Outcome of Prolonged Video-EEG Monitoring in Children with Epilepsy

Uzun Dönemli Video-EEG Görüntülemenin Epilepsili Çocuklarda Sonuçları

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ABSTRACT Objective: This aim of this study was to evaluate usefulness and diagnostic efficacy of video-EEG monitoring in children with epilepsy in terms of differential diagnosis, epilepsy classification, management, presurgical evaluation, and nonepileptic events. **Material and Methods:** Three hundred eighty two children were evaluated concerning the nature of clinical behaviour, seizure classification, or work-up prior to epilepsy surgery. The patients were divided into two groups as younger than 6 years of age and older than 6.1. Seizure classification was performed using both ILAE 1981 and 1989 classifications. Localizing and lateralizing signs and nonepileptic events were also investigated. **Results:** One-hundred and seven (28%) of the patients were seizure free, 74 (19.4%) of them had nonepileptic events, 201 (52.6%) of them had real seizures. While the children younger than 6 years had more primary generalized seizures (37.2%) and epileptic spasm (16.3%), the children older than 6 years had more complex partial seizures (55.7%) and temporal lobe epilepsy (27.8%) ($p<0.05$). Contralateral head version (14.4%) was the most frequent lateralizing sign in both groups, and ipsilateral automatism (16.9%), contralateral dystonia (12.9%), and nose wiping (11.4%), were noted as well. Sixty eight percent of children with behaviour arrest had extratemporal lobe epilepsy, and 24% of them were younger than 6 years of age. Ictal fear was more common in temporal lobe epilepsy (64.2%). Forty three patients underwent epilepsy surgery. While 24 (56%) of them were performed resective surgery, 19 (44%) of them had vagal nerve stimulation. **Conclusion:** Prolonged video EEG monitoring is a mandatory method for assessment and successful management of children with refractory epilepsy, especially in patients enrolled for epilepsy surgery or suspected of having pseudoseizures and nonepileptic events.

Key Words: Epilepsy; electroencephalography; child

ÖZET Amaç: Bu çalışmanın amacı epilepsili çocuklarda video-EEG görüntülemenin tanı değeri ve kullanışlılığının ayırıcı tanı, epilepsi sınıflandırılması, yönetimi, ameliyat öncesi değerlendirme ve epilepsi dışı olaylardaki yerinin değerlendirilmesidir. **Gereç ve Yöntemler:** Üç yüz seksen iki hasta, klinik davranış özellikleri, nöbetin sınıflandırılması ya da epilepsi cerrahisi öncesi hazırlık için değerlendirildi. Hastalar 6 yaşın altındakiler ve 6.1 yaşın üzerindekiler olarak iki gruba ayrıldı. Nöbet sınıflaması ILAE 1981 ve 1989 sınıflamaları kullanılarak yapıldı. Lokalizasyon ve lateralizasyon bulguları ve epilepsi dışı olaylar da tespit edildi. **Bulgular:** Hastaların 107 (%28) tanesinde nöbet görülmezken, 74'ünde (19.4) epilepsi dışı olaylar, 201'inde (%52.6) ise gerçek nöbet görüldü. Altı yaşın altındaki çocuklarda primer jeneralize nöbetler (%37.2) ve epileptik spazmlar (16.3) daha sık görülürken, 6 yaş üstü çocuklarda kompleks parsiyel nöbetler (%55.7) ve temporal lob epilepsisi (%27.8) daha sıktı ($p<0.05$). Kafanın karşı tarafa çevirimi (%14.4) her iki grupta da en sık görülen lateralizasyon bulgusuyken, ipsilateral otomatizma (%16.9), kontralateral distoni (%12.9) ve burun silme (%11.4) de görüldü. Hareket durması olan çocukların %68'inde temporal lob-dışı epilepsi vardı ve bu hastaların %24'ü 6 yaşından küçüktü. İktal korku temporal lob epilepsisinde daha sıktı (%64.2). Kırk üç hasta epilepsi cerrahisi geçirdi. Bu hastaların 24'ünde (56%) rezeksiyon cerrahisi yapılırken 19'una (%44) vagal sinir stimülasyon yapıldı. **Sonuç:** Uzun dönemli video-EEG görüntüleme refrakter epilepsili çocuklarda özellikle epilepsi cerrahisi planlanan ya da yalancı nöbet ve epilepsi dışı olaylardan şüphelenilen hastalarda değerlendirme ve başarılı bir tedavi için mutlaka gereklidir.

