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EEG correlation with clinical profile of 57 children with neurocysticercosis in rural Western Utter Pradesh

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Abstract:
Introduction: *Neurocysticercosis is the most common parasitic disease of the human nervous system. EEG in Neurocysticercosis is used to analyse epileptic activity in patients. There are few studies which show exact correlation of Electroencephalographic (EEG) findings to type of seizure activity in children with neurocysticercosis.* ***Methods:*** *This was an observational study in which 57 patients were selected for study (JULY 2012 to DECEMBER 2013) who met the definitive or probable diagnosis of neurocysticercosis as per the revised diagnostic criteria for neurocysticercosis[5]. Electroencephalogram (EEG) study was done in all patient with 32 channel EEG Ceegraph vision, EEG was performed after 3rd day of admission and duration of EEG recording in each patient was 30 minutes. EEG records were classified as (a) normal, (b) focally abnormal, or (c) diffusely abnormal and compared with the type of seizure presented in children with NCC.* ***Results.*** *All 57 patients presented with seizures, 32(56.1%) children present with Focal seizures while 25 (43.9%) children presented with generalized seizures. Among 57 children with neurocysticercosis, 13 (22.8%) had normal EEG, 44 (77.2%) children had abnormal EEG. Among 44 children who has abnormal EEG, there was focal discharge and generalized discharge in 27 (47.4%) and 17(29.8%) respectively. Among 32 (56.1%) children who presented with focal seizure 6 (18.8%) had normal EEG, 18 (56.3%) had focal discharge on EEG and 8 (25%) had generalized discharge on EEG.Among 25 (43.9%) children who presented with generalised seizure 7 (28%) had normal EEG, 9 (36%) had focal discharge on EEG while generalised discharge was present in 9 (36%).* ***Conclusion.*** *In this study focal seizures were more common type of seizures followed by generalised seizure in neurocysticercosis in children but statically the type of seizure had no relevance. EEG was abnormal in most of children with NCC. Focal discharge was most common finding in EEG. EEG has poor correlation to type of seizure.*

Keywords: *AED, Electroencephalography, seizure, neurocysticercosis, SSECTLs.*

I. Introduction

Taenia solium is the most common helminthic infection of the central Nervous system and a leading cause of Acquired epilepsy worldwide [1]Neurocysticercosis is the most common parasitic disease of the human nervous system. Its prevalence varies greatly according to the geographical region and is not yet precisely known [2].

Neurocysticercosis predominantly affects adults in their third or fourth decade of life; it is uncommon in children and elderly people.

Clinical presentation of NCC can be variable. NCC induces neurological syndromes that vary from an asymptomatic infection to sudden death. Differences in the clinical picture depend on the number, size, stage and localization of cysts and the patient's immune response. Seizures are the commonest presentation of NCC [50-80%] [3] ,various types of seizures have been described among patients with NCC including generalized, focal and rarely myoclonus and acquired epileptic aphasia. In general, it seems that about half the cases have partial seizures and the other half generalized seizures, a proportion similar to that of the general population[4].

Neuroimaging is the mainstay of diagnosis of NCC. A set of objective diagnostic criteria has been proposed which is revised diagnostic criteria for neurocysticercosis [5]Radiologically, [on contrast - enhanced computed tomography (CECT)], the lesion is typically single, small(<20 mm), well - defined, contrast enhancing (ring / disk) (hence, single, small , enhancing computed tomography lesions or SSECTLs), with or without surrounding edema and associated with minimal mass effect and no midline shift . Usually, there is no evidence of persistent focal neurological deficit and raised intracranial pressure[6].

