior frontal area.

Surgically Correctable Lesions Detected by CT Scanning in 306 Patients with Chronic Epilepsy

Patient No.	Age at Onset (yr)	Duration of Seizures (yr)	Type of Cerebral Lesion	Location
1	29	3	Thrombosed arteriovenous malformation	Left anterior temporal lobe
2	26	13	Low-grade glioma	Left posterior frontal lobe
3	28	14	Low-grade glioma	Both frontal lobes
4	26	1	(Gliosis) (? Low-grade glioma)	Left posterior frontal lobe
5	9	14	Residual of old infarct	Right occipital lobe
6	12	8	Low-grade glioma	Left temporal lobe
7	8	21	Gliotic, nonmalignant	Right posterior frontal lobe
8	2	11	Low-grade glioma	Right temporal lobe
9 ^a	1	27	Mesial temporal sclerosis	Right temporal lobe

^aThis patient [4] was not included in either of the two series.

angiograms were normal. The patient was discharged from the hospital on a regimen of diphenylhydantoin, 300 mg daily, and was followed in the outpatient neurology clinic. Four months later he was readmitted because of a prolonged (about five minutes) focal seizure of the right upper extremity. There was no change in his neurological examination, and a new CT scan was unchanged. Angiograms again revealed no abnormality.

At craniotomy the cortex appeared normal at the posterior frontal region (corresponding to the area of CT abnormality). Multiple biopsies from this region revealed

mild to moderate gliosis but no malignancy. Over the next 8 months the patient had several focal and generalized seizures despite taking anticonvulsant medications. A bilateral carotid and vertebral arteriogram repeated in another institution revealed no abnormality. A CT scan 7 months after exploration was unchanged from the previous studies.

Discussion

Regardless of the age of patients or type of seizure, abnormalities on CT scan have been reported in 37

to 55% of large groups of epileptic patients [1-3, 6, 8]. Focal seizures with elementary symptomatology and focal seizures with secondary generalizations have shown the highest correlations with abnormal CT studies: 62.5% [7], 65% [2], and 71% [6]. Furthermore, CT scanning has demonstrated surgically correctable brain lesions in certain chronic epileptic conditions that are known to be radiologically silent. Zimmerman, Niedermeyer, and Hodges [9] discovered a case of temporal lobe glioma and another of tuberous sclerosis during CT evaluation of 38 patients with Lennox-Gastaut syndrome. In another radiologically silent but important cause of chronic temporal epilepsy, mesial temporal sclerosis, we have found CT scans to be instrumental in detecting the site of an operable cerebral lesion [4].

We previously reported 4 patients among a group of 143 with early-onset chronic epilepsy in whom the CT scan was the sole detector of a surgically correctable cerebral lesion [5]. Duration of the seizure disorder in these patients had varied from 8 to 21 years. Their cerebral lesions consisted of low-grade gliomas in 2, the residuals of an old infarct in 1, and a nonmalignant, gliotic lesion in the fourth. The Table shows the findings in patients with both early-onset and adult-onset chronic epilepsy. As noted, twothirds of the patients had experienced seizures for more than 10 years, and about half had potentially malignant lesions.

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