Seizure 20 (2011) 419–424

Contents lists available at ScienceDirect

Seizure

journal homepage: www.elsevier.com/locate/yseiz

Long term outcome in patients not initially seizure free after resective epilepsy surgery

Alaa Eldin Elsharkawy [a,b,*], Terttu A. Pietilä [b], Abdel Hamid Alabbasi [c,1], Heinz Pannek [b], Alois Ebner [a,**]

[a] Department of Presurgical Evaluation, Bethel Epilepsy Center, Krankenhaus Mara, Maraweg 21, 33617 Bielefeld, Germany
[b] Neurosurgical Department, Bethel Epilepsy Center, Germany
[c] Department of Biostatistics and Demography, Institute of Statistical Studies and Research (ISSR), Cairo University, Egypt

ARTICLE INFO

Article history:
Received 16 November 2010
Received in revised form 14 January 2011
Accepted 31 January 2011

Keywords:
Epilepsy surgery
Long-term outcome
Initially non-seizure free
Predictors of outcome

ABSTRACT

Purpose: To assess the long-term seizure outcome and find predictors of outcome for patients who were not initially seizure free 6 months after epilepsy surgery.
Methods: We retrospectively reviewed all adult patients who underwent epilepsy surgery at the Epilepsy Center Bethel, between 1992 and 2003. There were 266 patients included in this analysis.
Results: Of the 266 patients who were included in this study, the probability of becoming seizure free was 12% (95%CI 8–16%) after 2 years, 19.5% (95%CI 15–24%) after 5 years and 34.7% (95%CI 28–41%) after 10 years. In patients who had auras only, the probability of being seizure free was 18.2% after 2 years, 25.5% after 5 years, and 39.1% after 10 years. In the multiregression analysis, the EEG carried out 2 years after surgery, a psychic aura, the frequency of postoperative focal seizures and hypermotor seizures predicted seizure remission in the long-term outcome.
Conclusions: The frequency and type of postoperative seizures are critical determinants for long-term outcome. Seizure semiology may be the clue to a precise diagnosis and long-term prognosis of epilepsy.

1. Introduction

The main goal of epilepsy surgery is the long-term freedom from seizures.[1] In general, about 60% of patients with temporal lobe epilepsy and 25–40% of those with extratemporal epilepsy achieve long-term seizure freedom after epilepsy surgery.[2]

Currently, seizures persist or recur in 20–60% of patients following resective surgery for intractable partial epilepsy.[3–5] Most published studies were interested in evaluating the outcome in general[6] and/or in evaluating patients initially seizure free after epilepsy surgery.[7] Information regarding the course of patients who were not initially seizure free is scarce in the literature and predictors of the outcome are not known.[8,9]

The few studies reporting the outcome in those patients were older ones performed prior to the introduction of new anti-epileptic drugs (AEDs), were limited in the duration of follow-up, and reported only temporal lobe cases. Furthermore, the focus of these studies was on the early seizure recurrence in the first months after surgery and the results were gathered using limited statistic tools.[10–13]

More data concerning this group of patients is needed for several reasons. For one reason, there is a substantial number of patients who are not initially free of seizures. Secondly, it is important to know more about the dynamics of the course of seizures: i.e. the "running up" or "running down" after surgery, and thirdly, studying this group of patients helps to complete evaluation of the efficacy of epilepsy surgery.[14,15] Moreover, patients are concerned about whether seizures after epilepsy surgery will eventually be controlled in the long term and are in need of appropriate consultation.[16]

Our aim was to study the long-term seizure outcome among a large group of postsurgical patients who were not seizure free 6 months after surgery. We also intended to look at the relationship between postoperatively prescribed AEDs and the outcome.

1.1. Clinical materials and methods

We retrospectively reviewed the records of all adult patients (16 years and older) who underwent epilepsy surgery at the Epilepsy Center Bethel, Bielefeld, Germany, between May 1992 and May 2003. The preoperative protocol developed in the Bethel Epilepsy Center to identify patients for surgery has been published elsewhere Elsharkawy et al.[3,6,17]. We excluded patients who had

* Corresponding author at: Department of Presurgical Evaluation, Bethel Epilepsy Center, Krankenhaus Mara, Maraweg 21, 33617 Bielefeld, Germany. Tel.: +49 52177278870; fax: +49 52177278872.
** Corresponding author. Tel.: +49 52177278870; fax: +49 52177278872.
E-mail addresses: alaa.elsharkawy@mara.de, alaa.elsharkawy@googlemail.com (A.E. Elsharkawy), alois.ebner@mara.de (A. Ebner).
[1] Prof. Dr. Abdel Hamid Alabbasi conducted the statistical analysis (drabdo1@yahoo.com).

1059-1311/$ – see front matter © 2011 British Epilepsy Association. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.seizure.2011.01.016

Table 1
Patients' characteristics.

