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STUDY OF CORRELATION OF ICTAL VIDEO EEG AND SEMIOLOGY OF SYMPTOMS OF SEIZURES.

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ABSTRACT

Introduction: Ictal recordings have long been considered a critical component of the pre-surgical evaluation. However, with the exception of TLE, the localizing value of Ictal EEG not been extensively studied. In this study, we are trying to correlate the ictal video EEG with semiology of symptoms of seizures. There are lots of studies which are dealing in inter-ictal EEG but very few shows ictal Video EEG correlation with semiological classification of seizure. This will also be the first study involving the population of North-east which had been exclusive from medical research till now in the field of epilepsy.

Methodology: In this pilot study, 100 patients who had paroxysmal event or seizure during Video EEG Monitoring were included in this study. The data was collected by taking clinical history of the patients, Interviewing the attendant and eye witness, Video EEG monitoring. The patient underwent at least 12-hour video EEG and events were recorded. The records of Video EEG were reviewed by electrophysiologist and Clinical semiology of symptoms of seizure was done by the neurologist. Both the semiology of seizure was compared. After the ictal video EEG recording, the electro physiologist had classified the seizure and at the same time clinical classification of seizure was done independently by the neurologist. The two semiological classifications were compared with each other and noted the variation.

Results: In Ictal phase, tonic movement had occurred in 74% and clonic in 44% of the cases. The version of head and eye (both forced and unforced) was found in the 44% cases. In the complex behavior, oro-alimentary automatism, motor /gestural automatism was found to be 27% and 23% respectively. The extreme fear was associated with both temporal and frontal seizure in 16% cases and laughing or crying was found in 10% case. The hyper motor activity finds worth mentioning especially seizures originating in frontal lobe in 11% cases. The facial grimace was in 10% case and ipsilateral nose rubbing in 4% cases.

Conclusion: Our results, confirm some Ictal clinical sign, when studied in cluster can be used as localization and lateralization of epilepsy. When the clinical semiology of seizure correlated with the ictal Video EEG findings can confirm the localization and lateralization in 76% of cases. Therefore, the finding of our study further consolidated the concept that VEEG and semiology of seizures when done together in detail can be accurate as depicted by the positive predictive value. The other modalities like invasive recording and functional MRI would still be required to ascertain the seizure zone before elective surgery.

KEYWORDS : Seizures, EEG, Video EEG, Semiology of Seizure Symptoms

INTRODUCTION

In most developed countries, video-EEG (VEEG) performed in epilepsy monitoring units is a well-established diagnostic tool with a widely recognized purpose. Major indications include either differentiation between pseudo seizures and epilepsy, presyncope, to diagnose the type of seizure correctly, pre-surgical assessment in preparation for epilepsy surgery, diagnostic assessment of intractable seizures, and sleep disorders[1]. In India, VEEG is an emerging technology with which practicing clinicians have had limited experience. Referrals for VEEG are also quite limited due to lack of awareness about this test. Ictal recordings have long been considered a critical component of the pre-surgical evaluation. However, with the exception of TLE, the localizing value of Ictal EEG not been extensively studied. In this study, we are trying to correlate the ictal video EEG with semiology of symptoms of seizures. There are lots of studies which are dealing in inter-ictal EEG but very few shows ictal Video EEG correlation with semiological classification of seizure. This will also be the first study involving the population of North-east which had been exclusive from medical research till now in the field of epilepsy.

AIM

To compare the efficacy of semiology of seizure made by Ictal Video EEG with clinical semiology of seizure symptoms