EEG in neurocysticercosis is used to notice epileptic activity in patients. Electroencephalographic (EEG) findings show little relation

to symptoms in patients with neurocysticercosis.[7]Albendazole and praziquantel both have been used for nearly two decades in patients with NCC and their benefits have been widely documented. Controversies have surrounded the management of SSECTLs. In view of the frequent spontaneous disappearance of CT lesions, some authors do not recommend the use of cysticidal agents in the management of SSECTLs. Among antiepileptic agents single agent first-line AED such as phenytoin or carbamazepine usually results in adequate seizure control. The optimal duration of AED therapy has been debated and is estimated by identifying the parasite stage at the time of the seizure [16].There are, however, no guidelines for how long AEDs should be continued after an acute episode.

As Clinical presentation & Radiological finding of NCC is variable in children, there are few studies which do not shows exact relation of Electroencephalographic (EEG) findings to symptoms.So our present study attempts to study the type of seizure and its relation to EEG finding in children with neurocysticercosis.

II. Material and Methods

2.1 Study Design:an observational study.

2.2 Method of Selection:

The present study was carried out in the Department of Paediatrics, U.P. Rural Institute of Medical Sciences and Research, Saifai, Etawah (U.P) during JULY 2012 to DECEMBER 2013. Ethical clearance was obtained from the ethical committee of the college. The study group enrolled (total 108 patients) were drawn from the patients presenting to the indoor patient of the department, aged more than 1 year and less than 14 yearswith convulsion of onset less than 8 days of admission and without meningeal signs and among them 57 patients (met the definitive or probable diagnosis of neurocysticercosis as per the revised diagnostic criteria for neurocysticercosis [5]) were taken in to study.

2.3 Inclusion-criteria

1-Patients coming under definitive or probable diagnosis of NCC as per the revised diagnostic criteria for neurocysticercosis [11].

- However, histological demonstration of the parasite from biopsy of a brain lesion was not done, as this is an invasive procedure.
- Also, serum EITB and CSF ELISA tests were not done due to nonavailability of these tests in the institute and non-affordability of the patients.

Thus, the diagnosis will be based on clinical and radio-logical features. (MRI not done due to non-affordability of the patients).

2-Age group 1-14 years.

2.4 Exclusion criteria-

1. Subjects with Mantoux positivity & evidence of tuberculosis,
2. HIV-reactive patients.
3. Patients with known malignancy were excluded due to greater chance of intra cranial space occupying lesions in these patients.
4. Patients in moribund condition.
5. Whose guardian will not give consent?Patients with ocular cyst, ventricular cyst, spinal, hydrocephalus &Cysticercotic encephalitis Revised diagnostic criteria for Neurocysticercosis[5]

Absolute

1. Histological confirmation of parasite from biopsy of brain or spinal cord lesion.
2. Scolex on CT or MRI.
3. Subretinal parasites on fundoscopic examination.

Major

1. Lesions highly suggestive of NCC on CT or MRI (cyst without scolex, enhancing or calcified lesion).
2. Positive serum immunoelectrotransfer blot (EITB) detection of anticysticercal antibodies.
3. Resolution of intracranial cystic lesions after therapy with albendazole or praziquantel.
4. Spontaneous resolution of small single enhancing.

Minor-

1. Lesions compatible with NCC on neuroimaging
2. Clinical manifestations suggestive of NCC
3. Positive CSF ELISA
4. Cysticercosis outside the CNS Epidemiological

1. Contact with Taenia solium infection
2. Living area where cysticercosis is endemic
3. History of travels to disease endemic areas

Definitive Diagnosis-
1. One absolute criterion.
2. Two major plus one minor plus one epidemiologic criterion. Probable Diagnosis-
1. One major plus two minor criteria.
2. One major plus one minor plus one epidemiologic criterion.
3. Three minor plus one epidemiologic criteria.

A detailed medical history with emphasis on the description of the seizure, (seizure,type of seizure,headache,vomiting,loss of consciousness,loss of vision,behavioural change,fever, subcutaneous nodule,rashes,worm in stool,pain in abdomen,memory loss) ,anthropometric measurements, General examination, head to toe examination and systemic examination, including neurological examination was performed.

