New-Onset Psychogenic Seizures After Surgery for Epilepsy

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Background: The emergence of psychogenic seizures after surgery for epilepsy is not well recognized.

Objectives: To identify the frequency of psychogenic seizures in an 11-year surgical experience and to characterize the patients with this complication.

Methods: Ninety-six patients underwent surgery for epilepsy between 1985 and 1996. The surgical database was reviewed and all patients who experienced postoperative psychogenic seizures were identified. Patients were characterized by sex, age, psychopathologic conditions, full-scale IQ, duration of epilepsy, surgical procedure, and operative complications. Patients were compared with the surgical group as a whole for these variables.

Setting: A comprehensive epilepsy center.

Results: Five patients were identified: 3 men and 2 women. Mean full-scale IQ was 73 (range, 66-82). Mean age was 29.8 years (range, 22-36 years). Three patients were diagnosed as having psychosis, 1 with borderline personality disorder and 1 with generalized anxiety. Operations included 4 anterior temporal lobectomies and 1 occipital lobectomy. Two patients experienced operative complications. Compared with the surgical cohort, patients had a higher frequency of preoperative psychopathologic conditions, lower mean full-scale IQ, and a greater occurrence of operative complications.

Conclusions: (1) Patients can develop new-onset psychogenic seizures after surgery for epilepsy. (2) Low full-scale IQ, serious preoperative psychopathologic conditions, and major surgical complications may be risk factors. (3) Atypical postoperative seizures should be evaluated with video electroencephalographic monitoring before concluding that they are epileptic.

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PATIENTS AND METHODS

Ninety-six patients underwent surgery for epilepsy between 1985 and 1996. These procedures included 89 anterior temporal lobectomies (46 left and 43 right), 6 partial frontotemporal resections, and 1 partial occipital lobectomy. There were 49 women and 47 men. The mean (± SD) age at the time of surgery was 33.7 ± 8.97 years (range, 12-59 years). The preoperative evaluation included prolonged video electroencephalographic (EEG) monitoring, magnetic resonance imaging, neuropsychological testing, and a psychiatric evaluation. A neurologist (G.C.N. or N.S.) saw the patients several times in the first postoperative year. They were seen annually thereafter, or more frequently if postoperative seizures occurred. Outcome scores from 1 to 4 were assigned to all the patients with epilepsy who underwent surgery similar to the classification of Engel. Class 1 indicates free of seizures since surgery or currently free of seizures for more than 1 year; class 2, rare seizures, ie, fewer than 5 seizures per year or nocturnal seizures only; class 3, worthwhile improvement, ie, more than 80% reduction in seizure frequency; and class 4, no worthwhile improvement or less than an 80% reduction in seizure. We usually recommend postoperative video EEG monitoring to patients with less than an excellent outcome (patients in class 3 or 4).

The surgical database was reviewed and 5 patients who experienced postoperative PS were identified. Patients were characterized by sex, age, full-scale intelligence quotient (FSIQ), duration of epilepsy, surgical procedure, and operative complications. Psychiatric evaluations from patient charts were reviewed. Psychiatric diagnoses were obtained from these evaluations using criteria from the Diagnostic and Statistical Manual of Mental Disorders. Diagnoses that included the terminology rule out were not listed. Patients were compared with the surgical group as a whole for these variables. The preoperative EEG and the postoperative EEG were compared with the surgical group as a whole for these variables. The preoperative EEG and the postoperative EEG were compared in the 5 patients with PS.

Case 3

This patient was a 23-year-old man whose seizures started at the age of 4 years. He did not drive and lived with his parents. Seizures occurred 2 to 3 times per month and involved staring and purposeful movements with the left hand that progressed to convulsions. Seizures were refractory to 3 different antiepileptic drugs. The FSIQ was 73 and a generalized anxiety disorder was diagnosed. Magnetic resonance imaging findings were normal. A positron emission tomographic scan showed left temporal hypometabolism. Prolonged EEG recording demonstrated inactive left temporal spikes and 3 seizures with left temporal evolution. An anterior left temporal lobectomy was performed uneventfully. In the immediate postoperative period the patient reported seizures that consisted of “shakes and shocks” that involved the left half of the body. He underwent 48 hours of video EEG monitoring. Several events occurred that involved trembling of the entire body. Consciousness was preserved and there were no EEG changes suggesting an epileptic seizure. No spikes or sharp waves were recorded. The patient underwent psychotherapy. Psychogenic and epileptic seizures stopped and he now works and drives.