MATERIAL & METHOD

This pilot study was carried out at Institute of Neurological Sciences, GNRC Hospitals Comprehensive Epilepsy Care Unit, Guwahati. The study population consists of patient mainly from north eastern region who had been having paroxysmal events or seizures and were referred or admitted to this hospital for Video EEG monitoring. In this study, 100 patients who had paroxysmal event or seizure during Video EEG Monitoring were included in this study. The data was collected by taking clinical history of the patients, Interviewing the attendant and eye witness, Video EEG monitoring. The patient underwent at least 12-hour video EEG and events were recorded. The records of Video EEG were reviewed by electrophysiologist and Clinical semiology of symptoms of seizure was done by the neurologist. Both the semiology of seizure was compared. After the ictal video EEG recording, the electro physiologist had classified the seizure and at the same time clinical classification of seizure was done independently by the neurologist. The two semiological classifications were compared with each other and noted the variation. The observations were plotted as per tables and charts and mean, median, mode & SD was calculated by SPSS 07 software. The positive predictive value was noted when semiology of symptoms of seizure was correlated with VEM monitoring. We tested the differences of continuous parameters for statistical significance with Mann Whitney U Test. The Z test for two proportions was used to compare two seizure zone symptoms & its localization. The chi square test was used where ever applicable.

RESULTS

There were 56 males and 44 females out of 100 patients. The mean age at the time of Video EEG study was 19.4± SD11.99 year, (range, 0.5 – 65 years). The mean age at the onset of disease was 11.9± SD 9.9 years (range,0.3 - 60 years). The average duration of illness had been 7.98± SD 7.0 yrs(range from 0.5 to 32 years). The seizures burden was calculated by seizure frequency and was found to be in the range from multiple episodes in a day to 1 episode in two years. The maximum number of patients was from age group of 11 to 20 years amounting to 50% of cases.

Epileptic seizures were seen in 90 patients and non-epileptic form events were found in 9 patients. The 1 patient has both epileptic seizures and non-epileptic seizures. There were 1 patient with primary generalized seizures, 35% had secondary generalization after focal onset and 63 % had partial seizures historically and 1 % had mixed seizure.

The Aura was found in 56 %. Both history of febrile seizure and birth asphyxia was present in 11% patient respectively. The average length of stay was 2 days and the average number of events recorded per patient was 3. There were 44 cases who had daily frequency and 32 had persist seizures, 12 had rare seizures and another 12 had unspecified or variable nature of the disease.

In the aura, the most common was staring which was present in 44%, looking around' in 42% cases, somato sensory aura in the 32%. visual symptoms and hallucination in 12%. In the autonomic changes, breathing difficulty and the cardiovascular symptoms were commonly present.

In Ictal phase, tonic movement had occurred in 74% and clonic in 44% of the cases. The version of head and eye (both forced and unforced) was found in the 44% cases. In the complex behavior, oro-alimentary automatism, motor /gestural automatism was found to be 27% and 23% respectively. The extreme fear was associated with both temporal and frontal seizure in 16% cases and laughing or crying was found in 10% case. The hyper motor activity finds worth mentioning especially seizures originating in frontal lobe in 11% cases. The facial grimace was in 10% case and ipsilateral nose rubbing in 4% cases.

In the post ictal phase, generalized weakness was the most common feature occurring in 39 % of the cases followed by confusion in 26% cases, focal motor deficit in 23% cases and dysphoria in 19% cases. The amnesia was found in the 16% cases associated especially with temporal lobe epilepsy. The urine incontinence was an important feature of generalized epilepsy in 19% cases and 12% cases had tendency to urinate which is mentioned occasionally in various studies. The post ictal aphasia was seen in 17% cases. There was unusual hunger and thirst in the 02 % cases. The clinical semiology was made in each case after taking detailed history from the relatives, patients and even by phone from the school teachers, friends and wardens where ever the localization and lateralization was a problem or history was doubtful. As per the history, clinical semiology was made in all the patients but only in 76% cases semiology was found to be correct when compared with VEEG findings. There were 41 cases of Temporal Lobe Epilepsy historically but only 34 cases (83%) could be localized to temporal lobe by Video-EEG and clinical semiology. The remaining 07 cases which could not be localized were further classified into more specific groups like Fronto-Temporal, Temporo-Occipital and psychogenic non-epileptic seizure depending on the video EEG findings and clinical pictures. There were 31 cases of Frontal Lobe Epilepsy clinically but only 16 (52%) cases could be localized to frontal lobe with the help of clinical semiology and video-EEG. The remaining 15 were further classified to their respective groups. There were 06 cases of Primary Generalized Epilepsy clinically and confirmed by Video-EEG. The 05 more cases were included in this group after video-EEG evaluation as they had generalized expression in video-EEG and devoid of any focal localization. There were 04 cases of Occipital Lobe Epilepsy, 03 cases of Parietal Lobe Epilepsy, 01 case of Lennox Gaustat syndrome and 01 case of West syndrome. There was 01 case of psychogenic non-epileptic seizure which was confirmed after clinical correlation and video-EEG study but 08 more cases were included in this group as all these cases had a suspicion of Temporal/Frontal Lobe Epilepsy and video-EEG did not reveal any changes suggestive of Epileptic form discharges All in all 24 cases out of 100 patients were found to be mislocalized clinically when compared with Video EEG. The most of these cases were from frontal lobe possibly due to rapid spread to other areas and unavailability of large area to scalp electrodes. Statistically, there was no significant difference found between semiology of seizure by Video EEG when compared with clinical semiology of symptoms of seizure. Mann Whitney U Test (Two tail) was used to test significance. Overall Positive predictive value (PPV) of the seizures indicated that in spite of above statistical findings, the semiology of seizure done by Video EEG was superior to clinical semiology.