2.5 Investigations:

2.5.1 Diagnostic evaluation -

included haemoglobin, peripheral blood smear, total and differential leukocyte counts, microscopic examination of stool done for taeniasis, work-up for tuberculosis (erythrocyte sedimentation rate, Mantoux test, chest radiograph), HIV, EEG, contrast-enhanced CT scan of brain, Number, site, stage, size of the lesions, presence of scolex, and perilesional edema were noted.

Stool- for evidence of Taenia solium infestation Three consecutive daily stool samples were examined for the presence of proglottids and scolex of Taenia solium.

2.5.2 CECT Head-

Contrast enhanced CT scan of the head was performed on a 64 slice SOMATOM sensation SIEMENS CT scanner (Siemens).All CT scans were assessed by a neuro-radiologist independently. At the time of the initial CT scan emphasis was laid on the following characteristics of the lesions :(a) no. of lesion (b) side (c) site (d) stage (e) size (f) scolex (g) perilesional oedema.

2.5.3 EEG Study-

Electroencephalogram (EEG) study was done in all patient with 32 channel EEG Ceegraph vision (Bio-logic systems corp.) model no.580 sspl. EEG was performed after 3rd day of admission Duration of EEG recording in each patient was 30 minutes.EEG included in study to study relation of EEG with neurocysticercosis. EEG records were classified as (a) normal, (b) focally abnormal, or (c) diffusely abnormal.

III. Results

In his studytotal 57 children werediagnosed as neurocysticercosis as per diagnostic criteria. All 57 children clinically presented with seizures. 32 (56.1%) had focal seizures while 25 (43.9%) presented with generalized seizures.

3.1 EEG and seizure profile at Presentation-

Among 57 children 13 (22.8%) shows normal EEG while 44 (77.2%) have abnormal EEG. Focal discharge on EEG was present in 27 subjects (47.4%) while generalised discharge was shown by 17 (29.8%) children.

TABLE 1-Type of seizures and EEG findings at presentation (N=57)

Features	
Type of seizures	
Focal	32(56.10%)
Generalized	25(43.90%)
Type of EEG finding	
Normal	13(22.80 %)
Focal discharge	27 (47.40%)
Generalized discharge	17 (29.80%)

3.2Demographic and clinical features

Most common age group was between 6-10 years (52.6%) mean age was 8.5±2.8. Male (59.65%) were affected more than the female (40.35%).NCC was more common in Hindu (87.72%) and among vegetarians (68.42%). All children present with seizure, most common presentation was seizure associated with headache and vomiting (40.0%), isolated seizure was present only in 09 children (15.79%), summarized in table2.

TABLE-2Demographic and clinical features of study patients (N=57)

Features		no. of cases (n=57)
Age in years		
1-5	09 (15.79%)	
6-10		30 (52.63%)
11-15		18 (31.58%)
Sex		
Male		34 (59.65%)
Female		23 (40.35%)
Religion		
Hindu		50 (87.72%)
Muslim		07 (12.28%)
Food preference		
Vegetarian		39 (68.42%)
Non vegetarian		18 (31.58%)
Clinical presentation		
Only seizures		09 (15.79%)
Seizures & headache		11 (19.30%)
Seizures & vomiting		07 (12.28%)
Seizures & headache & vomiting		23 (40.35%)
Seizures + vomiting +headache +others		07 (12.28%)

3.3 EEG in relation to type of seizure

Among 32 (56.1%) children who shows Focal seizure 6 (18.8%) have normal EEG, 18 (56.3%) have focal discharge on EEG and 8 (25%) have generalized discharge on EEG.

Among 25 (43.9%) children who shows generalised seizure 7 (28%) have normal EEG, 9 (36%) have focal discharge on EEG while Generalised discharge was present in 9 (36%), depicted in table3. (p value =0.35).

