Surgical treatment of temporal lobe epilepsy. Personal Experience

A.Faleh-Tamimi y A.Qudah


Summary

The authors present their results with epilepsy surgery of the temporal lobe performed during a 5 years period at the Hospital of the University of Jordan, in 12 patients. All patients underwent comprehensive presurgical evaluation, including neurological history, examination, video-Electroencefalogram, Electroencephalogram for interictal and habitual seizures and optimum magnetic resonance. After appropriate selection, we performed epilepsy surgery in 12 patients (9 males and 3 females). The mean age at operation was 21.4 years (range 4-44 years). All patients were receiving high therapeutic doses of antiepileptic therapy. Abnormal findings in Magnetic Resonance were observed in all cases. Pre and post resection electrocorticogram were recorded and graded according to Jay Scale. Pathological findings showed, neoplastic lesion in 2 cases (16%); one ganglioglioma and a low grade astrocytoma) and 10 patients (84%) showed non-neoplastic lesions. Three patients (25%) had cortical dysplasia, another 3 (25%) had mesotemporal sclerosis, three more (25%) gliosis and one (8%) an arachnoid cyst. Post resection ECoG showed (84%) type A, (8%) type B, and (8%) type C. The present study has shown that intraoperative ECoG has an important role in the prediction of medically intractable epilepsy. Outcome of temporal lobe epilepsy surgery in our series was comparable to results reported by other authors despite of the absence of sophisticated functional tests.

KEY WORDS: Temporal lobe epilepsy. Seizure. Temporal lobectomy. Electrocorticography. Epilepsy surgery

Tratamiento quirúrgico de la epilepsia del lóbulo temporal. Experiencia personal

Resumen

Los autores analizan los resultados de la cirugía de la epilepsia del lóbulo temporal en 12 pacientes tratados a lo largo de 5 años en el hospital de la Universidad Jordana de Amman. Todos los pacientes fueron sometidos a una evaluación prequirúrgica, incluyendo historia neurológica, examen clínico, electroencefalograma bajo control de vídeo electroencefalograma para la actividad intercritica y resonancia magnética. La elección quirúrgica fue realizada en 12 pacientes (9 mujeres y 3 varones), la edad media fue de 21 años, oscilando entre 4 y 44 años, todos ellos habían recibido dosis altas de poliquimioterapia antiepiléptica. La resonancia magnética fue anormal en todos los casos.

Se realizó electrocorticografía antes y después de la resección utilizando la escala de Jay. Los estudios histológicos mostraron hallazgos neoplásicos en 2 casos (16%); un caso de ganglioglioma y otro de astrocitoma de bajo grado. Diez pacientes (84%) no mostraban lesiones neoplásicas. Tres (25%) tenían displasia cortical, tres (25%) esclerosis mesotemporal, dos (16%) gliosis, y un paciente (8%) con quiste aracnoideo. La electrocorticografía post-resección mostró 84% tipo A, 8% tipo B, y otro 8% tipo C. El presente estudio demostró que el uso de la electrocorticografía tiene valor predictivo del pronóstico postoperatorio y que en general el resultado de la cirugía del lóbulo temporal es favorable.


Introduction

Epilepsy is found in the general population in approximately six/1000 persons745. About one third of all epileptic patients suffer from temporal lobe seizures41422526 and approximately one half of these do not have good medical control4112. It is estimated that about 10 to 25% of all patients with temporal lobe epilepsy have complex partial seizure and may be considered surgical candidates12.

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Medically refractory temporal lobe epilepsy is currently treated by a variety of surgical techniques including tailored anterior temporal lobectomy guided by intraoperative electrocorticography (ECoG), standard anterior temporal lobectomy with and without (ECoG), and amigdalohypocampectomy with sparing of the lateral temporal neocortex. All these approaches provide an extensive resection of mesial temporal structures, particularly the hippocampus. Each technique has purported advantages; however, similar seizure control rates have been reported. Certainly it has been demonstrated that temporal lobectomy is viable treatment modality for patients with temporal lobe seizures refractory to medical therapy. The prognosis of seizure control following temporal lobe surgery is generally more favorable for tumor related than for non-neoplastic condition such as mesial temporal sclerosis. Seizure control can be achieved by removing the epileptic area without total removal of the lesion. The purpose of this paper is to report our surgical results with the treatment of temporal lobe epilepsy mainly guided by intraoperative ECoG.

