Outpatient based Video EEG Monitoring and Outcome A Step towards Epilepsy Surgery

Anand Diwan[1], Gouri Diwan[2], Ashok Pillai[3], Milind Vaidya[4], Mahendra Guta[5]

ABSTRACT

Introduction: The central role in the diagnosis of the epilepsy is played by electroencephalogram (EEG). Also, in India, there exists a large treatment gap as appropriate treatment for the condition is not received by the patients suffering from active epilepsy. The main reasons responsible for this includes poverty, lack of knowledge, social stigma and poor health infrastructure. In developing countries an enormous gap between the number of patients who could be benefited from epilepsy surgery and those who actually receive this treatment has been created by the lack of availability and affordability, which can only be minimized by developing more centres in the country, where epilepsy surgery can be undertaken. Hence; we undertook the present study to create a model for Epilepsy surgery programmse in small cities/ district places accessible to majority of medically refractory patients.

Material and methods: The present study was carried out in the epilepsy centre. For predicting medically refractory epilepsy, a pre surgical evaluation was carried out on out-patient basis,saving cost and inconvenience of hospitalization for pre-surgical evaluation. It included Video EEG, MRI 1.5 or 3 Tesla, Neuropsychiatric assessment. If required, functional imaging – like PET scan,Syndromic classification and differentiation of True and Pseudo-seizures and epilepsy mimics were made-based on the on semiology, interictal and ictal EEG. MRI brain 3 T (if not imaged before) and neuropsychology assessment was done in medically refractory epileptic patients. Few patients were asked to undergo PET-CT scan-Brain. All the results were recorded and analyzed using SPSS software.

Results: Surgically remedial Epilepsy was found in 24patients, out of which 9 patient successfully undergone Epilepsy surgery with Engel-1 outcome for the follow up ranging from few months to 1 year. All patients are free of minor as well as major seizures. No permanent disability or adverse effect was seen post surgically.

Conclusion: Selection of candidates destined to have a seizure-free outcome using locally available limited technology and expertise is required for developing cost-effective, epilepsy surgery centres in India

Keywords: Ambulatory, Electroencephalogram, Epilepsy

INTRODUCTION

The central role in the diagnosis of the epilepsy is played by electroencephalogram (EEG).[1] It is difficult to capture seizures on a short EEG since they can be very rare events. The trend has shifted in favour of prolonged EEG recordings.[2] For the pre-operative evaluation of the epilepsy patients, although long-term inpatient video-EEG (vEEG) telemetry has long been considered the gold standard, it is resource-intensive, time-consuming, costly, and not universally available.[3]

EEG recording of the patients on a portable unit has been enabled with Ambulatory EEG (aEEG) while the patient conducts normal activities of life at home, school, or work. Quality of aEEG recordings are subjected to various artefacts causing quality degradation and electrode connection issues as the patient is unmonitored and not confined to a single location. In comparison to the traditional monitoring of the patients, aEEG recording costs approximately 50%.[4] In India, there are approximately 10 million persons suffering from epilepsy.[4]

Also, in India, there exists a large treatment gap as appropriate treatment for the condition is not received by the patients suffering from active epilepsy. The main reasons responsible for this includes poverty, lack of knowledge, social stigma and poor health infrastructure. Pre-surgical evaluation and epilepsy surgery is essentially required in twenty to twenty five percent of the epileptic patients which are found to be refractory to traditional medicinal treatment. In India, there are less than 2000 neurologists and less than 20 established Epilepsy surgery centres and it is almost impossible to collectively assess this medically refractory patients.[5]

It is immensely important to create such centres in each district. Every year, nearly 1000 epilepsy surgery/year in India are currently being performed in India. Thus, only a minuscule of potential surgical candidates in India ever gets a chance to undergo pre-surgical evaluation. In developing countries an enormous gap between the number of patients who could be benefited from epilepsy surgery and those who actually receive this treatment has been created by the lack of availability and affordability, which can only be minimized by developing more centres in the country, where epilepsy surgery can be undertaken.[6]

Hence; we undertook the present study to create a model for Epilepsy surgery programme in small cities/district places accessible to majority of medically refractory patients.

MATERIAL AND METHODS

The present study was carried out in the epilepsy centre of the institution and included assessment of 210 patients from June 2014 to July 2016. For predicting medically refractory epilepsy ,, a pre surgical evaluation was carried out on out-patient basis,saving cost and inconvenience of hospitalization for pre-surgical evaluation. It included Video EEG, MRI 1.5 or 3 Tesla,

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Neuropsychiatric assessment. If required, functional imaging – like PET scan, saving cost and inconvenience of hospitalization for pre-surgical evaluation. After acquiring short training in EEG and epilepsy monitoring, epilepsy programme was started as a part of out-patient clinic in March 2014. In the side of the main consulting room, a Video-EEG room was established in which Nihon-Kohden Video EEG system was installed. A staff trained in nursing care was given added training in monitoring Video-EEG patients personally and though workshops conducted for technicians by teaching institutes. Emergency care (Oxygen, multipara monitoring, suction, AMBU bag-mask and intubation facilities) was also made available in the same room. Only on outpatient basis, Video EEG monitoring was performed for all patients for 8 to 12 hours.

