Seizures and Brain Tumor in Neurologically Intact Adult Patients: Role of Computerized Tomography (CT Scan)†

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CT scan of 13 patients with adult onset of seizures who were neurologically intact and otherwise asymptomatic revealed a supratentorial mass in all. Significant EEG abnormalities were recorded in five, and the isotope brain scan was positive in eight. In three patients, both studies were normal. Angiograms confirmed the location of tumor, and histology was established following craniotomy. The value of the CT scan as a screening test for detecting brain tumor in this group of seizure patients is evident.

Since the introduction of computerized tomography (CT scan), the detection of cerebral lesions in patients with seizures has increased significantly.†‡ Recently, 13 patients with adult onset seizures were selected on the basis of being neurologically intact and otherwise asymptomatic. Furthermore, the CT scan demonstrated a supratentorial mass in all. The purpose of this study is to compare the diagnostic procedures performed in these patients.

Material and Methods

In the accompanying table, the 13 patients in our series are grouped according to type of tumor and listed by number.

Neurological examination was normal except for one patient (No. 4) with ataxic gait and nystagmus due to phenytoin intolerance and except for another (No. 1) with mild personality changes of several years' duration. Headaches were not a significant complaint, and no other neurological symptoms were elicited. There was no past history of alcoholism or head trauma. A family history of seizures was not obtained.

All patients were treated with anticonvulsant medications and in only three (Nos. 2, 5, 7) were the seizures controlled. Skull x-rays, electroencephalogram (EEG), isotope brain scan (Tc°° labelled DTPA), and CT scan were performed in all patients. At least one EEG was obtained at the time of CT scan. In addition to routine EEG tracings, hyperventilation and photic stimulation were performed in all patients. Sleep recordings were obtained in four patients who had psychomotor seizures. CT scans were performed before and after the intravenous injection of contrast material (Renografin 76). Angiographic studies were then undertaken. Craniotomy was performed and the histology of the tumors was established.
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### Results

Skull x-rays were normal in all patients, and the calcified pineal, visualized in four (Nos. 1,3,7,9), was in the midline. EEG and isotope brain scan findings are presented in the table above. Focal EEG abnormalities that consisted of slowing, spikes or paroxysmal discharges were recorded in five patients: three astrocytomas, one glioblastoma, and the patient with reticulum cell sarcoma. Nonfocal and mild disturbances of cerebral activity were found in five patients: one oligodendroglioma, two glioblastomas, two meningiomas, and the patient with reticulum cell sarcoma. Normal EEGs were obtained in three patients: one astrocytoma and two oligodendrogliomas. These EEG findings were unchanged by the various activating techniques.

The isotope brain scan revealed a focal area of increased uptake in eight patients: two astrocytomas, one oligodendroglioma, two glioblastomas, two meningiomas, and the patient with reticulum cell sarcoma. In the remaining five patients the isotope brain scan was normal, but in three (Nos. 1,5,6) this study was performed from three to six months before the CT scan.

In three patients the EEG and isotope brain scan were both normal. One of these (No. 1) had a ten-year history of psychomotor seizures and was found to have an astrocytoma of the left fronto-temporal area. Another patient (No. 5) with an oligodendroglioma in the right frontal area had experienced generalized convulsions for three years, while the third patient (No. 6) had a right fronto-temporal oligodendroglioma with focal seizures of six months' duration.

CT scan revealed a focal area of abnormality in all patients, and except for the two with meningiomas, the ventricular system was displaced. After contrast had been injected, the supratentorial tumor was enhanced in the three patients with glioblastomas and the two meningioma patients. Calcification within the tumor was detected in two patients with astrocytomas (Nos. 1,2) and in one patient with an oligodendroglioma (No. 7). In eleven patients the pineal was visualized in four (Nos. 1,3,7,9), was in the midline. Angiograms confirmed the presence of the supratentorial tumor, and the localization was similar to CT scan.

Surgical resection was possible in the patient with a right frontal oligodendroglioma and in the two patients with meningiomas. In the remaining cases, the tumor was partially removed. Following surgery, seven patients were treated with irradiation, and the three patients with glioblastomas received additional chemotherapy.