Anahtar Kelimeler: Epilepsi; elektroensefalografi; çocuk

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Epilepsy affects 1% of the population and as far as 20 and 30% of children with epilepsy have been known as refractory to medical treatment.[1,2] Furthermore, many of those children are potential candidates for surgical treatment.[1,2] Accurate diagnosis and classification of the seizure type in children with epilepsy are important steps for selecting the most effective treatment modality.[3,4] Technological advances such as video-EEG monitoring and clinical application of positron emission tomography enhance the capabilities of the pediatric neurologists and neurologists.[3-6] In patients with intractable partial epilepsy with a consideration of a focal cortical resection, video EEG monitoring is also essential for surgical localization.[1,7-9] Due to its value, video EEG monitoring is the principal activity in epilepsy centers.[4,8]

The aim of this study was to evaluate usefulness, diagnostic efficacy and therapeutic relevance of long-term video-EEG monitoring in children with intractable epilepsy and nonepileptic events.

MATERIAL AND METHODS

During a seven-year period (from January 2000 to January 2007), 382 children with either diagnosed or suspected epilepsy applied to the Department of Pediatric Neurology at Gazi University Faculty of Medicine were evaluated.

Approval for this study was granted by Gazi University Faculty of Medicine Ethical Committee. Informed consent was obtained from the patients' families.

Video EEG recording was considered if there was a need to determine the nature of clinical events, seizure classification, and work-up prior to epilepsy surgery. A detailed history was obtained from charts or patients and their parents, including perinatal, natal, postnatal, developmental and family histories. Each patient underwent a complete neurological examination, and brain MRI and PET scans were performed. Additionally, selected patients underwent metabolic screening.

The patients were divided into two groups to evaluate any differences in seizure nature, EEG findings, seizure frequencies, and durations. First group was younger than 6 years of age including infancy and preschool period, whereas second group was older than 6.1 years of age including late childhood and adolescent period.

VIDEO-EEG EVALUATION

Ictal and interictal video EEG monitoring was performed using the Telefactor Beehive system (Telefactor, Philadelphia, PA). Scalp electrodes were placed according to the international 10-20 system. Trained EEG technicians, pediatricians and nurses examined the patients during seizures to determine their level of consciousness or responsiveness to external stimuli.

The video EEG data were reviewed by two expert pediatric neurologists (AS, TH). The seizures were identified, an attempt was made to characterize them,and the EEG correlation was determined. An electrical seizure was defined as a well-defined change in the EEG pattern with a clear onset and offset, and a demonstrable evolution in amplitude frequency and morphology. The following patterns were classified as electrical seizures: Electodecremental pattern with abrupt attenuation of ongoing electrical activity, alteration of background with super-imposed fast activity (10-20 Hz), attenuation of background with rhythmic slow activity, generalized slow spikes and waves complexes followed by attenuation and/or suppression or superimposed activity, focal or generalized recruiting rhythm in the alpha or theta or beta frequency.

SEIZURE CLASSIFICATION

Seizure classification was performed according to "International League Against Epilepsy" (ILAE) 1981 and 1989 syndromic seizure classification.[10,11] Therefore, seizures were classified as aura, simple partial seizures, complex partial seizures, secondary generalized seizures, and primary generalized seizures using ILAE 1981 seizure classification, while they were classified as temporal and extratemporal lobe epilepsy, Lennox Gastaut syndrome, epileptic spasm according to ILAE 1989 syndrome classification system.

Pseudoseizures or nonepileptic events were defined according to the criteria laid down by Meierkord et al.[12] Nonepileptic episodes were diagno-

sed when the clinical seizures were inconsistent with epileptic clinical seizures and ictal EEG failed to show any changes. Thus, these seizures were classified as pseudoseizures, movement disorders, or sleep disorders.

Localizing and lateralizing signs were determined as defined by Loddenkemper and Kotagal[13], ictal fear and behaviour arrest were also described as defined by Fogarasi et al.[14]

STATISTICAL ANALYSIS

All the statistical analyses were performed with the software package SPSS 11.5 for Windows. Descriptive analyses were performed and data were presented as mean ± standard deviation (SD).

The differences in the duration of the seizures were calculated by Mann Whitney U test. Chi-square (χ^2) analysis was used either as Pearson Chi-square test or Fisher's Exact test depending upon on the number of cases in the cross-table grids. A p value less than 0.05 was considered as significant.

