



ROLE OF RADIO IMAGING (CT AND MRI) IN CHILDREN WITH FIRST EPISODE OF APPARENT UNPROVOKED GENERALIZED SEIZURE

Radiology

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ABSTRACT

Approximately 10% of population will have at least one seizure in their lifetime at some point of time. Half of these will occur during childhood and adolescence with highest risk before one year. Some patients with a first seizure eventually go on to have additional seizures and be diagnosed with epilepsy. Thus the occurrence of a single seizure in childhood deserves careful consideration. **Aims and objectives:** To determine the percentage of children presenting with first episode of an apparent unprovoked generalized seizure and role of CT and MRI. **Materials and Methods:** Children between the age groups of 6 months to 12 years presenting to the O.P.D and Emergency department of Pediatric Medicine, IGIMS, Patna, Bihar from October 2018 to August 2019. **Results:** In our study among all unprovoked generalized seizures in childhood- idiopathic variety is the commonest group 88.13%(N=52) out of total 59 cases. Among all unprovoked generalized seizures generalized tonic clonic is the major group 69.49%(N=41). **Conclusion:** The incidence of radioimaging abnormality in first episode of unprovoked generalized seizure is significant (11.86%). Majority of lesions being granuloma -either tuberculoma or cysticercosis.

KEYWORDS

CT, MRI, Seizures

INTRODUCTION:

Approximately 10% of population will have at least one seizure in their lifetime at some point of time. Half of these will occur during childhood and adolescence with highest risk before one year. Some patients with a first seizure eventually go on to have additional seizures and be diagnosed with epilepsy. Thus the occurrence of a single seizure in childhood deserves careful consideration.[1]

Firstly a distinction should be made between provoked and unprovoked seizure since this has implication for treatment and prognosis, such as the risk of developing epilepsy. Provoked seizures are those event that result from some immediately recognizable stimulus or cause. [2]

As per ILEA (International league against epilepsy) seizure is classified based on clinical features and EEG findings is partial seizures and Generalized Seizures.

The role of neuroimaging following first episode of partial seizure is already an established fact but it's role in generalized seizure is still a debatable point. The occurrence of an unprovoked seizure may suggest the possibility of an underlying neuroradiological structural abnormality – particularly in this era of newer imaging modalities like MRI in different sequences and functional imaging like PET (Positron emission tomography), SISCOM (Subtraction ictal SPECT coregistered to MRI) & MRI spectroscopy.in the form of SPECT (Single photon emission computed tomography),.[3]

AIMS AND OBJECTIVES:

To study Utility of neuroimaging (CT or MRI) in evaluation of children with first episode of an apparent unprovoked generalized seizure.

Materials and Methods:

Children between the age groups of 6 months to 12 years presenting to the O.P.D and Emergency department of Pediatric Medicine, IGIMS, Patna, Bihar from October 2018 to August 2019. Patients who fit into generalized seizure disorder as per International League Against Epilepsy (ILEA) classification of Epileptic seizures was considered fit for the study. Myoclonic jerks, infantile spasms and Focal seizures with secondary generalization are excluded from the study. History from parents and caregivers was taken into account in the study.

History is the most important thing in the present study as incidence has already taken place by the time the patient reports to a doctor. Detailed history of the incident – how it took place whether focal or generalized in onset- what was the associated features, whether any provocative factor was present For vivid information

of the incident the parents and caregivers were asked to act out the incident. History of similar episode in the family is enquired into. Thorough physical examinations, neurological examination with EEG evaluation of patients along with detailed history of developmental milestones, socio-economic and particularly contact H/O. Tuberculosis was enquired into. History of residence, occupation, annual income of the guardian was also taken while history taking.

Selected patients fit for study group were advised to undergo MRI study of brain. Those who could not afford MRI were advised to undergo CT SCAN of brain. Contrast was used as and when necessary.[CT scan machine- 128-slice helical MDCT(Toshiba Aquillion), MRI machine- GE primitive of 1.5T]

RESULTS:

Total 59 children of age groups 6 months to 12 years attended the department of Paediatric medicine IGIMS as outdoor and indoor patients with apparent first episode of generalized seizures. They were advised to undergo radioimaging study of brain. The patients were divided in different groups and results were analysed in different parameters in Table form.