DISCUSSION

In this pilot study we correlated the Ictal VEEG changes with semiology of symptom of seizure in our northeast population.

Patterns of seizures The sequential analysis of the seizure pattern manifested by these 100 patients revealed: 41(41%) Temporal Lobe Epilepsy (TLE), 31(31%) Frontal Lobe Epilepsy (FLE), 08(8%) Fronto Temporal, 01(1%) Fronto Central, 01(1%) Temporo Occipital, 03(3%) Parieto Temporal, 03(3%) Parietal Lobe Epilepsy (PLE), 03(3%) Occipital lobe epilepsy (OCE), 06(6%) Primary Generalize epilepsy (PGE), 01 psychogenic non epileptiform activity, 01 West syndrome and 01 Lennox Gastaut Syndrome (LGS). In other studies, similar prevalence has been noticed where complex partial seizure arises from the temporal lobe in about 60% of cases, the frontal lobe in about 30% and other cortical areas in about 10% of cases [2]. The marginal variation in the prevalence was expected as we had divided the patients into more specific group like Fronto temporal, Parieto temporal and Temporo occipital etc.

Temporal lobe epilepsy A similar pattern was noted in the study by Kotagal and associates who analyzed 31 Engel class 1 patients, who had complex partial seizures of temporal lobe onset to detect symptom clusters and seizure progression. Aura consisting of psychic symptom or auditory and visual hallucinations have been also proposed as reliable indicators of lateral temporal seizure as mentioned in Williamson et al,1987[3]. Conversely autonomic auras (especially epigastrium) have been considered typical of MTLE and to be rare with NCTE. While we found olfactory and gustatory hallucinations only occurred in this MTS group and autonomic auras were more common in these MTS patients. The lateralizing value of versive head & eye movement was seen in 43%. Kahane F et al. found that forced head deviation was contralateral in more than 90% of seizure, when the seizure developed in generalized tonic-clonic seizure or occurred within 10s prior to generalization[4]. In our study, 41% patients had head version which is comparable to above studies. On comparing the head version of both frontal and temporal lobe epilepsy, it showed that the head turning is initiated earlier in FLE and last longer in the TLE. When ipsilateral head turning was present, it always preceded contralateral head turning. In TLE, the spread of seizure activity to the FEF is reflected by contralateral head turning (Shin et al.,2002),[5] but the spread occurs only after a considerably longer time than in case of spread within the frontal lobe (Gotz- Trabert et al.,2008)[6], which may then be reflected by later head turning as shown in our study and also for extratemporal lobe epilepsy in general. The lateralizing value of unilateral dystonic posturing was first described in the English literature by Kotagal et al.[7] in his study, a total of 118 seizures in 31 consecutive patients who became seizure free after temporal lobectomy and in 10 patients who underwent video/eeg evaluation were reviewed. Unilateral dystonic posturing was observed in 41 seizures in 18 patients and dystonic posture was always contralateral to the side of seizure onset. In our study 20 patients (49%) had dystonic postural out of 41 patients of TLE, 15 patients had contralateral localization and 4 patient had unilateral features and only 1 patient had bilateral dystonic feature. This was only seen in the temporal lobe epilepsy. Ipsilateral the nose wiping was again important features of TLE in 14 patients (34%) out of 41 patients of TLE. In the Leutmezer et al. study, ipsilateral nose wiping occurred in 86.5% of TLE patients. conversely, nose wiping was ipsilateral in 54.5% of patients with extra temporal lobe epilepsy[8]. The post ictal paresis is the oldest described lateralising sign. He also observed 44 patients with post ictal paresis among 328 patients (13.4%). The suspected mechanism includes neural exhaustion of the primary motor area. In our study, there were 22 cases (54%) who had post ictal weakness. The incidence was high in our study as this percentage is out of 41 TLE patients. The overall incidence is 23%. In our study, the post Ictal confusion was seen in 15 cases (37%) out of TLE. We also had 5 cases of post ictal aphasia in TLE and 12 cases in FLE making overall 17 cases (17%), all were lateralized to the dominant side. Mesial temporal sclerosis (MTS), hippocampal sclerosis (HS), is the most common cause of TLE, representing greater than 80% [9]. We had 7 patients MTLS & 7 patients hippocampal malformation patient. We had less numbers i.e. 14 patients out of 34 which is only 40% possibly due to our inexperience in detecting the abnormal radiological changes or less occurrence in this part of country, needs larger study to prove. The epigastirc sensation was found in 20% cases, staring in 4% cases & complex motor seizure in 16% cases and looking around in 20% cases which is also found in the Kotagal et al 1995. The lateralization of these symptoms was found in dominate side in 60% case on the basis of long duration of seizure lasting more than 01 mins.