CHARACTERISTICS OF POSTSURGERY PS GROUP

Four of the 5 patients were from our hospital and 1 patient underwent surgery at a different institution but attended our clinic. We identified 4 other patients from our surgical cohort in whom the diagnosis of postoperative PS was seen. She was treated with desipramine hydrochloride and supportive psychotherapy for 3 months. Events subsequently stopped. The patient remains in her group home and is unemployed.

Case 2

This patient was a 29-year-old mentally retarded woman with poorly controlled seizures since the age of 2 years. She attended day programs and lived with her mother. The seizures involved behavioral arrest with change in facial expression, bilateral purposeful upper extremity automatisms, and flexion posturing of both arms. She was having 10 to 20 seizures per month at the time of surgery sustaining multiple injuries including third-degree burns to the arms that required skin grafting. Seizures were refractory to 9 different antiepileptic drugs. The initial noninvasive video EEG evaluation showed active bitemporal spikes and ictal scalp EEG was nonlocalizing. Seven seizures were recorded during a subsequent intracranial evaluation, which were left hippocampal in onset. Volumetric magnetic resonance imaging study showed a hippocampal asymmetry with the left hippocampus being significantly smaller than the right. The FSIQ was 66. Before surgery she experienced outbursts and delusions and was diagnosed as having psychosis. The patient underwent a left anterior temporal lobectomy during which she sustained an infarction of the left internal capsule. She awoke from surgery with a right hemiparesis. Three months after surgery she began to complain of frequent seizure activity and she was admitted for prolonged video EEG monitoring. During the evaluation she experienced several events that involved side-to-side movements of the head and jerking of the arms. There were no EEG changes suggesting an epileptic seizure. Five to 10 spikes were seen each day during 5 consecutive days of EEG monitoring (compared with 40 spikes per hour during wakefulness before surgery). Therapy with mexiteline hydrochloride was started as was weekly psychotherapy. She is back in a day program and the hemiparesis has almost fully resolved. There have been no epileptic seizures since surgery and nonepileptic seizures have also stopped.

RESULTS
was suspected. Two of these patients declined postoperative EEG monitoring and 2 did not have events during postoperative EEG monitoring. These latter 4 patients were not included in this study.

Definite postoperative PS were seen in 4 (4.2%) of 96 of our surgery patients with epilepsy. The 5 patients in this study included 3 men and 2 women. Mean FSIQ was 73 (range, 66-82). Mean age was 29.8 years (range, 22-36 years). The mean duration of epilepsy was 22.8 years (range, 18-33 years). All 5 patients had preoperative psychopathologic conditions. Three patients had psychosis and the fourth patient had generalized anxiety disorder. The fifth subject was diagnosed as having a borderline PD. Of 3 patients with psychosis, 2 had comorbid PD.

Three patients underwent anterior temporal lobectomy with hippocampectomy, 1 patient underwent anterior temporal lobectomy with hippocampal sparing, and 1 patient had an occipital lobectomy. Four patients experienced no epileptic seizures following surgery. One patient had an epileptic seizure during the postoperative EEG monitoring. In this case the ratio of PS to epileptic seizures was in excess of 10:1. Two patients experienced serious operative complications. One sustained a hemiparesis and a third nerve palsy and the other had hemiparesis. These findings are summarized in Table 1.

Patients with the postoperative PS were followed up on average for 27 months before surgery (range, 1.5-84 months). Preoperatively, the patients with PS had been recorded with video EEG for an average of 8.5 days (range, 6-14 days) with a mean of 7.25 epileptic seizures recorded (range, 3-15). In all cases the patients’ habitual seizures were recorded and these were correlated with the history. No PS were recorded before surgery and no patient was thought to have preoperative PS. After surgery, the patients were studied with video EEG monitoring for an average of 4.25 days. The average length of time after surgery when patients were diagnosed as having PS was 2.3 months (range, 0.25-5 months). We verified that the postoperative-type attacks were new and had never been witnessed by family members or patients before surgery.

All patients had an abnormality showed on preoperative interictal EEG. One patient’s EEG showed active interictal epileptiform spikes, 2 were moderately active, and 1 was inactive. Three patients had no epileptiform abnormalities following surgery, while inactive spikes were seen in 1 patient. The patient with an active epileptiform abnormality before surgery continued to show an active epileptiform abnormality afterward.