In our study among all unprovoked generalized seizures in childhood- idiopathic variety is the commonest group 88.13%(N=52) out of total 59 cases. Among all unprovoked generalized seizures generalized tonic clonic is the major group 69.49%(N=41).

Although patients with intracranial structural lesions mostly present with focal seizure some of them may present with generalized seizures – this is as per study of singhi PD, Baranwal AK in October 2001. In our study structural lesions among generalized seizures was 11.86%.

There is significant sex distribution of seizures noted in our study as male : female ratio has been found to be 1.8:1. This corresponds to study of Eriksson and Koivikko in 1977.

As per our study Age group of 1 to 5 years are the most vulnerable group in unprovoked generalized seizure-44.06%(N=27) out of total 59 cases This is in keeping with the fact of Nelson's Text book of Pediatrics.

Rural and urban population group show no difference in seizure incidence – in terms of first episode of generalized seizures.

Difference lies with western population in terms of type of Intracranial structural lesion focal or generalized cortical atrophy, tumors, A-V malformation etc. are more common lesion in western population

where as Granuloma, A-V malformation, tumor are the most predominant finding in India. Single ring enhancing lesion (SREL) is the commonest finding – this corroborates with study of Wadia et al and Hussain Jageer's study.

Also study corroborates with Trentin AP, Teive HA in June 2002 where calcification/ cysticercosis and neurocysticercosis/cysts has been found as the most predominant lesion (23.6%).

No difference in terms of incidence of Intracranial structural lesions is present between rural and urban population but difference lies in terms of type of lesion as – Granuloma is the most common lesion found in rural population of India.

Tuberculoma has been incriminated as the most common finding in present study which corroborates with Hussain Jageer's study on Indian population.

Among Granuloma two lesion were unidentifiable – where either neurocysticercosis or Tuberculoma could be the finding. For definitive diagnosis biopsy from lesion is indicated.

Table - 1 CT / MRI Findings In First Episode Of Generalized Seizure Total Seizures Cases -59

RADIO-IMAGING FINDINGS	ABNORMALITY DETECTED	PERCENTAGE
ABNORMAL CT/ MRI	7	11.86%
NORMAL CT/MRI	52	88.13%

Table – 2 Distribution Of Ring Enhancing Lesions: Total No. Of Ring Enhancing Lesions – 5

TYPE OF LESION	NUMBER	PERCENTAGE
SINGLE RING ENHANCING LESION	3	60%
MULTIPLE RING ENHANCING LESION	2	20%
MULTIPLE CALCIFIED LESION	15	20%

Table - 3 Distribution Of Granuloma In Brain In Patients With First Episode Of Apparent Unprovoked Generalized Seizure

Total No. Of Granuloma - 5

BRAIN LOCATION	NUMBER	PERCENTAGE
SUPRATENTORIAL	4	75%
INFRATENTORIAL	1	25%

Table – 4 Types Of Lesions Detected In Granuloma

TYPE OF LESION	NUMBER	PERCENTAGE
TUBERCULOMA	2	40%
N. C. C.	1	20%
UN IDENTIFIED LESION	2	40%

DISCUSSION:

The role of radioimaging in partial seizures in children has already been an established fact but its role in children with generalized seizures particularly in unprovoked seizure is still a debatable point. Several studies have been done regarding role of radioimaging in seizure disorder. Most of the studies have been done in general population without discriminating between provoked and unprovoked seizures, symptomatic and asymptomatic seizures, idiopathic and cryptogenic seizures.

Role of radioimaging in symptomatic seizures, provoked seizures, partial seizures in childhood group has already been established fact, even role of radioimaging in adult population with unprovoked generalized seizures has been established. Study regarding role of radioimaging in first apparent unprovoked generalized seizure in childhood population is not available and its role in such cases still remains a debatable point.