RESULTS

Of 382 children, 107 (28%) did not display either recordable clinical or electrographic seizures, 74 (19.4%) had nonepileptic events, 201 (52.6%) had clinical seizures consistent with electrographic findings.

The duration of recording varied from 4 to 7 days.

Of the 107 patients who did not have seizure, 68 (63.5%) had abnormal interictal EEG recordings (background slowing, intermittent slowing, regional/ generalized sharp waves and spikes while 39 (36.4%) had normal EEG findings.

Distribution of the events among 74 (19.4%) patients with nonepileptic events were as follows: 31 (58.4%) patients had pseudoseizures, 23 (31%) patients had movement disorders, and 20 (27%) patients had sleep disorders, two of them had very rare cases:

One of these two patients was a 5.5-year-old-boy who was referred as status epilepticus without electrographic findings. We observed that he had daytime sleepiness, hypersomnia, sleep paralysis and cataplexy during his stay in video-EEG monitoring unit. Afterwards, we diagnosed him as narcolepsy based on the sleep study including fragmentized REM, increase in spontaneous arousals, decrease in MSLT index (1.625), and HLA DR2, DQB1*0602 positivity. Another patient was a 12-year-old-girl who was referred as recurrent status epilepticus without any electrographic changes. In history, it was learned that she had been started on pimoside due to her psychiatric problems by a pediatric psychiatrist. During her admission, we observed her typical seizures consistent with oculogyric crisis without any electrographic changes. After withdrawal of pimoside, she was seizure free.

Table 1 shows the nonepileptic events by age group.

Two hundred and one (52.6%) of 382 patients experienced real (true) clinical seizures consistent with both clinical and electrographic seizures during prolonged video-EEG monitoring and they were comprehensively evaluated. Ninety three of the patients were (46.3 %) girls; 108 (53.7%) were boys. The age of the 201 patients ranged from 1.5 to 17 (mean: 10.3 ± 4.4) years. While 43 children (21.4%) were younger than 6 years of age, 158 children (78.6%) were older than 6.1.

TABLE 1: The documentation of nonepileptic events defined using video-EEG monitoring.

	≤6 years N (%)	>6 years N (%)	Total N (%)
Pseudoseizure	-	31 (58.4)	31 (41.9)
Movement disorder	6 (28.5)	17 (32)	23 (31)
Tic	2 (9.5)	9 (16.9)	11 (14.9)
Non epileptic myoclonus	2 (9.5)	3 (5.6)	5 (6.6)
Dystonia	2 (9.5)	4 (7.5)	6 (8.1)
Oculogyric crisis	-	1 (1.9)	1 (1.35)
Sleep disorder	15 (71.4)	5 (9.4)	20 (27)
Insomnia	2 (9.5)	1 (1.9)	3 (4)
Narcolepsy	1 (4.8)	-	1 (1.35)
Sleep related rhythmic movement disorder	1 (4.8)	2 (3.8)	3 (4)
Night terror	6 (28.5)	-	6 (8.1)
Nightmare	5 (23)	2 (3.8)	7 (9.5)
Total	21 (28.4)	53 (71.6)	74 (100)

The mean duration of the disease in the entire group was 2.6 ± 1.3 years.

In the group of patients younger than 6 years of age, 79% had intractable and frequent seizures, defined as at least three seizures per week. Among children older than 6.1, 65.6% had intractable and frequent seizures, using the same criteria.

Thirty three children (16.4%) had delayed motor or social milestones. A family history of epilepsy was found in 29 (14.4%) of the children, and 49 (24.4%) children had febrile seizure. Other factors predisposing the patients to epilepsy were found in 79 (37.3%) cases. Abnormal results of the brain MRI were recorded in 55 (27.4%) patients. Table 2 summarizes these details.

The interictal EEG findings in 40 (19.9%) of the patients was normal. Hemispheric asymmetry was found in 34 (16.9%) of the patients, focal baseline irregularity in 128 (63.6%), generalized baseline irregularity in 12 (5.9%), focal spike and wave in 147 (73.1%), generalized spike and wave discharges in 10 (4.9%), secondary bilateral synchrony in 73 (36.3%), polyspike in 14 (6.9%), hypsarrhythmia in 3 (1.4%), and suppression in 5 (2.4%) patients. A comparison of the findings in the two age groups demonstrated that generalized baseline irregularity, generalized spike and wave, and hypsarrhythmia were significantly more common among patients who were younger than 6 years of age ($p<0.05$) (Table 3).