TABLE 3- EEG in relation to type of seizure (N=57)

EEG /clinical ppt.	Focal seizure	Generalized seizure	P value
Normal EEG	6 (18.8%)	7 (28%)	
Focal discharge	18 (56.3%)	9 (36%)	P= 0. 350
Generalised discharge	8 (25%)	9 (36%)	
Total	32(56.1%)	25(43.9%)	

IV. Discussion

In our study the most common EEG presentation was focal discharge when performed after third day of seizure, followed by generalized and normal pattern. The clinical pattern of seizure at the time of presentation was focal followed by generalized, but the clinical presentation of type of seizure showed variable pattern on EEG and did not correlate with the clinical presentation.

In our study all 57 children presented with seizures. 32 (56.1%) had focal seizures while 25 (43.9%) presented with generalized seizures as seizure being the most common clinical manifestation of NCC, in more than 70 % cases as reported [15]Seizures can be of any type focal or generalised, it has been documented that seizure are generalised in 80% of cases which often begin as fo cal seizure (simple and complex partial seizure) [15]. Our results were consistent with many published studies showing predominance of focal seizures at presentation namely RR das et al (2001)[16], Thussu et al (2007)[17],Swain PK et al (2007)[14]. There are some studies which are in favour of generalised seizure was the commonest presentation, Chaurasia et al (2010)[13],D Kishore et al (2007)[18],Shri Ram Sharma et al (2007)[19].and some published data shows no significant predominance of the type of se izure[8,,24] these studies were conducted mainly in adult population.Hence the type of presentation of seizure can be of any type generalised or focal although the recent studies in children as compared to adults are in favour of focal seizures which may progress to secondary generalisation as seen in our study.[16]

EEG has been found to be abnormal in 30-50% of patients with seizures due to NCC. It is assumed that EEG findings have poor correlation with symptoms and CT lesions in patients with NCC. [(9,10).]In our study EEG findings among the study group irrespective of the type of presentation of seizure clinically at the time of enrolment the electric discharges were classified as normal, focal and generalised. Among 57 children 13 (22.8%) showed normal EEG while 44 (77.2%) had abnormal EEG. Focal discharge on EEG was present in 27 subjects (47.4%) while generalised discharge was shown by 17 (29.8%) children.

Among 32 (56.1%) children who had Focal seizure 6 (18.8%) had normal EEG, 18 (56.3%) had focal discharge on EEG and 8 (25%) had generalized discharge on EEG.Among 25 (43.9%) children who presented with generalised seizure 7 (28%) have normal EEG, 9 (36%) have focal discharge on EEG while Generalised discharge was present in 9 (36%),p value of EEG finding to the type of seizure was 0.35 & is non significant.

Our results were somewhat similar to isabelcristina dos santos et al[20] 39%(normal), 56%(focal) and 5% (generalised) contrary to our results in Swain PK et al.(2007)[14] 25% have abnormal EEG, in PrabhjeetKaur,et al (2010)[11] 25% have abnormal EEG and in ShakyaBhattacharjee (2010)[12] 55.26% have abnormal EEG.

EEG did not correlate with clinical seizure pattern hence we recommend that type of antiepileptic drug initiation and duration should be more dependent on clinical presentation rather EEG results till we have more authenticated results regarding correlation of clinical seizure and EEG.

V. Conclusion

There are very less number of studies in neurocysticercosis in children which studied type of seizure in relation to EEG. In this study Focal seizures were more common type of seizures than generalised seizure in neurocysticercosis in children. EEG was abnormal in most of children with NCC. Focal discharge was most common finding in EEG. EEG has poor correlation to type of seizure.

The main limitation of our study was small sample size. Not enough literature of study on children with NCC and EEG to compare our results with. Our study emphasised that the choice of antiepileptic drug for treatment of type of seizure should be clinically determined rather on EEG reporting but for further impetus to this fact we recommended more studies with more sample size to conclusively determine the importance of EEG profile and its relation to type of seizure in pediatric age group.

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