Seizure 2003; **12:** 257–260
doi:10.1016/S1059–1311(02)00271-6

Lateralising value of ictal features in partial seizures: effect on postsurgical outcome

TAOUFIK M. ALSAADI[†], GEORGE L. MORRIS[‡] & WADE M. MUELLER[§]

[†]*Department of Neurology, University of California, Davis 4860 Y Street, Sacramento, CA, USA; Departments of* [‡]*Neurology and* [§]*Neurosurgical Surgery, Medical College of Wisconsin, Milwaukee, WI, USA*

Correspondence to: Dr Taoufik M. Alsaadi, M.D., Department of Neurology, University of California, Davis, 4860 Y Street, Suite 3700, Sacramento, CA 95817, USA. *E-mail*: taoufik.alsaadi@ucdmc.ucdavis.edu

We reviewed the videotapes of 49 consecutive patients with a history of medically refractory temporal lobe epilepsy for the presence and laterality of unilateral hand posturing (UHP), unilateral hand automatism (UHA), non-forced head turning (HT), and post-ictal dysphasia (PID). All of these patients underwent temporal resections with follow-up for more than 2 years after the surgery. We examined the correlation of consistency, frequency, and laterality of each of these signs on the postsurgical outcomes. The distribution of these signs was not significantly different between patients with Engel class 1 versus Engel class 2–4. The consistency and laterality of these signs do not correlate with postsurgical outcomes.

Key words: partial seizures; lateralising features; temporal lobe epilepsy; epilepsy surgery.

INTRODUCTION

Ictal and post-ictal clinical manifestations recorded in the pre-surgical evaluation of patients with intractable localisation-related epilepsy have lateralising value. Investigators have reported the lateralising value of several seizure phenomena[1–8]. Unilateral hand automatisms (UHA), unilateral dystonic hand posturing (UHP), head turning (HT), and post-ictal dysphasia (PID) are valuable lateralising signs in these reports. Clinical variations of these signs among partial-onset seizures are common and likely different within and among patients.

Because electroclinical studies show that temporal seizures exhibit variable electrical propagation both among and within patients, the observed clinical pleomorphism may reflect this electrical variability[9]. In this study, we defined consistency as the persistent presence of a sign to the same side each time for all the seizures recorded. Consistency and laterality of these features among and within patients with partial seizures evaluated for temporal lobectomy are likely different. However, they were never correlated with postsurgical outcome. In this study, we wished to examine the effects of consistency and laterality of these signs on postsurgical outcome.

METHODS

Patient selection

Subjects for this study were selected from a series of patients with intractable temporal lobe epilepsy who underwent temporal resections between 1990 and 1994. We included only patients with known postsurgical outcomes for more than two years and for whom follow up information was available. Forty-nine patients with medically intractable temporal lobe epilepsy met these criteria, and their seizures were analysed. Videotapes of all seizures were examined repeatedly by the first author (T.M. Alsaadi) who was blinded to clinical details. The author (G.L. Morris) examined many of the seizures independently. Although no inter-rater reliability test was done, differences in interpretation seldom occurred and were settled with arbitration. All of these patients were admitted to our video-EEG-monitoring unit as part

of their pre-surgical evaluation, which also included MRI of the brain. For patients in whom MRI scan did not provide adequate lateralising information, PET scan was obtained.

Videotape assessments

We reviewed the following features: (1) unilateral hand posturing (UHP); (2) unilateral hand automatisms (UHA); (3) non-forced head turning (HT); and (4) PID for all patients. As a result, audio-visual analysis of 255 seizures (average of five seizures per patient, range of 1–10 seizures per patient) was performed for the presence, absence, laterality, and assessibility of signs as recorded. UHP was defined as a fixed abnormal contorted posture at the wrist or the whole limb. UHA was defined as repetitive stereotyped movements at the hand, arm, or fingers. HT was defined as the first turn of the head at the onset of the partial seizure. These signs were considered present only if persisted for a minimum of 10 seconds. If any of the above signs could not be assessed accurately during a seizure (e.g. due to bad recording, hands covered, nurse covering the scene), that episode would be excluded from the evaluation. PID was defined as inability to read a test phrase for at least 30 seconds following cessation of the seizures, which is part of a routine seizure assessment protocol at our centre. If the test phrase was presented to the patient after 30 seconds or, if reading was not assessed due to poor audio recording then, that episode would not be considered for evaluation.

Data analysis

Postsurgical outcomes were determined using Engel classification[10]. Patients were divided into two groups: Engel class 1 versus Engel class 2–4.

Data were analysed as follows:

(1) The presence of a sign for less than or greater than 50% of total patient's seizures was correlated with post-operative outcome.