**COMPARISON OF POSTSURGERY PS GROUP WITH EPILEPSY SURGERY COHORT**

Mean follow-up for the 96 members of the epilepsy surgery group was 4.5 years (range, 1-11 years). Fifty-three (56%) were considered class 1, 19 (20%) class 2, 10 (10%) class 3, and 10 (10%) class 4. One patient (1%) died, 1 patient (1%) was lost to follow-up, and we were unable to classify 2 patients (2%) secondary to limitations of their postoperative histories. Thirteen (65%) of 20 patients in classes 3 and 4 underwent prolonged video EEG monitoring after surgery. Three others were offered evaluation but refused. Four patients were not offered postoperative evaluations because we believed that this would not change management. Psychiatric evaluations were available for 75 (78%) of 96 patients who had epilepsy surgery at our hospital: 26 patients (27%) had major psychiatric disorders. Eight patients (8%) had psychoses characterized by intermittent hallucinations and delusions. Two patients (2%) had psychotic symptoms exclusively related to seizure exacerbations. Thirteen patients (14%) had affective disorders and 3 (3%) had anxiety disorders. Twenty-two surgery patients (23%) were diagnosed as having PDs. These included 3 schizotypal PD (3%), 3 narcissistic PD (3%), 1 antisocial PD (1%), 2 avoidant PD (2%),

<table>
<thead>
<tr>
<th>Sex/ Age, y</th>
<th>Preoperative Psychopathologic Conditions</th>
<th>FSIQ</th>
<th>Surgical Procedure</th>
<th>Complication</th>
<th>Presurgery EEG</th>
<th>Postoperative Epileptic Seizures</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/35 Psychosis dependent PD</td>
<td>75</td>
<td>Left anterior temporal lobectomy†</td>
<td>None</td>
<td>Active left temporal spikes</td>
<td>Active left temporal spikes</td>
<td>Rare</td>
<td>Unknown</td>
</tr>
<tr>
<td>M/27 Psychosis, schizotypal PD</td>
<td>70</td>
<td>Right occipital lobectomy</td>
<td>None</td>
<td>Moderately active bioccipital spikes</td>
<td>Normal</td>
<td>No</td>
<td>Cortical dysplasia</td>
</tr>
<tr>
<td>F/29 Psychosis</td>
<td>82</td>
<td>Left anterior temporal lobectomy</td>
<td>Hemiparesis, third nerve palsy</td>
<td>Moderately active left temporal spikes</td>
<td>Left temporal slowing, no spikes</td>
<td>No</td>
<td>Mixed oligodendroglioma astrocytoma</td>
</tr>
<tr>
<td>M/22 Generalized anxiety disorder</td>
<td>66</td>
<td>Left anterior temporal lobectomy</td>
<td>Hemiparesis</td>
<td>Moderately active bitemporal spikes</td>
<td>Inactive bitemporal spikes</td>
<td>No</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

*PS indicates psychogenic seizure; ED, emergency department; FSIQ, full-scale intelligence quotient; EEG, electroencephalogram; PD, personality disorder; active, more than 40 spikes per hour awake; moderately active, between 5 and 40 spikes per hour; and inactive, less than 5 spikes per hour.
†Surgery not performed at our institution.
and 6 borderline PD (6%). Seven patients (7%) were diagnosed as having nonspecific PD. Ten patients (10%) had both a major psychiatric disorder and a PD.

The frequency of psychosis within the PS group was 60% while the frequency of psychosis (not related to seizure exacerbations) in our surgical population as a whole was 8.8%. The difference was significant ($\chi^2 = 46.9; P < .001$). The mean FSIQ for our surgery patients as a whole was 91.6 (SD, 12.7; range, 54-131) while the mean FSIQ for the PS group was significantly lower at 73.2 (SD, 9.9; $t(95) = 2.5; P < .01$). Two (40%) of 5 patients with PS had operative complications while the occurrence of such serious perioperative morbidity in our entire surgical group was 3 (3.1%) of 96 patients. Note that 2 of our 3 patients with serious surgical complications were in the PS group. The increased rate of morbidity in the PS group was statistically significant ($\chi^2 = 14.1; P < .001$). Mean (SD) duration of epilepsy for the PS group was 22.8 (6.7) years (range, 18-33 years) and 19.7 years (SD, 10.9; range, 2-49 years) for the surgery group as a whole ($t = 0.63; P = .53$). These results are summarized in Table 2.

**Comment**

We identified 5 patients with epilepsy who developed new-onset PS after surgery for epilepsy. The diagnosis of PS was established with prolonged video EEG monitoring during which habitual attacks were recorded. This is the accepted standard for diagnosing PS.8 Our patients had lower FSIQs, more preoperative psychopathologic conditions, especially psychosis, and more surgical morbidity than our surgery cohort. Onset was always within the first year of surgery and usually within the first 3 months. The problem was typically self-limited with early intervention.