Depending upon frequency of attacks, drug tapering was decided to record habitual attacks but at the same to avoid clustering of seizures. If attacks were daily-no tapering was advised. For 2-3 attacks/week- only sleep deprivation (3-4 hrs of sleep) was suggested. For infrequent attacks like one or less/week (day 1-75% and day-2, 50% tapering was done). Patients without history of major GTCs were not admitted to the indoor facility and were asked to use nasal midazolam spray if seizures occur. Those with history of GTCs or Injuries, no drug tapering was advised but asked to select appointment for VEEG based on their experience or premonitory symptoms. After admitting patients to Video EEG room, Intravenous line was secured to abort prolonged generalised seizure.

Syndromic classification and differentiation of True and Pseudo-seizures and epilepsy mimics were made-based on the on semiology, interictal and ictal EEG. MRI brain 3 T (if not imaged before) and neuropsychology assessment was done in medically refractory epileptic patients. Few patients were asked to undergo PET-CT scan-Brain. The seizure semiology, MRI brain and Pet scans were discussed with epilepsy specialists on Skype and epilepsy surgery planning was carried out. For Epilepsy surgery, patients were admitted to hospitals. The local neurosurgeon assisted and received experience in operating these patients. Over time, he would acquire more skills and knowledge and should operate independently.

STATISTICAL ANALYSIS

All the results were recorded and analyzed using SPSS software with the help of descriptive statistics like mean and percentages.

RESULTS

Surgically remedial Epilepsy was found in 24 patients, out of which 9 patients successfully undergone Epilepsy surgery with Engel-1 outcome for the follow up ranging from few months to 1 year. Of 210 Video EEGs, 43 Video EEGs did not show any interictal or ictal abnormality. Psychogenic epileptic attacks were recorded in 21patients. 24 generalised and 121 focal epileptic abnormalities were noted. The Ictal events were recorded in 128 (61%) patients, which ranged from 1 to 14.

3 cases of lesional mTS (all three left sided), 1 case of MRI negative, PET positive Rt mTS undergone ATL-AH. 1 male child of 5 years and 1female patient of 27 years old undergone corpus callosotomy for frequent disabling drop attacks. Post callosotomy female patient developed transient mutism for

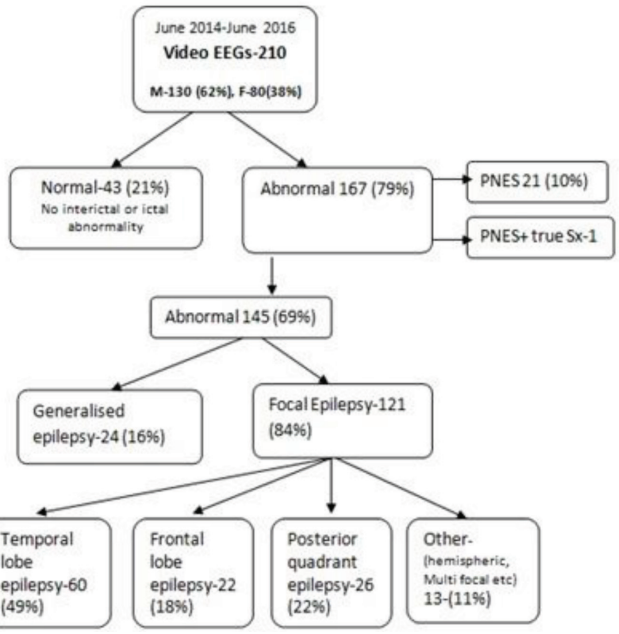

Figure-1: Flow chart of the study

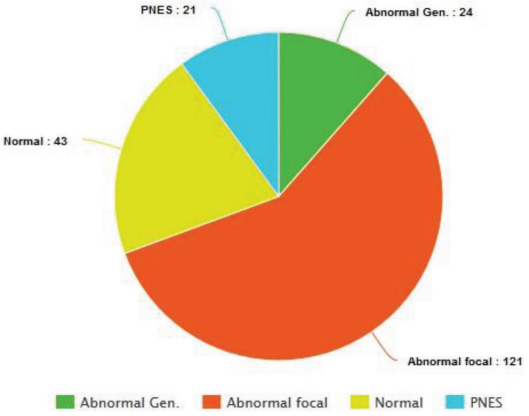

Figure-2: Distribution of patients included in the study

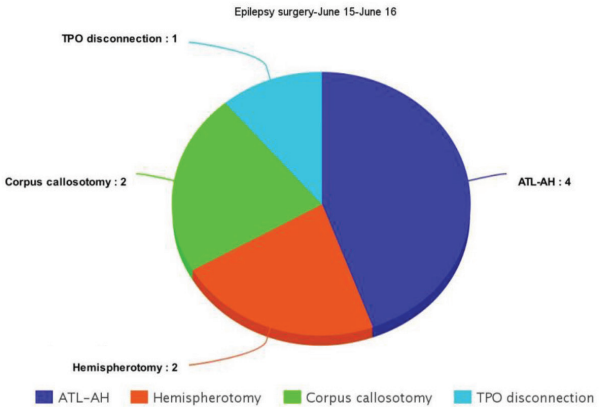

Figure-3: Distribution of patients undergoing epilepsy surgery

60-72 hours, but then fully recovered and now free from drop attacks. Her MRI showed bilateral perisylvian cortical dysplasia. 2 patients underwent Hemispherotomy for perinatal large MCA infarct causing scar epilepsy. One patient underwent posterior quadrant disconnection for gliotic scar. All patients are free of minor as well as major seizures. No permanent disability or adverse effect was seen post surgically.

