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An evaluation of lateralizing signs in patients with temporal lobe epilepsy

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ABSTRACT

Resective epilepsy surgery has been accepted as an effective treatment for patients with medically intractable temporal lobe epilepsy (TLE) to control the seizures and to limit cognitive dysfunction. Complete resection of the epileptic zone, and therefore the success of the surgery, depends on the identification of the seizure focus. Reliable lateralizing semiologic signs, together with other presurgical assessments, are of great importance for an accurate identification of the seizure focus. In this respect, this study evaluated the frequency of semiologic signs in medically intractable temporal lobe epilepsy (TLE) together with the lateralizing values and variations according to the age and gender groups. Two hundred seventy-three seizures of 55 patients of the Adult Epilepsy Monitoring Unit of Gazi University Faculty of Medicine with the diagnosis of medically intractable TLE, whose epileptic foci were detected through noninvasive presurgical procedures and seizures were controlled successfully after anterior temporal lobectomy (ATL), were analyzed retrospectively. Seizure semiologies of the patients were evaluated in terms of lateralizing values, and it was inquired whether age/gender causes any variation. Versive head rotation, unilateral dystonic limb posturing, asymmetric tonic limb posturing, and the combination of unilateral hand automatisms and dystonic posturing were determined as the semiologic signs with the highest lateralizing values (90–100%). While hand automatisms were observed frequently in the group with early seizure-onset age (onset age ≤ 2), asymmetric tonic limb posturing was detected as more frequent in the group with later seizure-onset age (onset age > 2; $p < .005$). In addition to this, semiologic signs were noted to be different between male and female groups; psychic and autonomic auras and ictal emotional signs were associated with women ($p < .005$).

1. Introduction

Temporal lobe epilepsy (TLE) is considered to be the most frequent cause of partial epilepsy in adults, and a large number of patients with TLE especially mesial TLE [MTLE] have seizures that are resistant to antiepileptic drugs. Resective epilepsy surgery, however, stands out as a highly effective treatment for this group. The success of resective epilepsy surgery depends on the accurate identification of the epileptogenic zone [1,2]. Recognition of semiological lateralizing signs during seizures is important in the presurgical evaluation of the patients and adds further information to interictal–ictal EEG, neuroimaging, functional mapping, and neuropsychological evaluation. Ictal semiology analysis, in this respect, is of crucial importance for the lateralization and localization of the epileptic focus. Identification of reliable lateralizing signs, especially in cases with MTLE, together with concordant presurgical noninvasive investigations, enables a successful surgical intervention without invasive tests [2–4].

There have been several previous studies which evaluated the frequencies and lateralizing values of semiologic signs. To the best of our knowledge, in some of these studies, the seizure focus is determined according to the results of EEG, and MRI and clinical findings are assessed accordingly. These results, however, cannot determine the seizure focus definitely, and this might end in a misleading assessment of lateralizing values. The present study aimed to evaluate the frequencies and lateralizing values of seizure semiology signs by observing patients whose epileptic foci are identified definitively through resective epilepsy surgery and successful seizure control.

Previous literature that focuses on ictal semiology in different gender groups has reached various results [5–13]. Earlier neuroradiological studies in human and animal models have shown differences in the functional and anatomical organization of the brain between sexes that affects cerebral transmission and connections [6,14]. Considering that a similar difference between sexes should be seen in ictal semiology, this study investigated the variations of lateralizing sings according to gender.

Although there are studies that assess semiologic signs in different age groups, studies that compare semiologic features associated with seizure-onset age are few [15–18]. Previous studies have shown that seizure-onset age and, thus, epilepsy duration might have an impact on pathophysiologic mechanisms and might be predictive in drug-resistant seizures [19]. This study, therefore, evaluated semiologic signs according to seizure-onset age.

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2. Materials and methods

Among Gazi University Adult Epilepsy Monitoring Unit patients diagnosed with medically refractory MTLE, 55 patients with completed preoperative noninvasive evaluations, identified epileptic foci, and postoperative seizure freedom or a significant decrease in seizure frequency that confirms the suspected epileptic foci were included in this study. Video-EEG monitoring records and reports of those 55 patients were analyzed retrospectively; their clinical histories, personal and family histories, neuroimaging findings, neuropsychological test results, psychiatry consultations, surgical procedures, pathological findings, and postoperative follow-ups were assessed. Presurgically, long-term scalp video-EEG monitoring was performed for all patients until at least three typical seizures were recorded. Video-EEG monitoring was performed with a Telefactor system, with up to 32 channels of EEG recorded continuously, and for electrode placement, the international 10-20 system was used. The patient or the attendant was asked to press the event button when the patient had auras or seizures. Information on whether patients had auras or not and the type of auras were noted together with ictal behavioral patterns, and the frequency and lateralizing values of these were evaluated. Besides, any possible variations in lateralizing signs that can be associated with either sex or seizure-onset age were analyzed. Video recordings of seizures were analyzed by two of the authors (E.E.A. and E.B.) who were blinded to the epileptic foci of the patients.