The Ictal EEG onset was defined by the occurrence of a low voltage fast beta activity spikes or occurrence of a rhythmic theta in TLE. Fast rhythmic sharp waves and post-Ictal showing occurred more often in patients with MTS than those with NTLE, while bilateral seizures activity occurred more than an earlier in patients with NTLE. There are two previous preliminary reports comparing scalp ictal-EEG in patients with MTLE, noted that its appearance correlated with the spread of seizures activity into the lateral neocortex on simultaneous

depth electrode recording. The finding that the scalp-EEG changes become bitemporal earlier in patients with NTLE is likely to reflects earlier spread in these patients to the contralateral temporal neocortex. [10]The presence of lateralized onset seizure activity, fast rhythmic sharp waves and lateralized post-ictal slowing were all highly predictive for lateralization of the side of the lesion.

Frontal lobe epilepsy FLE occurs in approximately 30% of adult with partial epilepsy.[11] Rasmussen described the clinical, EEG, radiological and pathological finding in 40 patients with non-tumoral epileptogenic lesions who underwent cortical excision of portion of frontal lobe and remained seizure free of 5 year. The Seventeen (42%) of his patients reported no aura. seven (17%) had a somatosensory aura and five patients 12% each, had epigastric, vague head and general body sensation as aura. Absence or amnestic episodes were present in 14 (35%), automatism in 12 (30%), focal sensorimotor attacks in 11(27%) and generalized convulsions in 36(90%) of their patients. Otherwise in another study also, higher proportions of frontal lobe patient (18 - 55%) have been reported to have Aura in the literature[163]. In our study, there were 31 patients who were semiologically found to have purely FLE. The no aura was found in 16 patients (52%) case. The staring was most common, found to be in 15 patients (48%), & cephalic aura in 10 patients (32%), somatosensory aura in 8 patients (26%) and 6 patients (19%) had hyper motor behavior. Kotagal et.al reported staring in 31% of FLCPS but only in 12% mesial temporal seizure.

OCCIPITAL LOBE EPILEPSY Occipital lobe epilepsies are relatively uncommon on epilepsy monitoring units, making up only about 5 % (1.6 -8%) of epilepsy cases. In 70 % to 90 % of cases, the major clue comes from the presence of visual phenomena in the early seizure symptoms. If visual symptoms are minor or absent, seizure localization to the occipital lobes is likely to be missed. [13] In our study we have 03 cases which form 3 percent of our cases which is almost same as mentioned in above studies.