During video EEG monitoring, the number mean of seizures was 11.0 ± 14.3. It was 15.32 ± 15 in patients younger than 6 years of age, while it was 9.8 ± 14 in the ones older than 6.1 years of age ($p< 0.001$).

The mean duration of the seizures was significantly longer in children older than 6.1 years of age (84 ± 160.2 seconds) than the children younger than 6 years of age (37.7 ± 40 seconds) ($p< 0.001$).

Children younger than 6 years of age tended to have primary generalized seizures (37.2%) and epileptic spasm (16.3%), while those over 6 years of age had more complex partial seizures (55.7%) and temporal lobe epilepsy (27.8%) ($p< 0.05$; Table 4). We also described gelastic seizure in three patients. One of them had hamartoma in Tuber cinerum, the others had nomal MRI findings.

One hundred seventy two (85.5%) of 201 patients had only one seizure type, 22 (10.9%) had two different seizure types, five (2.4%) had three different seizure types, and two (0.9%) had four different seizure types (Table 5).

The diagnosis of the patients and classification of epilepsy by the history was changed after video EEG monitoring in some patients. So, the diagnoses previously classified as simple partial seizure in 8 (3.9%) patients, complex partial seizure in 16 (7.9%) patients, secondary generalized seizure in 12 (5.9%) patients, primary generalized seizure in 21 (10.4%) patients absence of seizure, in one patient with were changed after video-EEG monitoring. Furthermore, seizure classifications changed in so-

TABLE 2: History, clinical, and radiological findings of the patients.

	≤ 6 years		>6 years	
	Present (%)	Not present (%)	Present (%)	Not present (%)
Family history	7 (16.3)	36 (83.7)	22 (13.9)	136 (86)
Febrile seizure history	11 (25.6)	32 (74.4)	38 (24.1)	120 (75.9)
Predisposition*	10 (23.3)	33 (76.7)	69 (43.7)	89 (56.3)
Mental-motor retardation	5 (11.6)	38 (88.4)	28 (11.7)	130 (82.3)
MRI**	10 (23.3)	33 (76.7)	45 (28.5)	113 (71.5)

*The factors of predisposition to epilepsy: birth asphyxia, infection, trauma, prematurity, jaundice.

**MRI findings: encephalomalasia, dysplasia, hypocampal sclerosis, atrophy, cyst, mass.

TABLE 3: Interictal EEG findings of the patients.

	≤ 6 years N:43 (%)	>6 years N:158 (%)	χ^2	P value
Hemispheric asymmetry	11 (25.6)	23 (14.6)	2.92	0.087
Focal baseline irregularity	24 (55.8)	104 (65.8)	1.46	0.226
Generalized baseline irregularity	9 (20.9)	3 (1.9)	-	0.0
Focal spike /sharp waves	27 (62.8)	120 (75.9)	2.97	0.084
Generalized spikes	5 (11.6)	5 (3.2)	-	0.039
Secondary bilateral synchrony	19 (44.2)	54 (34.2)	1.46	0.226
Polyspike	3 (7)	11(7)	-	1.0
Hypsarryhthmia	3 (7)	-	-	0.009
Burst-Suppression	2 (4.7)	3 (1.9)	-	0.291

χ^2: In empty cells, Fisher exact test was used.

TABLE 4: Seizure classification after Video-EEG monitoring.

	≤6 years N:43 (%)	>6 years N:158 (%)	χ^2	P value
ILAE 1981 classification				
Auras	1 (2.3)	15 (9.5)	-	0.202
Simple partial seizures	7 (16.3)	24 (15.2)	0.031	0.861
Complex partial seizures	9 (20.9)	88 (55.7)	16.362	0.000
Secondary generalized seizures	8 (18.6)	46 (29.1)	1.900	0.168
Primary generalized seizures	16 (37.2)	22 (13.9)	11.954	0.001
Absence	4 (9.3)*	2 (1.3)	-	0.02
Myoclonic	5 (11.6)	12 (7.6)	-	0.369
Atonic	2 (4.7)	3 (1.9)	-	0.291
Tonic-clonic	2 (4.7)	4 (2.5)	-	0.610
ILAE 1989 classification				
Temporal lobe epilepsy	4 (9.3)	44 (27.8)	6.396	0.011
Extratemporal lobe epilepsy	28 (65.1)	101 (63.9)	0.021	0.885
Epileptic spasm	7 (16.3)	1 (0.6)	-	0.000
Lennox Gastaut	5 (11.6)	6 (3.8)	-	0.06

χ^2: In empty cells, Fisher exact test was used.
*: Two of them were atypical absence

TABLE 5: Sum of the total seizure numbers of the patients during video-EEG monitoring.