(2) The laterality of each sign among the two outcome groups.

(3) Engel scores were coded as a binary variable representing the two outcome groups 1 versus 2–4. Kendall's Tau-b was calculated to measure the univariate association between outcome and the percentage with which each sign occurred. MH-Chi-Square statistic was used to test any correlation between these variables. Multivariate analysis was also carried out using Binary Logistic Regression and other models as well.

Table 1: Seizure type by post-operative seizure outcome.

	Engel class 1 ($N = 35$)	Engel class 2–4 ($N = 14$)
Complex partial	173 (77%) ($N = 27$)	52 (23%) ($N = 10$)
Secondarily T-C	14 (46.6%) ($N = 8$)	16 (53.3%) ($N = 4$)

Table 2: Hand automatisms, posturing, and seizure outcome by Engel class.

	Sign frequency (%)	Engel class 1 (%)	Engel class 2–4 (%)
HA	>50	47	50
	<50	53	50
HP	>50	41	57
	<50	59	43
HT	>50	24	29
PID	>50	75	92
	<50	25	8

HA: hand automatism; HP: hand posturing; HT: non-forced head turning; and PID: post-ictal dysphasia.

RESULTS

Table 1 provides summary of seizure types, where patients with complex partial seizures were sub-divided into those with secondarily generalisation and those without it. There were 35 patients who were in Engel class 1 versus 14 patients in Engel class 2–4 (Table 1). Thus 71% of our patients had an excellent postsurgical outcome, which is similar to most published series on postsurgical outcome in temporal lobe epilepsy[11, 12]. The average percentage of each sign present for Engel class 1 versus Engel class 2–4 was not significantly different. Table 2 shows the percentages of patients' postsurgical outcome for Engel class 1 versus Engel class 2–4 when the sign was present for less or greater than 50% of assessable seizures. These percentages did not reach statistical significance between the two outcome groups. The laterality of each sign among the two different groups is summarised in Table 3. The distribution of each sign whether ipsilateral or contralateral to the seizure focus was not any different among the two outcome groups.

DISCUSSION

In this study, we found no relationship between the frequencies that an ictal or post-ictal feature is present and the outcome following temporal lobe resection. The average percentage presence of any of the signs was not higher in the seizure-free group when compared to patients with continuing seizures. Patients with less frequent signs occurring in (<50%) were no less likely to experience seizure freedom

Table 3: The correlation of the laterality of these signs to the Engel class outcome patients.

Seizure feature	Number of patients (number of seizures) contralateral to seizure focus	Number of patients (number of seizures) ipsilateral to seizure focus
Engel class 1		
HA	8 (19)	27 (90)
HP	32 (99)	3 (5)
HT	14 (34)	21 (166)
Engel class 2–4		
HA	3 (5)	11 (102)
HP	11 (110)	3 (5)
HT	5 (8)	9 (44)

HA: hand automatism, HP: hand posturing, HT: non-forced head turning.

post-operatively. Furthermore, the distribution of these signs whether ipsilateral or contralateral to the seizure focus was not any different between the outcome groups. Although less frequently observed, these signs were present contralateral to their predictive lateralising value but still without any effect on outcome.

Retrospective studies are flawed and these findings might be altered by a prospective analysis. Patients' selection bias is unlikely to be a factor in our findings since all patients were selected based on strict ictal EEG recording as was proposed by Risinger *et al*.[13]. This criterion was found to predict accurate localisation in most patients with temporal lobe epilepsy. It is conceivable that some of our patients may have had neocortical temporal lobe epilepsy (NTLE) since not all of our patients had evidence of mesial temporal sclerosis on MRI. Dupont *et al*. reported the presence of ipsilateral HP and contralateral HA exclusively in patients with NTLE[14]. This may explain our finding of ipsilateral HP and contralateral HP in the minority of our patients. Our findings, in agreement with others, support the concept of variability of these signs within and among patients. Therefore, the more seizures recorded during evaluation, the more likely this variation becomes apparent.

The findings in this study are important for physicians questioning witnesses on seizure manifestations. Successful epilepsy surgery potentially provides evidence of a common origin for seizures with and without a given sign. The frequency of a sign occurrence did not affect successful outcome. Consistency, the presence of a feature in all seizures, is uncommon. The independence of sign frequency and outcome is consistent with the concept of partial seizure progression from simple partial to secondarily generalisation as a function of seizure spread. Different seizure signs may represent different progression patterns or rates from a common location[15–20].

In summary, ictal and post-ictal signs are one but not the most important element in epilepsy surgery. Concordant ictal EEG and clinical semiology are necessary to define the seizure focus for the patient to be considered a candidate for seizure surgery. Surgical decision should not be altered based on the presence, absence, or the laterality of these signs as recorded.