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### Table: Clinical Features, EEG, Isotope Scan, and Post-Operative Findings

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age &amp; Sex</th>
<th>Duration of seizures</th>
<th>Type of seizures</th>
<th>EEG</th>
<th>Isotope Scan</th>
<th>Location of Tumor</th>
<th>Post-operative follow-up</th>
<th>Post-operative disability</th>
<th>Meningioma</th>
<th>Oligodendroglioma</th>
<th>Glioblastoma</th>
<th>Astrocytoma (grade 1 &amp; 11)</th>
<th>Reticulum cell sarcoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63</td>
<td>10 yrs.</td>
<td>Psy.</td>
<td>Normal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>6 mos.</td>
<td>severe</td>
<td>normal</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
<td>2 yrs.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Pos.</td>
<td>(Rl) Fr. -Te.</td>
<td>2 mos.</td>
<td>mild</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
<td>Non</td>
<td>Non</td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>4 yrs.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>16 mos.</td>
<td>moderate</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
</tr>
<tr>
<td>4</td>
<td>53</td>
<td>10 yrs.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>1 wk.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
<tr>
<td>5</td>
<td>23</td>
<td>3 yrs.</td>
<td>Gen.</td>
<td>Normal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>1 yr.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
<tr>
<td>6</td>
<td>63</td>
<td>6 yrs.</td>
<td>Gen.</td>
<td>Focal</td>
<td>Pos.</td>
<td>(Rl) Fr. -Te.</td>
<td>4 mos.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
<tr>
<td>7</td>
<td>34</td>
<td>1 yr.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Pos.</td>
<td>(Rl) Fr. -Te.</td>
<td>4 mos.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>11 mos.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>1 yr.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
<tr>
<td>9</td>
<td>34</td>
<td>7 mos.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>6 mos.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
<tr>
<td>10</td>
<td>34</td>
<td>4 mos.</td>
<td>Psy.</td>
<td>Focal</td>
<td>Neg.</td>
<td>(Rl) Fr. -Te.</td>
<td>1 yr.</td>
<td>severe</td>
<td>Non</td>
<td>Focal</td>
<td>Non</td>
<td>Focal</td>
<td>Focal</td>
</tr>
</tbody>
</table>

Notes: Foc. = Focal; Psy. = Psychomotor; Gen. = Generalized; Fr. = Frontal; Te. = Temporal; Par. = Parietal; Sph. = Sphenoid Ridge; Par. = Parasagittal; Pos. = Positive; Neg. = Negative; Non = Non-focal; Focal = Focal; Severe = Severe; Moderate = Moderate; Mild = Mild; Normal = Normal; Bedridden = Bedridden; Minimal Handicap = Minimal Handicap; Hemiparesis = Hemiparesis; Severe = Severe.
Postoperative follow-up was obtained for all patients (see the table), ranging from one to twenty-two months. The three oligodendroglioma and the two meningioma patients remained asymptomatic and free of seizures on anticonvulsant medication. Two patients with astrocytomas developed a mild hemiparesis, while the other astrocytoma patients were disabled with a profound hemiplegia. The three patients with glioblastomas developed a hemiparesis, while the reticulum cell sarcoma patient became bedridden. The seizures were more effectively controlled following surgery than they had been before, except in two cases: one with an astrocytoma (No. 2) and the reticulum cell sarcoma patient.

Discussion
The possibility of a brain tumor was raised in this group of patients by the adult onset of seizures without apparent cause, failure to control the seizures with medication in ten of the thirteen patients, and by the type of seizures, which were focal and psychomotor in ten patients. Certain features, however, were not entirely in accord with this diagnosis. These included the prolonged history of seizures (a year or more in seven patients and ten years in two), the absence of other neurological complaints, and a normal neurological examination.

To evaluate these patients, skull x-rays, EEG, isotope brain scan, and CT scan were all performed. The skull x-rays were normal and of no help in detecting brain tumors. EEG abnormalities were recorded in ten of the thirteen, but in only five did the changes indicate a focal lesion. The isotope brain scan, which was positive in eight patients, surpassed the EEG and skull x-rays in detecting brain tumor in these patients. When CT scan was performed, a supratentorial tumor was demonstrated in all patients.

Other studies have reported the value of CT scan, isotope brain scan, and EEG in detecting and localizing brain tumor in patients with adult onset of seizures.^13-5^-8 In these patients, brain tumor has been detected in 16% by CT scan^1^ and in 11% by isotope brain scan.^6^-1^ To our knowledge, a statistical evaluation of the EEG in detecting brain tumor in a similar group of patients has not been reported. It is generally felt, however, that EEG abnormalities suggestive of a mass lesion occur in fewer than 10% of patients with focal and psychomotor seizures.

In patients with supratentorial tumors, CT scan has been reported as positive in 89%, while isotope brain scan is positive in 82.6% of these patients.^9^-1^ The difference between the two procedures is attributed to the greater sensitivity of the CT scan in detecting low grade gliomas. In our series, there were seven tumors of this type (four astrocytomas and three oligodendrogliomas), and in four of these the isotope brain scan was negative.

The small number of patients and relatively short period of postoperative observation do not allow us to assess accurately the role of surgical treatment in managing these patients.
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References