DISCUSSION

Epilepsy surgery has improved over the last decade, approaching 60% to 90% seizure-free outcome in patients with temporal lobe epilepsy and 40% to 60% in extratemporal lobe epilepsy.[7] Precise localization of the epileptic foci is a prerequisite for good surgical outcome, but it remains a challenge, especially in cases of non-lesional epilepsy which are associated with normal findings on magnetic resonance imaging (MRI).[8] Hence; we undertook the present study to create a model for Epilepsy surgery programme in small cities/district places accessible to majority of medically refractory patients.

In the present study, we observed that. A total of 210 video EEGs were carried. Out of these, 130 were males and 80 were females. No abnormality was detected in 21 percent of the subjects whereas in 79 percent of the subjects, abnormality was present. Among abnormalities detected, generalized epilepsy was present in 24 subjects while 121 subjects showed presence of focal epilepsy. Majority of cases of focal epilepsy were of frontal lobe type.

A case report of 51 year old right handed male was described by Rizvi SA, who was unable to do any kind of work or driving since the age of 35 years. The reason behind his inactivity was intractable partial onset epilepsy. From his right temporal region, a total of eighteen seizures were recorded in a 72-hour outpatient ambulatory EEG. In his left hemisphere, no epileptiform activity was seen. On Magnetic resonance imaging, it was observed that right mesial temporal sclerosis and area of encephalomalacia at the medial inferior right temporal lobe was present. On doing the neurological and psychological assessment, it was observed that the patient was a good neurosurgery candidate. Following the surgery, for a time period of 10 months, the patient was found to be free from seizures. The authors believed that use of aEEG in preoperative planning should be restricted to cases of TLE and to patients with a high frequency of seizures.[9]

Zhang et al reported a complex multifocal case. With a normal magnetic resonance imaging (MRI) result and nonlocalizing electroencephalography (EEG) findings (bilateral temporal lobe epilepsy (TLE) and extratemporal lobe epilepsy (ETLE), with more interictal epileptiform discharges [IEDs] in the right frontal and temporal regions), a presurgical EEG-functional MRI (fMRI) was performed before the intraoperative intracranial EEG (icEEG) monitoring (icEEG with right hemispheric coverage). EEG-fMRI findings were reanalyzed and were found to be concordant with those of EEG and icEEG. After resection of the right frontal and temporal regions, presence of dual pathology was observed. The case suggested that EEG-fMRI is valuable in presurgical evaluation, but requires caution; and the intact seizure focus in the remaining brain may cause the non-seizure-free outcome.[10]

Efficacy of the inpatients was assessed by Guerreiro et al, who also compared them with daytime outpatient telemetry. A total of 73 patients were assessed by the authors, with medically intractable TLE. Performing of 91 telemetry sessions was done among which 35 were inpatients and 56 were outpatients. Outpatient was monitored in the EEG laboratory. In the laboratory, 18- channel digital EEG was used. In the outpatients group, no change in the medication was done. Data were analyzed in terms of period with one period equivalent to twelve hours. They didn't observed any significant difference in the between the two study groups in terms of age, mean seizure frequency before monitoring and mean number of seizures per period. From the results, they concluded that in comparison to the inpatient monitoring, for pre-surgical evaluation, Daytime outpatient video-EEG monitoring is an efficient method.[11] West et al assessed the overall outcome of epilepsy surgery according to evidence from randomised controlled trials. They searched the Cochrane Epilepsy Group Specialised Register, the Cochrane Central Register of Controlled Trials, MEDLINE, ClinicalTrials.gov and the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) for relevant trials up to 4 July 2013. All the references for the eligibility were screened by three different independent groups of reviewers comprising of two authors in each group. They extracted the data and assessed the quality of the study performed. A total of 177 studies were identified by them which consisted of over sixteen thousand participants and investigated the surgery outcome in epilepsy patients for the treatment of the same. As far as RCTs were concerned, the assessed risks of biasness were unclear or high. Multivariate models were reported in 29 studies, for the purpose of assessment of prognostic factors. The study design issues and limited information presented in the included studies mean that our results provide limited evidence to aid patient selection for surgery and prediction of likely surgical outcome.[12]

CONCLUSION

From the above results, the authors concluded that selection of candidates destined to have a seizure-free outcome using locally available limited technology and expertise is required for developing cost-effective, epilepsy surgery centres in India. However; future studies and research works are required in this area of medicine for better results.

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