ACKNOWLEDGEMENT

The authors thank Dr Paul Garcia from the Department of Neurology at the University of California, San Francisco for his valuable suggestions and comments.

REFERENCES

1. Gabr, M., Luders, H., Dinner, D., Morris, H. and Wyllie, E. Speech manifestations in lateralization of temporal lobe seizures. *Annals of Neurology* 1989; **25**: 82–87.
2. Kotagal, P., Luders, H., Morris, H. H. *et al.* Dystonic posturing in complex partial seizures of temporal lobe onset: a new lateralizing sign. *Neurology* 1989; **39**: 196–201.
3. Privitera, M. D., Morris, G. L. and Gilliam, F. Postictal language assessment and lateralization of complex partial seizures. *Annals of Neurology* 1991; **30**: 391–396.
4. Theodore, W. H., Porter, R. J. and Penry, J. K. Complex partial seizures: clinical characteristics and differential diagnosis. *Neurology* 1983; **33**: 115–121.
5. Wyllie, E., Luders, H., Morris, H. H., Lesser, R. P. and Dinner, D. S. The lateralizing significance of versive head and eye movements during epileptic seizures. *Neurology* 1986; **36**: 606–611.
6. Maldonado, H. M., Delgado-Escueta, A. V., Walsh, G. O., Swartz, B. E. and Rand, R. W. Complex partial seizures of hippocampal amygdalar origin. *Epilepsia* 1988; **29**: 420–433.
7. Williamson, P. D., Thadani, V. M., French, J. A. *et al.* Medial temporal lobe epilepsy: videotape analysis of objective clinical seizure characteristics. *Epilepsia* 1998; **39**: 1182–1188.
8. Marks, W. J. M. Jr and Laxer, K. D. Semiology of temporal lobe seizures: value in lateralizing the seizure focus. *Epilepsia* 1998; **39**: 721–726.
9. Spencer, S. S. Cortical and intercortical seizure spread. In: *Anatomy of Epilepsy* (Eds J. Ferendelli, H. G. Weiser and B. Meldrum). London, John Libbey, 1988: pp. 139–154.
10. Engel, J. Jr. Outcome with respect too epileptic seizures. In: *Surgical Treatment of the Epilepsies* (Ed. J. Engel Jr). New York, Raven Press, 1987: pp. 553–571.
11. King, D. W., Flanigan, H. F., Gallagher, B. B. *et al.* Temporal lobectomy for partial complex seizures: evaluation, results, and 1-year follow-up. *Neurology* 1986; **36**: 334–339.
12. Duncan, J. S. and Sagar, H. J. Seizure characteristics, pathology, and outcome after temporal lobectomy. *Neurology* 1987; **37**: 405–409.

13. Risinger, M. W., Engel, J. Jr, Van Ness, P. C. *et al.* Ictal localization of temporal lobe seizures with scalp/sphenoidal recording. *Neurology* 1989; **39**: 1289–1293.
14. Dupont, S., Semah, F., Boon, P. *et al.* Association of ipsilateral motor automatism and contralateral dystonic posturing. *Archives of Neurology* 1999; **56**: 927–932.
15. Williamson, P. D., Thadani, V. M., Darcey, T. M., Spencer, D. D., Spencer, S. S. and Mattson, R. H. Occipital lobe epilepsy: clinical characteristics, seizure spread patterns, and results of surgery. *Annals of Neurology* 1992; **31** (1): 3–13.
16. Saygi, S., Spencer, S. S., Scheyer, R., Katz, A., Mattson, R. and Spencer, D. D. Differentiation of temporal lobal behavior associated with hippocampal sclerosis and tumors of temporal lobe. *Epilepsia* 1994; **35** (4): 737–742.
17. Salanova, V., Andermann, F., Rasmussen, T., Olivier, A. and Quesney, L. F. Parietal lobe epilepsy. Clinical manifestations and outcome in 82 patients treated surgically between 1929 and 1988. *Brain* 1995; **118**: 607–627.
18. Quesney, L. F. Clinical and EEG features of complex partial seizures of temporal lobe origin. *Epilepsia* 1986; **27** (Suppl. 2): S27–S45.
19. Quesney, L. F., Constain, M., Fish, D. R. and Rasmussen, T. The clinical differentiation of seizures arising in the parasagittal and anterolaterodorsal frontal convexities. *Archives of Neurology* 1990; **47** (6): 677–679.
20. Lieb, J. P., Dasheiff, R. M. and Engel, J. Jr Role of the frontal lobes in the propagation of mesial temporal lobe seizures. *Epilepsia* 1991; **32** (6): 822–837.