	≤6 years	>6 years
ILAE 1981 classification		
Auras	3	63
Simple partial seizures	145	191
Complex partial seizures	57	625
Secondary generalized seizures	50	317
Primary generalized seizures	305	400
Absent	21	69
Myoclonic	54	177
Atonic	28	85
Tonic-clonic	14	5
ILAE 1989 classification		
Temporal lobe epilepsy	23	287
Extratemporal lobe epilepsy	328	890

me patients after video-EEG monitoring: nine (4.4%) patients were classified as complex partial seizure, 14 (6.9%) patients were classified as secondary generalized seizure, six (2.9%) patients were classified as primary generalized seizure, and three (1.4%) patients were classified as absence seizure.

Almost all of the lateralizing signs were seen in the patients who were older than 6 years of age (Table 6). Contralateral head version (14.4%) was the most frequently seen lateralizing sign in all age groups. Most common localizing signs were ipsilateral automatism (16.9%), contralateral dystonia (12.9%), and nose wiping (11.4%). Although, thirst and coughing were determined in the limited number of the patients, all of them pointed to temporal lobe epilepsy. Behaviour arrest was determined in 25/201 (12.4%) patients; 17/25 (68%) of them was extratemporal lobe epilepsy ($p<0.001$). Five (20%) of them was younger than 6 years of age, while 20 (9.9%) of them were older than 6 years of age. Ictal fear (14/201; 6.9%) was more common in temporal lobe epilepsy (9/14; 64.2%, $p<0.001$) and three (21.4%) of them were younger than 6 years of age and 11 of them (5.4%) were older than 6 years of age. The comprehensive localizing and lateralizing signs are shown in Table 6.

The antiepileptic drugs were changed or their dose was rearranged in 67.4% of the patients younger than 6 and 89.7% of those older than 6.1 of age after video EEG monitoring.

Based on video-EEG monitoring, MRI and PET scan, and after discussed with epilepsy team, 36

TABLE 6: Localizing and lateralizing signs of the patients.

	≤6 years N:43 (%)	>6 years N:158 (%)
Localizing Signs		
Ipsilateral automatism*	2 (4.6)	32 (20.2)
Contralateral dystonia*	1(1.3)	25 (15.8)
Nose wiping*	-	18 (11.4)
Thirst*	-	3 (1.9)
Coughing*	-	1 (0.63)
Behaviour arrest (temporal lobe)	1 (2.3)	7 (4.4)
(extratemporal lobe)	4 (9.3)	13 (8.2)
Ictal fear (temporal lobe)	2 (4.6)	7 (4.4)
(extratemporal lobe)	1 (2.3)	4 (9.2)
Lateralizing Signs		
Four position	-	8 (5)
Forced head version to contralateral side	4 (9.3)	25 (15.8)
Early onset of contralateral tonic activity	-	8 (5)
Late offset of ipsilateral clonic activity	-	5 (3.16)

*: All the seizures are appreciated as from temporal lobe.

(17.9%) of the patients were candidate for resective surgery and 20 (10.7%) of them were candidates for functional surgery (Vagal nerve stimulation, VNS). Consequently, 43 patients underwent epilepsy surgery. While 24 (56%) of them underwent resective surgery, 19 (44%) of them had functional surgery. One patient was 2 years old, remaining patients were older than 6 years of age. Thirteen of them were operated from left side, 11 of them were operated from right side. Pathological findings were as follows: gliosis (n=3), cortical dysplasia (n=2), arachnoid cyst and cortical dysplasia combination (n=1), Rasmussen encephalitis (n=1) and hippocampal sclerosis (n=12). The patients were followed for 1-7 years after surgery. Nineteen patients were seizure free and five patients had very rare seizures. Four (21%) patients who underwent VNS were seizure free and seizure frequency decreased by 56% in the remaining 15 patients.