Ferguson and Rayport4 describe the postoperative psychiatric problems of 5 patients with epilepsy undergoing surgery, 1 of whom developed postoperative PS. This was before the availability of prolonged video EEG monitoring. Krahn et al3 reviewed their database of all adult patients with epilepsy undergoing surgery that included “more than 700 patients” and identified 6 patients with postoperative PS. The average FSIQ for their group was 78, and 5 patients had preoperative psychopathologic conditions. One patient was psychotic. These authors did not comment on surgical morbidity. Their findings of low FSIQ and preoperative psychopathologic conditions were similar to our observations. The higher incidence of psychosis in our series may reflect referral bias or differences in surgical selection criteria. Krahn et al3 suggest that long duration of illness predisposes patients to postoperative PS. The mean duration of illness was slightly longer in our patients with PS than our surgical cohort (22.8 years vs 19.7 years). However, this finding was not statistically significant ($P = .53$). Of the 6 patients of Krahn et al3 with postoperative PS, 3 had PS and epileptic seizures before surgery. Patients were not compared statistically with the entire surgery group.

Patients with intractable epilepsy often become free of seizures after surgery for epilepsy.10,12 Patients with epilepsy may accept social and occupational limitations within the context of their chronic illness. When patients are suddenly deprived of their long-standing role of chronic illness they are confronted with greater internal and external demands and expectations. This situation may create psychological stress,9 which may be manifested as PS. Patients with less education and cognitive impairment may be at increased risk for somatizing behaviors such as PS.13,14 Some authors15,16 have stressed the importance of learned helplessness in the psychological functioning of patients with seizures before and after surgery. When patients with seizures are confronted with the psychological stresses of increased social demands they may try to express their learned helplessness by reenacting their chronic disease. Krahn et al3 and Ferguson and Rayport4 emphasize the importance of these psychological issues in the development of PS after surgery for epilepsy.

We observed a higher surgical complication rate (2 of 5) in our patients than in our surgery group as a whole. Both patients with complications had a history of psychosis. The additional stress of coping with surgery and surgical morbidity may have promoted PS in these patients; however, this finding may be coincidental.

Conversion disorder is a frequent psychiatric accompaniment of PS.17 None of our 5 patients with postoperative PS had conversion disorder. Three of our 5 patients had a diagnosis of psychosis that is uncommon in patients with PS.17 These findings suggest that postoperative PS may have a different psychiatric basis than the more commonly encountered PS.

Postoperative PS stopped in 3 of 5 patients. Patients were promptly evaluated with EEG telemetry when they complained of postoperative seizures. Psychiatric consultation was obtained in all patients with PS. Three patients received psychiatric treatment and 2 patients declined psychiatric care. Psychogenic seizures ceased in all the patients who received psychiatric intervention. These observations suggest that with early diagnosis and treatment, postoperative PS can frequently be controlled.

While our investigation has the limitations of a retrospective study, our data suggest that postoperative PS may be a relatively common problem. We made this diagnosis in 4 (4.2%) of 96 of our surgery patients. These patients were evaluated following surgery because we sus-

### Table 2. Postoperative Psychogenic Seizure Group vs Entire Surgical Group

<table>
<thead>
<tr>
<th></th>
<th>Mean Full Scale IQ (Range)</th>
<th>Serious Surgical Morbidity, d</th>
<th>Psychosis, %</th>
<th>Mean Age, y (Range)</th>
<th>Mean Duration of Epilepsy, y (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All surgical patients</td>
<td>91 (54-131)</td>
<td>2.4</td>
<td>8.8</td>
<td>33.9 (12-59)</td>
<td>19.7 (2-49)</td>
</tr>
<tr>
<td>Postoperative psychogenic seizure group</td>
<td>73 (66-82)</td>
<td>40</td>
<td>60</td>
<td>29.8 (22-36)</td>
<td>22.8 (18-33)</td>
</tr>
</tbody>
</table>

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pected PS based on the patients’ medical history and observations of family members. Not every patient with reported postoperative seizures was investigated. We presume that 4 other patients have postoperative PS based on their medical histories. They were not included in this study because we could not definitively prove the diagnosis. Therefore, the true occurrence of postoperative PS in our patients is likely greater than 4.2% and is closer to 8 (8.3%) of 96. The recurrence rate of seizures after resective surgery for epilepsy is between 30% and 55% depending on the surgical procedure. If 4% to 8% of patients develop postoperative PS, the above recurrence rates may be overestimates. Patients who report atypical postoperative seizures merit an investigation with prolonged video EEG monitoring to differentiate epileptic seizures from nonepileptic seizures.

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REFERENCES