**Patients and method**

The clinical records of 12 patients undergoing epilepsy surgery of the temporal lobe for refractory seizures at the Jordan University Hospital (JUH) over 5 years period were reviewed (between July 96 and December 2000). They were selected from a total of 27 patients treated with epilepsy surgery in the same period. All had suffered chronic drug-resistance epilepsy by using at least two conventional antiepileptic drugs with therapeutic levels.

Magnetic resonance (MR) with a 1.5 T superconducting magnet (General Electric) with conventional T1 and T2 weighted with coronal cuts of thin section imaging of the hippocampus with 3mm thick section was obtained in all patients and abnormalities were seen in all patients. (Table 1)

The preoperative neurophysiological investigations consisted primarily of scalp electroencephalography (EEG) recordings. Intercritical scalp recording showed epileptiforme activity, and lateralization in all patients. Video-EEG (at least one seizure was recorded) documented further the epileptic focus in the temporal lobe.

Five to six cm “in block” temporal lobectomy was performed under general anesthesia in 10 patients (84%). The mesial temporal structures were removed in patients with abnormal MRI findings. The hippocampal gyrus was removed by subpial suction, thus preserving a pial envelope covering the third cranial nerve, brain stem and tentorial notch. Lesionectomy was done in one patient, and micro fenestration of arachnoid cyst in another.

Pre and post resection ECoG were recorded and graded according to Jay et al. Scale (Table 2) in all patients. Histological material from all cases was reviewed.

Postoperative seizure control was graded according to Kobayasi classification (Table 3). The mean follow-up period was 20 months, (range 6-54 months). (Table 4).
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Table 2
Jay Electocorticography (EcoG) Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>EcoG findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No residual epileptiforme activity</td>
</tr>
<tr>
<td>B</td>
<td>Mild residual activity</td>
</tr>
<tr>
<td>C</td>
<td>Moderate residual activity</td>
</tr>
<tr>
<td>D</td>
<td>Unchanged</td>
</tr>
<tr>
<td>E</td>
<td>Undetermined</td>
</tr>
</tbody>
</table>

Table 3
Kobayasi Outcome scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Seizure free without antiepileptic drugs</td>
</tr>
<tr>
<td>II</td>
<td>Seizure free on antiepileptic drugs</td>
</tr>
<tr>
<td>III</td>
<td>&gt;50% reduction on seizure frequency</td>
</tr>
<tr>
<td>IV</td>
<td>&lt;50% reduction on seizure frequency</td>
</tr>
<tr>
<td>V</td>
<td>Not improved</td>
</tr>
</tbody>
</table>

Table 4
Results of epilepsy surgery of the temporal lobe in 12 patients

<table>
<thead>
<tr>
<th>Case no</th>
<th>Type of surgery</th>
<th>Intraoperative ECoG Findings</th>
<th>Seizure outcome</th>
<th>Histology</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>I</td>
<td>Cortical disp.</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Lesionectomy</td>
<td>A</td>
<td>II</td>
<td>LGA</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>Temporal lobectomy</td>
<td>C</td>
<td>III</td>
<td>Cortical disp.</td>
<td>28</td>
</tr>
<tr>
<td>4</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>II</td>
<td>MTS</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>I</td>
<td>MTS</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>Temporal lobectomy+lesionectomy</td>
<td>A</td>
<td>I</td>
<td>Ganglioglioma</td>
<td>54</td>
</tr>
<tr>
<td>7</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>III</td>
<td>MTS</td>
<td>26</td>
</tr>
<tr>
<td>8</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>II</td>
<td>Gliosis</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>II</td>
<td>Gliosis</td>
<td>07</td>
</tr>
<tr>
<td>10</td>
<td>Temporal lobectomy</td>
<td>A</td>
<td>II</td>
<td>Cortical disp.</td>
<td>06</td>
</tr>
<tr>
<td>11</td>
<td>Microfenestration</td>
<td>A</td>
<td>II</td>
<td>Arachnoid cyst</td>
<td>06</td>
</tr>
<tr>
<td>12</td>
<td>Temporal lobectomy</td>
<td>B</td>
<td>III</td>
<td>Gliosis</td>
<td>06</td>
</tr>
</tbody>
</table>

EcoG: Electrocorticography, M: Months, A: No residual epileptiforme activity, B: Mild residual activity, C: Moderate residual activity, D: Unchanged, E: undetermined due to drug resection, I: Seizure without antiepileptic drugs, II: Seizure with antiepileptic drugs, III: >50% reduction on seizure frequency, MTS: Mesotemporal sclerosis, MST: Medial temporal sclerosis

Results

The mean duration of seizures was 15.3 years, (range 1-24 years). Age at onset was 10 years (range 1-20 years). The mean age at operation was 21.4 years (range 4-44 years). Eleven (92%) patients presented with partial complex seizure with and without secondary generalization and demonstrated that all pediatric patients were free of convulsions, one without medication and the other two, with antiepileptic drugs.