DISCUSSION

Comprehensive prolonged video-EEG monitoring provides both the establishment of firm and precise diagnosis of epilepsy and differentiation of real (true) epileptic events from other behaviours in infants and children.[7,15,16] Furthermore, it contributes to evaluate specific epileptiform events and improves management with respect of increasing the detection of specific electrical epileptiform events, making possible the precise characterization of the clinical and electrical seizure activities and their interrelationships, providing a method for the quantization of the epileptic process in the brain before and after treatment.[6-8]

The prevalence of pseudoseizures in adults is between 8 and 10%.[4,17] However, there is paucity in literature about pseudoseizures in children.[4,17,18] In a study involving 100 patients (age range: eight days to 67 years) evaluated by video-EEG monitoring, the referral diagnosis changed in 37 patients; this number included changes in diagnosis of seizure type in 17 epileptic patients; 10 patients were found to have had pseudoseizures and 10 patients had nonepileptic neurological disorders.[18] In another study conducted in children, 110 children had conversion disorder and 50 had pseudoseizures (45.5%). After the correct diagnosis and appropriate treatment, the outcome for children with pseudoseizures was good.[19] Of our patients, 58.4 % (31/74) had pseudoseizures, which is in agreement with the literature.

In a study, 186 children aged between 3 weeks to 17 years were studied by prolonged video and EEG monitoring. A specific diagnosis of the nonictal events was observed in 24 subjects: postures of spasticity in children with neurological impairment (6), Munchausen-by-proxy (5), pseudoseizures (3), breath holding (2), masturbation (2), reflux (2), shudder (1), movement disorder (1), motor tic (1) and pertussis (1). Specific descriptive patterns were assigned to the remaining 51 events. These included staring (20) and jerks (16) or unusual dysplasia (15).[16] Similarly, we had 23/74 (31%) patients with tic and movement disorders and one patient had interestingly oculogyric crisis due to overdose use of pimozide.

Benign myoclonus of early infancy is a rare condition characterized by nonepileptic spasms that may resemble the epileptic spasms as seen in West's syndrome.[20] Myoclonic jerks occurred within the first 16 days (median 3 days) of life irrespective of other conditions. The jerks are predominantly observed at the beginning of the sleep and disappeared spontaneously in the first 10 months (median 2 months) of life.[21] We found that two patients had myclonus in infancy and three had nonepileptic myoclonus.

Narcolepsy is a rare condition in childhood and characterized by daytime sleepiness, cataplexy, sleep paralysis and hypnogogic hallucinations.[22] In a study on adults, it was reported that the symptoms started before 15 years of age in more than 50% of patients, and they were evident before five years of age in 4.5% of the patients.[23] In our study, 20 patients had sleep disorders and one of them was a rare case. This patient was referred to our epilepsy center with recurrent status epilepticus attacks and normal routine EEG findings. During his admission, we realized that he had daytime sleepiness, sleep paralysis and normal long-term video-EEG recording. We confirmed the diagnosis of narcolepsy with polysomnography, MSLT, and positivity in HLA DR2, DQB1*0602.

Connolly et al. investigated video-EEG monitoring in 43 children with frequent seizures of symptomatic generalized epilepsy.[5] Seizures were classified in 15 of the 25 patients investigated to determine seizure type, and classification was different from the original in nine of the 15 children. A change in epilepsy syndrome classification was made in nine children. Prolonged video EEG allowed diagnosis in 25 of the 43 children (59.5%).[5] Our study showed that the generalized epilepsy with respect to clinical signs and EEG findings was related with the younger age group. Furthermore, some patients were newly diagnosed as secondary generalized epilepsy while they were followed up with primary generalized seizure before. At this point, even if there is a focal focus, it may be presented with generalized seizure in younger age group. The occurence of focal epileptogenesis which result in generalized findings is important to determine early treatment modalities before occurrence focal epileptogenesis.[24-27] In addition, Gupta et al., evaluated children who had generalized abnormality on scalp EEG but had focal lesion on MRI, and reported that they benefited from surgical treatment.[27] For this reason, they indicated that even in older children with surgically remediable epilepsy, interictal and ictal scalp EEGs may reveal generalized and multiregional abnormalities with no dominant EEG focus.[27]

Gelastic seizures comprise a very rare form of epilepsy.[28] They present with recurrent bursts of laughter voices without mirth and are most commonly associated with the evolution of a hypothalamic hamartoma.[28] However, focal cortical dysplasia can also cause "laughing seizures", and such cases can be difficult to localize with EEG.[29] Similarly we also detected hamartoma in Tuber cinerum in one patient who had gelastic seizure.