Variable	Temporal	Extratemporal	Total	Sig.
Mean age at surgery (yrs)	34.0 ± 10.7	28.9 ± 10.8	32.5 ± 11.0	0.001
Mean age at epilepsy onset (yrs)	12.1 ± 9.2	11.0 ± 9.7	11.7 ± 9.3	0.391
Mean of epilepsy duration (yrs)	22.2 ± 11.0	17.8 ± 10.0	21.0 ± 10.8	0.002
Mean duration of follow-up (yrs)	9.1 ± 3.0	8.9 ± 2.7	9.0 ±3.0	0.572
Predisposing factors in no. of patients				
Febrile convulsion	35 (18.2%)	2 (2.7%)	37 (13.9%)	0.000
History of head trauma	16 (8.3%)	12 (16.2%)	28 (10.5%)	0.059
History of meningitis	17 (8.9%)	7 (9.5%)	24 (9%)	0.541
Family history of epilepsy	8 (4.2%)	3 (4.1%)	11 (4.1%)	0.622
Pathological finding in no. of patients				
No pathology	1 (0.5%)	3 (4.1%)	4 (1.5%)	0.000
HS	116 (60.4%)	0	116 (43.6%)	
Tumor	39 (20.3%)	14 (18.9%)	53 (19.9%)	
FCD	10 (5.2%)	37 (50%)	47 (17.7%)	
Vascular	6 (3.1%)	5 (6.8%)	11 (4.1%)	
Inflammation	3 (1.6%)	5 (6.8%)	8 (3%)	
Gliosis	16 (8.3%)	8 (10.8%)	24 (9%)	
Other	0	2 (2.8%)	2 (0.8%)	

Mean ± standard deviation, HS, hippocampal sclerosis; FCD, focal cortical dysplasia.

previous epilepsy surgery outside our clinic and patients who had malignant tumors or who were reoperated on for malignant tumors. This left 639 patients who were included. Of these, 373 (58%) were categorized as completely seizure free (without aura) and 266 (42%) as not seizure free at the 6-month follow-up examination. Out of the 266 patients who still had seizures, 55 patients (20.7%) had auras only.

1.2. Patient characteristics

Our analysis included 266 patients (146 (55%) males and 120 (45%) females). The mean age in years at surgery was 32.5 ± 11 (range 16–61 for temporal lobe epilepsy patients and 16–59 for extratemporal). The mean age of epilepsy onset was 11.7 ± 9.3 (range 0–53 for temporal and 0–51 for extratemporal). The mean duration of epilepsy was 21 ± 10.8 years (range 2–57 years for temporal and 1–57 years for extratemporal). The mean duration of follow-up was 9 ± 3 years (range 5–16 years for temporal and 5–14 years for extratemporal). Patient characteristics, predisposing factors and neuropathologic findings are summarized in Table 1.

1.3. Surgical procedure and postoperative evaluation

In this study, 74 patients (27.8%) had extratemporal resections: 37 (13.9%) underwent frontal lobe surgery, and 34 (12.8%) had posterior cortical epilepsy, 3 (1.1%) submitted to multilobar resections. There were 192 patients (72.2%) who underwent temporal lobe epilepsy surgery, 145 (54.5%) of them had mesial resection and 47 (17.7%) had lateral temporal lobe resection.

Our surgical procedures for temporal and extratemporal resections have been published elsewhere.[6,17] Eleven patients in this study had additional MSTs (multiple subpial transsections). Invasive monitoring in the form of subdural electrodes was used on 42 (15.8%) patients(39 (92.9%) extratemporal lobe and 3 (7.1%) temporal).

1.4. Outcome evaluation

At the first follow-up examination 6 months after surgery, outcome was evaluated using Engel's classification.[4] All patients were then reclassified into two groups determined by whether they were completely seizure free or not. For this study, all patients who were not completely seizure free were included.

In subsequent follow-up examinations 2, 5 and 10 years after surgery, patients were defined as seizure free if they had absolutely no seizures, including auras, for at least one year before the follow-up examination. Patients in remission were patients who not only became seizure free but maintained seizure freedom during the entire period of follow-up. Seizure types were classified according to the semiological seizure classification suggested by Luders et al.[18] AEDs were evaluated 6 months and 2 years postsurgically. Depending on the seizure situation and the serum levels of AEDs, they were replaced by other AEDs or the dosage was modified. Patients whose AEDs were replaced by other ones were seen every 3–6 months. In our study, 95 patients (35.7%) had such AED modifications or replacements after surgery within the follow-up period.

Post-operative MRI evaluation revealed that 173 (65%) had complete resection of preoperative lesions and 93 (35%) had incomplete resections, and in 5 of the patients, there was a lesion in the functional area. Postoperative EEG was carried out at the 6-month and 2-year follow-up examinations. Seizure semiology was re-evaluated 6 months and 2 years after surgery. In this anaylsis 17 (6.4%) had new seizure semiology during the first 2 years. Postoperative seizure frequency was evaluated during the first 6 months after surgery. For details of numbers and frequency, see Table 4.

1.5. Statistical analysis

Kaplan–Meier methods were used to estimate the probability of patients remaining seizure free as a function of time. Univariate analysis was used to detect factors affecting the long-term outcome. A stepwise logistic multivariate regression model was

Table 2
Seizure outcome.

Variables	Seizure free	In remission	Not seizure free	Total no. of patients
All patients				
2 years	32 (12%)	24 (9%)	234 (88%)	266
5 years	52 (19.5%)	41 (15.4%)	214 (80.5)	266
10 years	69 (34.7%)	56 (28.1%)	130 (65.3)	199
Patients who had auras only				
2 years	10 (18.2%)	9 (16.4%)	45 (81.1%)	55
5 years	14 (25.5%)	12 (21.8%)	41 (74.5%)	55
10 years	18 (39.1%)	14 (30.4%)	28 (60.9%)	46
Patients with other forms of seizures				
2 years	22 (10.4%)	15 (7.1%)	189 (89.6%)	211
5 years	38 (18%)	29 (13.7%)	173 (82.0%)	211
10 years	51 (33.3%)	42 (27.5%)	102 (68.6%)	153