Parietal/epilepsy The two most common manifestations include paresthetic seizures and painful seizures. In our study we had 03 case of suspected parietal lobe epilepsy as two had tingling sensation, crawling sensation over whole body.

Psychogenic non- epileptic seizure The non-epileptic seizures are a frequent phenomenon which includes involuntary episodes of movement, sensation, or behavior resembling a seizure but do not result from abnormal cortical discharges. It is estimated that 5% to 33% of the outpatient epilepsy population and is even higher inpatient & comprehensive epilepsy care center where frequency is reported from 30 to 50%[14]. Unfortunately, the mean latency between initial manifestations and correct diagnosis is 7.2 years and up to 7.5% gets the AED initially. In our study, we had 9 patients of PNES which is in comparable to the prevalence rate in various study and also matches the clinical description. The 4(44%) patients had somatosensory symptoms to begin with mainly cephalic vague sensations, 3(33%) patients had breathing difficulty, 4(44%) patients showed fluctuating ,variable, long lasting, motor tonic ,clonic activities including pelvic thrusting.

CONCLUSIONS

The VEEG remains an important diagnostic test in evaluating a patient with possible epilepsy, providing evidence that helps to confirm or refute the diagnosis. It also assists in classifying the underlying and there by guide management of epileptic syndrome. Our results, even though is not 100% conclusive, but confirm some Ictal clinical sign, when studied in cluster can be used as localization and lateralization of epilepsy. When the clinical semiology of seizure correlated with the ictal Video EEG findings can confirm the localization and lateralization in 76% of cases. Therefore, the finding of our study further consolidated the concept that VEEG and semiology of seizures when done together in detail can be accurate as depicted by the positive predictive value. The other modalities like invasive recording and functional MRI would still be required to ascertain the seizure zone before elective surgery.

Recommendations –

The novelty of the study is, that despite the above limitations, it illustrates for the first time north eastern Indian population in the study like this. VEEG contributes significantly to long term therapeutic and economic benefits to the patients with difficult to diagnose and treat paroxysmal effect. The recommendations of the study are as follows: -

1. VEM should be used in all case of seizures disorder to confirm the epilepsy of the paroxysmal event and initiate appropriate therapy, thereby improving the patient's quality of life.
2. The clinical semiology of symptoms of seizures should be done initially by neurologist or treating physician before sending the requisition for VEM.
3. Relatives should make video clips of seizures of their ward and make them available to compare with VEM recorded events.
4. Complex partial seizure requires neuroimaging especially MRI brain and seizure protocol for neuroimaging should be followed in every case.
5. The potential candidate for epilepsy surgery would require invasive recording and functional MRI to ascertain the seizure zone and its relationship to eloquent area of cortex (language area, motor & sensory cortex), thereby reducing the risk of permanent & neurological deficit after cortical resection.

CONFLICTS OF INTERESTS: NONE

FINANCIAL BENEFITS: NONE

TABLE 1: Clinical Semiology Of Symptoms And Signs Of Aura

COMPARISON OF SYMPTOMS OF SEIZURES		TLE		FLE		PLE		OLE		PGE		OTHERS		PNES		TOTAL
		N=41	%	N=31	%	N=3	%	N=3	%	N=6	%	N=15	%	N=1	%	N=100
AURA	NONE	19	46	16	52	0	0	0	0	3	50	5	33	1	100	44
	SOMATOSENSORY	14	34	8	26	3	100	0	0	0	0	7	47	0	0	32
	VISUAL	6	15	3	10	0	0	3	100	0	0	0	0	0	0	12
	AUDITORY	0	0	2	6	0	0	0	0	0	0	0	0	0	0	2
	OLFACTORY	1	2	1	3	0	0	0	0	0	0	1	7	0	0	3
	GUSTATORY	5	12	2	6	0	0	2	67	1	17	1	7	0	0	11
	VESTIBULAR	8	20	1	3	0	0	1	33	0	0	1	7	0	0	11
	DYSAMENSIA	15	37	0	0	0	0	0	0	0	0	0	0	0	0	15
	EMOTIONAL	10	24	0	0	0	0	0	0	0	0	0	0	0	0	10
	PSYCHIC	10	24	1	3	0	0	0	0	1	17	1	7	0	0	13
	CEPHALIC	7	17	10	32	0	0	0	0	0	0	2	13	0	0	19
	DIGESTIVE	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1
	UROGENITAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	STARING	27	66	15	48	0	0	1	33	0	0	1	7	0	0	44
	LOOK AROUND	20	49	9	29	2	67	1	33	2	33	8	53	0	0	42
AUTONOMIC CHANGES	CARDIOVASCULAR	5	12	2	6	0	0	0	0	0	0	1	7	1	100	9
	RESPIRATORY	11	27	4	13	1	33	0	0	0	0	1	7	1	100	18
	THERMOREGULATORY	3	7	0	0	0	0	1	33	0	0	0	0	0	0	4
	PUPILLARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	VOMITING	3	7	0	0	0	0	0	0	0	0	1	7	0	0	4
	SIALORRHEA	3	7	0	0	0	0	0	0	0	0	0	0	0	0	3
	URINATION	0	0	6	19	1	33	0	0	0	0	1	7	0	0	8
	SWEATING	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1