Two hundred seventy-three seizures of 55 patients were observed. Information on whether patients had auras and the types of auras (abdominal, auditory, autonomic, gustatory, olfactory, psychic, somatosensory, and visual) that they had were gathered from the patient descriptions on video-EEG monitoring and from medical records. Ictal behavioral characteristics mentioned in the previous literature [2,3,20,21] including behavioral arrest, oroalimentary and genital automatisms, dystonic or tonic limb posturing, versive or nonversive head deviation, postictal nose wiping, ictal vocalization or speaking, periictal vegetative signs (vomiting, urinary urge, coughing, thirst/drinking), ictal emotional signs (laughing, crying, fear), unilateral eye blinking, last clonic jerk, ictal spitting, ictal aphasia, and postictal paresis were observed in video recordings. Among these, ictal/postictal aphasia, postictal paresis, and ictal eye blinking were not observed as it was not possible to assess these three signs accurately though video-EEG records.

The anterior temporal lobectomy (ATL) protocol was performed at the Department of Neurosurgery of Gazi University Medical Hospital for all patients, and only those patients that were seizure-free (Engel 1a), those that had postoperative seizures but had been seizure-free for two years (Engel 1b), and those that had only auras (Engel 1c) in 1–24 months of follow-up were included. The side of the surgery in each case was accepted as the certain epileptic focus. Lateralizing and localizing values of semiologic signs were determined in comparison to the side of the surgical operation.

All statistical data were analyzed using Windows SPSS 12.0. The Mann–Whitney U-test was used to evaluate the correlation between clinical lateralizing signs/seizure-onset age and clinical lateralizing signs/sex. The lateralizing values of clinical findings (ipsilateral/contralateral or left/right TLE) were analyzed through chi-squared and Fischer's exact tests.

3. Results

Fifty-five patients (26 female (47.3%) and 29 male (52.7%)) had 273 seizures. The mean age of patients was 28.2 (range: 17–47). Data on seizure-onset age, epilepsy duration, video-EEG monitoring duration, and the number of seizures noted are summarized in Table 1, and risk factor, EEG, neuroimaging, operation, and postoperative outcome data are summarized in Table 2.

Table 1
Characteristics of patients and monitoring.

Variable (n = 55)	Range	Average
Age	17–47 years old	28.2
Seizure-onset age	0–40 years old	11.49
Epilepsy duration	2–40 years	17.7
Monitoring duration	2–7 days	3.54
Number of seizures	1–13	5.45

3.1. Frequency and lateralizing values of semiologic signs

Hand automatism was observed in 44 patients (80%). Of these, 35 (79.5%) had hand automatism that was ipsilateral to the epileptogenic seizure focus (18 right and 17 left) while 9 (20.5%) had bilateral hand automatism. No contralateral case was seen. Hand automatisms had a positive predictive value to be ipsilateral to the seizure focus ($p < 0.0001$).

Unilateral dystonic limb posturing was observed in 33 (60%) patients: contralateral to the seizure focus in 32 (96.9%) and ipsilateral in 1 (3.1%). Unilateral dystonic limb posturing contralateral to the seizure focus had a statistically significant lateralizing value ($p < 0.0001$).

The combination of hand automatism with dystonic limb posturing was observed in 30 (54.5%) patients. In all, hand automatisms were ipsilateral to the seizure focus, while dystonic limb posturing was contralateral. The ipsilateral hand automatism and contralateral dystonic limb posturing combination had a positive predictive value of 100%.

Nonversive head rotation was observed in 34 (61.8%) patients. In 25 (73.5%) of them, nonversive head rotation was ipsilateral to the seizure focus; in 5 (14%) of them, it was contralateral; and in 4 (11%) of them, it was both-sided. Thus, nonversive head rotation had a statistically significant lateralizing value associated with the ipsilateral seizure focus ($p < 0.05$).

Versive head rotation was observed in 26 (47.3%) patients: in 25 (96.1%), it was ipsilateral to the seizure focus and in 1 (3.9%), contralateral. As a result, versive head rotation was determined to have a meaningful lateralizing value for the contralateral seizure focus ($p < 0.0001$).

Postictal nose wiping was observed in 19 (34.5%) patients: in 15 (79%), nose wiping was performed with the hand ipsilateral to the seizure focus; in 1 (5.2%), with the hand contralateral to the seizure

Table 2
Risk factor, EEG, neuroimaging, operation and postoperative outcome data.

Variable (n = 55)	Number	Frequency (%)
Risk factors		
Hypoxia	47/55	85.5%
Febrile seizures	38/55	69.1%
Head trauma	38/55	69.1%
CNS infection	3/55	5.5%
Family history	18/55	32.7%
Kindred marriage	11/55	20%
EEG		
Lateralized interictal abnormality	40/55	72.7%
Lateralized ictal abnormality	45/55	81.8%
Lateralized postictal abnormality	39/55	70.9%
Neuroimaging		
Lateralized MRI abnormality	48/55	87.2%
Lateralized PET abnormality	36/38	94.8%
Operation		
Right ATL	24/55	43.64%
Left ATL	31/55	56.36%
Postoperative outcome		
Engel 1a	48/55	87.3%
Engel 1b	4/55	7.3%
Engel 1c	3/55	5.4%

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