Patients grade III (3 patients) were adult. Regarding the histological findings we found that the best result was observed in patients with neoplastic lesion as both are seizure free. Of the 10 patients (100%) with non-
neoplastic 7 (70%) were grade I and II and 3 (30%) were grade III.

Complications affected two patients (16%); one patient has permanent contralateral superior quadrant defect in the visual field, and another patient developed transitory behavioral changes for a period of 4 weeks in the early postoperative stage which needed medical treatment.

Discussion

Medically refractory temporal lobe epilepsy is currently treated by variety of surgical techniques including tailored anterior temporal lobectomy guided by intraoperative ECoG, standardized anterior temporal lobectomy with and without ECoG, and amygdalohippocampectomy with sparing of lateral temporal neocortex. All these approaches provide for an extensive resection of mesial temporal lobe structures. However similar seizure control outcome has been reported in all these techniques with minimum associated morbidity1,6,19,23,24,26. In our study, temporal lobectomy was performed in 10 patients (85%) and the other two cases were lesionectomy in one and micro fenestration of arachnoid cyst in another, and all were guided by intraoperative ECoG, our result showed that 9 (75%) patients were seizure free and 3 (25%) patients had improvement in more than 50% of seizure. Meyer et al.24, reviewed 50 patients under the age of 18 years noting that 78% were free of seizure and 88% benefited to some degree from the operation. McKhan et al.25, reviewed results of 140 patients aged from 7 to 59 years, in this group, 67% were seizure free, 20% had at least a reduction at 75% in seizures, and 13% had less than a 75% reduction in seizures. Jensen and Larsen18 demonstrated a clear correlation between improvement in seizure frequency and improvement in behavior and social abnormalities.

Mesial temporal sclerosis is the single most common abnormality described in temporal lobectomy for refractory seizure accounting for up to 65% of cases2,3,22. In our study mesiotemporal sclerosis documented in 3 (25%) patients only. It could be due to different patterns of pathology in our population or the number of cases in our study. Advanced MRI imaging allows recognition of focal abnormalities and better localization of the lesions, mesial temporal sclerosis, focal cortical displasia, other migrational abnormalities seen as pachygyria, polymicrogyria, and tumors5,21,29.

Single Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET) scoring technique provide further information about functional abnormalities corresponding to epileptogenic activity17,27. In our study, SPECT and PET were not used because of they are not available, yet, our results were not apparently different from others 19,21,23,24 using the above mentioned sophisticated technology.

The use of intraoperative ECoG to guide epilepsy surgery remains controversial. Several studies suggested that ECoG findings correlate with the outcome1,4,28. Many more reports have not supported this contention8,19.

The present study has shown in the postresection ECoG grade A in 10 patients (80%), nine patients (90%) of those were seizure free (grade I and II), and just one (10%) (grade III)

Our data added further information about the temporal lobe surgery and supported literature about the benefit value for temporal lobectomy in intractable temporal lobe epilepsy, despite of the absence of sophisticated functional tests for epileptic foci localization (PET and SPECT) our results are almost comparable to the results reported by others with this technology.

References

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Surgical treatment of temporal lobe epilepsy. Personal Experience


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Comentario al trabajo: Tratamiento quirúrgico de la epilep-
sia del lóbulo temporal, de A. Faleh y col.

Los Drs. Faleh Tamimi y Qudah presentan una serie retrospectiva de enfermos operados de epilepsia temporal. Es un trabajo interesante y estimulante, por el que los autores deben ser felicitados. En España acaba de aprobarse un protocolo para uso tutelado de la cirugía de la epilepsia, similar al que ha seguido Faleh. Parece que no incluyen en todos los casos un video EEG crítico, que realmente en enfermos temporales y con RM patológica en todos los casos, quizás no sea necesario, excepto como parte de una disciplina.

Además de haber sido capaces de encontrar anor-

ormalidades en la RM, también los patólogos llegaron a un diagnóstico siempre.

Han realizado electrocorticografía en todos los casos. Aunque algunas escuelas no la consideran necesaria siempre, nosotros damos mucho valor a la misma y en más de una ocasión nos ha llevado a modificar la técnica que creíamos más adecuada por el estudio preoperatorio.

Finalmente los resultados son buenos. No creo sea relevante que no hayan realizado lo que llaman pruebas más sofisticadas, en relación a SPECT y PET. Yo tampoco las realizo.”

Rafael Carrillo
Madrid