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Determine the role of neuroimaging techniques in establishing the etiology of complex partial seizures: A prospective clinical study

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Abstract
Aim: To determine the role of neuroimaging in establishing the etiology of complex partial seizures.
Materials and Methods: The present prospective clinical study was conducted in the Department of Pediatrics, Darbhanga Medical College and Hospital, Bihar. 48 cases of complex partial seizure were found to be eligible for inclusion in the study.
Results: Mean age was 6.81 years. Majority of children were in the age group of 5-10 years (60.4%), and majority (66.7%) of them were male children. Neuro-Imaging study revealed abnormalities in 20 (62.5%) children. Infection was the most common (43.5%) etiology, followed by (29.2%) developmental/ congenital brain lesions, tuberculoma (16.7%), trauma (6.7%) and tumor (4.2%).
Conclusion: The present study established that neuro-imaging had an incredible role to play in the etiological diagnosis of childhood seizures. MRI has emerged as a versatile tool in the evaluation of patients with central nervous system disorders.

Keywords: complex partial seizures, children, MRI, CT Scan, EEG

Introduction
A "seizure" is a paroxysmal alteration of neurologic function caused by the excessive, hypersynchronous discharge of neurons in the brain. "Epileptic seizure" is used to distinguish a seizure caused by abnormal neuronal firing from a non-epileptic event, such as a psychogenic seizure. "Epilepsy" is the condition of recurrent, unprovoked seizures [1].

Prevalence is the proportion of people with epilepsy in given population at a specified time. The worldwide prevalence of active epilepsy is 4-10 per 1000 population. The prevalence rate in India is 5.59 per thousand [2, 3]. Incidence is the number of new cases of epilepsy occurring during a given time interval, usually 1 year, in a specified population. Incidence rate varies from 38 to 49.3 per 1, 00,000 population per year from two community-based studies in India [4].

Studies have shown certain postnatal insults like birth trauma, CNS infection, cerebrovascular accidents and brain tumours greatly increase the incidence of childhood epilepsy. Although convincing evidence attributes some cases to specific etiologies, the cause of 70 % of all cases of seizures is unknown [5]. The field of neuro-radiology has become a fast moving, demanding and exciting multi-disciplinary activity [6]. It comprises of both structural and functional neuro-imaging. Thus, the present hospital-based study was conducted with the aim to determine the role of neuroimaging in establishing the etiology of complex partial seizures.

Materials and Methods
The present prospective clinical study was conducted in the Department of Pediatrics, Darbhanga Medical College and Hospital, Bihar.

Inclusion Criteria
1. Children between 1-10 years of age group
2. Newly diagnosed cases of complex partial seizure
3. Patients/Guardians who have provided the informed consent

Exclusion Criteria
1. Children above 10 years
2. Children with developmental delay
3. Patients/Guardians who have not signed the informed consent

Ethical approval and Informed consent
The study protocol was reviewed by the Ethical Committee of the Hospital and granted ethical clearance. After explaining the purpose and details of the study, a written informed consent was obtained.

Sample selection
The sample size was calculated using a prior type of power analysis by G* Power Software Version 3.0.1.0 (Franz Faul, Universitat Kiel, Germany). The minimum sample size was calculated, following these input conditions: power of 0.80 and $P \leq 0.05$ and sample size arrived were 48 participants.

Methodology
Detailed history was taken with description from eyewitness to rule out Non-epileptic seizure disorder followed by neurologic and other systemic examinations. Then routine investigations were followed, based on the presenting features, e.g. CSF and blood to rule out infective etiology in children presenting with fever. (7). Only Structural neuro-imaging have been included in the study, which include MRI and CT scan. EEG was conducted in almost all patients

to detect seizure type or to locate any lateralizing signs.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages and means.

Results

Table 1: Demographic profile of the study population

Age (Years)	N (%)
1-5	19 (39.6%)
5-10	29 (60.4%)
Mean±SD	6.81±1.17
Gender	
Male	32 (66.7%)
Female	16 (33.3%)

Table 2: Imaging abnormality to normal imaging

Imaging	N (%)
Normal	18 (37.5%)
Abnormal	30 (62.5%)

Table 3: various etiologies of seizures in the study population

Etiologies	N (%)
Infection	21 (43.7%)
Developmental	14 (29.2%)
Tuberculoma	8 (16.7%)
Trauma	3 (6.3%)
Tumor	2 (4.2%)
Total	48 (100.0%)

Table 4: association between EEG and Imaging in the study population

Imaging	EEG		Total
	Normal	Abnormal	
Normal	16	18	34
Abnormal	11	3	14
Total	27	21	48

Discussion

The investigation of a seizure disorder depends on many factors, including age of patient, type of seizure, frequency, presence or absence of neurologic findings and constitutional symptoms [7]. Majority of children were in the age group of 5-10 years (60.4%), and majority (66.7%) of them were male children. This corroborates with the study conducted by Eriksson and Koivikko, where incidence varies markedly with age and slightly higher ratio seen in male children [8].

Neuro-Imaging study revealed abnormalities in 20 (62.5%) children. This is in contrast to the study by Parihar *et al*. [9] which showed abnormalities on imaging in 39 (90.7%). This high positivity obtained in their study was because infants and children with delayed development were included. Amirsalari *et al*. [10] had found abnormalities only in 28.5% and 17% of their subjects, respectively. This lower rate of detection could probably be attributed to the much lesser incidence of infectious diseases in these parts of the world.

In the present study, Neuro-Imaging revealed abnormalities in 20 (62.5%) of the patients, infection was the most common (43.5%) lesion which meant infective causes of seizures were highest in our country, followed by (29.2%) developmental/ congenital brain lesions, tuberculoma (16.7%), trauma (6.7%) and tumor (4.2%). This was found in agreement with the studies reported in the literature review which also revealed that neuro-infections to be the most common etiology [9, 11].

In the present study a higher percentage of unexpected difference that the neuro-imaging detecting epileptogenic focuses in normal EEG subjects, comparable to our study conducted by Doescher *et al*. [12] among 181 children, which found 42% abnormality on MRI study in subjects with normal EEG. Our findings indicate that a normal EEG does not reliably predict the absence of epileptogenic focus in CPS and suggests that normal results on EEG should not be used to place a patient in a low-risk group of not requiring MRI scan for complete evaluation.

Conclusion

In conclusion, the present study established that neuro-imaging had an incredible role to play in the etiological diagnosis of childhood seizures. MRI has emerged as a versatile tool in the evaluation of patients with central nervous system disorders. MRI not only identifies specific epileptogenic substrates, but also determines specific treatment, predicts prognosis, as well as helps in limiting the use of Anti-Epileptic Drugs for prolonged periods of time.

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