In a study performed on 100 adult patients, as a result of the monitoring session, anticonvulsant medication started in 10 patients, changed in 47, stopped in five and remained unchanged in 23 patients, and 20 patients underwent surgery.[4] Another study with 400 patients, antiepileptics were started in 19 patients, stopped in six and remained unchanged in 110. The type and/or number of antiepileptics were changed in the 111 patients.[4]

In our study, antiepileptics were changed or rearranged in 84.56% of the patients after video EEG monitoring. Thus, we suggest that long term video-EEG monitoring evaluation is an important and a useful tool to attain treatment modalities in intractable epileptic patients. In conjunction with serial monitoring of serum anticonvulsant drug levels, comprehensive monitoring provides objective data for the rational treatment and management of seizure disorders which heretofore have been on empirical trial and error.[6]

In the current study, we found that almost all lateralizing signs were seen in patients older than 6 years of age. Contralateral head version (14.4%) was the most frequent lateralizing sign in all age groups. Most common localizing signs were ipsilateral automatism (16.9%), contraletral dystonia (12.9%), and nose wiping (11.4%). Although thirst and coughing were detected in limited number of the patients, all of them were signed to temporal lobe epilepsy. In a study involving adults with intractable temporal lobe epilepsy, 34% of the patients had a clear history of fear accompanied by a rising epigastric sensation as the initial manifestation of their habitual attacks.[30] In addition, they found that patients with more pronounced amygdaloid atrophy had prolonged febrile convulsions more commonly in early childhood and secondarily generalized seizures more frequently.[30] Fogarasi et al. evaluated localization and lateralization signs as two parts in children with epilepsy.[14] One of them is a behavioral change (BC) that refers to behavior arrest, another is affective type symptom that refers to ictal fear. Arrest-type BC lateralizes to the right hemisphere, while affective-type BC localizes to the temporal lobe in childhood partial seizures.[14] Thus, they put forward that type of BCs could add important information to the presurgical evaluation of young children with refractory partial epilepsy.[14] Similar to the literature, we determined behavior arrest in 12.4% of the patients, 68% of them was extratemporal lobe epilepsy, and 24% of them were younger than 6 years of age. Additionally, ictal fear was more common (64.2%) in temporal lobe epilepsy.

In the literature, about 30% of partial seizures were resistant to treatment; many of them were potentially candidates for surgical treatment despite the fact that the age at time of surgery steadily decreases, in the conviction that the persistence of intractable partial epilepsy is detrimental to cognitive development and can damage brain areas that are apparently healthy.[1]

In a study which evaluated 48 surgery patients, 29 of them became seizure-free, and 16 of them experienced greater than 90% seizure reduction after surgery.[4] VNS was performed in 11 patients; two became seizure-free and seven improved markedly.[4] Prilipko et al. discussed the results of the first 250 patients investigated with the long-term video-EEG monitoring unit.[31] Two-third of these patients were adults and one-third of them were children and adolescents.[31] Globally, more than 90% of patients benefited significantly from the surgical intervention: 76% of patients were seizure free and 18% significantly improved.[31] In a study on 150 patients, 25% were adolescents or infants who had surgery: 78% were seizure-free in the post-operative period, 14% were significantly ameliorated, and more than 90% significantly benefited from the intervention.[32] Our study is concordant with other studies and after surgery, 23 (19 resective, 4 VNS) patients were seizure free, and remaining patients had obviously decreased seizure frequencies. For this reason, the necessity of a rapid diagnosis of pharmaco-resistant epilepsy, amenable to surgical treatment, is discussed in order to obtain an optimal seizure control and preservation of the integrity of cognitive functions.[31]

CONCLUSION

It appears that prolonged video EEG is indispensible for differential diagnosis and management in epilepsy and nonepileptic events. Furthermore, it is a part of evaluation for patients who will undergo epilepsy surgery. Prolonged video EEG monitoring is also mandatory in children with refractory epilepsy for successful and true diagnosis, classification, and management of the seizures. Especially, video EEG monitoring is important for early detection of focal focus leading to generalized semiology, early treatment is important before focal epileptogenesis happens in younger age group. To our knowledge, our study is first comprehensive trial evaluating the characteristics and differences of the seizures between early and late childhood.

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