TABLE 2: Comparison Of Clinical Semiology Of Symptoms Of Seizure With Ictal Veeg

ICTAL VEEG FEATURES Vs CLINICAL SEMIOLOGY OF SZ					
LOCALIZATION OF VARIOUS EPILEPSY	CLINICALLY	CLINICALLY & VIDEO EEG	MISLOCAL -IZATION	REMARKS	PPV (%)
TLE	41	34	7	To PNES- 5, PGE-1, PT-1	82.93
FLE	31	16	15	To PNES-3, PGE-4, FCT-4, PT-2 , CP-1, OCE-1	51.61
FRONTO TEMPORAL (FT)	8	6	2	To FCT-2	75
PARIETAL TEMPORAL (PT)	3	6		From TLE-1, FLE-2	100
TEMPORAL-OCCIPITAL (TO)	1	1	0	-	100
FRONTO CENTERO TEMPORAL (FCT)	0	6		From FLE-4, FT-2	100
FRONTO CENTRAL (FC)	1	1	0	-	100
CENTRO PARIETAL (CP)	0	1		From FLE-1	100
PLE	3	3	0	-	100
OLE	3	4		From FLE-1	100
PGE	6	11		From TLE-1, FLE-4	100
PNES	1	9		From TLE-5, FLE-3	100
LGS	1	1	0	-	100
WEST SYNDROME	1	1	0	-	100

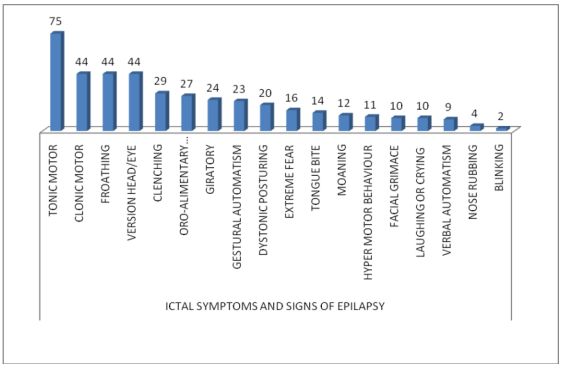

FIG 1: Clinical Semiology of Ictal Symptoms and Signs

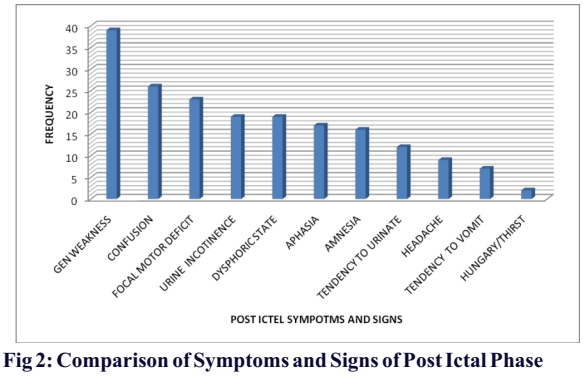

Fig 2: Comparison of Symptoms and Signs of Post Ictal Phase

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