In the present studies of 59 cases of unprovoked generalized seizure 11.86% (n=7) had abnormal radio-imaging studies – whereas 88.13% (n=52) had normal findings.

In a study by Trentin AP, Teive HA, Tsubouchi MH, de Paola L, Minguetti G. on June 2000 who found 48.8% of idiopathic generalized seizures and 51.2% abnormal studies.[4] However this study was done in a mixed population of age group 0 to 40 years and both provoked and unprovoked groups were taken into account. So the

study result might have been increased.

Our study also corroborates to some extent with a study done by Shinnar S, O' Dell C, Mitnick R, Berg AT, Moshe SL. on March 2001, USA – where the study was done in children presenting with a first seizure to determine the incidence and type of neuroimaging abnormalities detectable in them.[5] In the study out of 411 children- 45 (21%) of 218 imaging studies were abnormal.

However this study result is higher in comparison to ours because this study had been done in children with both provoked and unprovoked groups. Also all types of seizures were taken into account in the study.

Seizure cause considered symptomatic in 20 patients of whom 12 (60%) had normal CT results.

However this study was performed in emergency department with new onset seizures and both provoked and unprovoked groups were taken and also all types of seizures including partial seizures were taken into account. So the study result was higher in comparison to our study.

In Maytal J. krauss M's study in 2 patients with abnormal CT scans (both acute symptomatic), the imaging findings were of immediate therapeutic significance & were predictable from the clinical history and physical examination. [6]

Inference of their study was that patients with partial convulsive seizures were more likely to have abnormal CT scan than patients with generalized convulsive seizures, but the difference was not statistically significant.

In the present study there has been no cases in the emergency department with radioimaging lesions who required immediate intervention. This is corroborative with the study by Maytal J, Krauss JM in that their recommendation was routine practice in many pediatric emergency department of obtaining brain CT scan for all patients with new onset of nonfebrile seizure is unjustified. History and physical examination are sufficient to identify those patients for whom such studies are likely to be appropriate. Emergent CT is not indicated for patients with no known seizure risk factors, normal neurological examinations, no acute symptomatic cause other than fever and reliable neurological follow-up.[7]

The present study is in keeping with previous studies as most generalized seizure were of idiopathic varieties. Radiological abnormalities were particularly positive in those cases where focal neurological abnormality or prolonged neurological deficit following the seizure episode was evident or abnormal EEG was present.

While evaluating age of first seizure occurrence the most vulnerable age at first seizure were > 1 – 5 years. Out of 59 children with seizures 27 children (44.06%) had their first seizure at this age group, only 4 (6.77%) were more than 10 years old. This corroborates with the current knowledge that idiopathic generalized epilepsy is more prevalent among this age group.[8]

In the current study granuloma is the most common findings among the seizure patients. Among the lesions granuloma constituted 71.42% (n=5), A-V malformation 14.28% (n=1) and tumors 14.28% (n=1). This is quite different from the study result in western countries. In the study by Shinnar S, O'Dell the most common abnormalities were focal encephalomalacia (n=16) and cerebral dysgenesis (n=11) and cerebral migration abnormality (n=6).[9]

It is also important to note that a significant number of children with tuberculoma had evidence of other organ involvement. In these cases chest xray, mantoux and peripheral blood smear have been analyzed to come to conclusion.

Criteria for SREL (Single Ring Enhancing Lesion) to be Tuberculoma – when the lesion was an unbroken uniform ring enhancing lesion with central isodensity / hypodensity, (> 20 mm in size), or central calcification with surrounding irregular unbroken ring of enhancement (target sign) with or without surrounding perifocal edema with or without evidence of tuberculosis of other organs. Neurocysticercosis : Criteria of Del – Brutto – et al.

That predominant SREL in Indian subcontinent are tubercular in origin

corresponds to study made by Hussain Jageer, Srinivasan S, Serane V Tirumourougane Mahadevevan S, Elangovan S, Bhuvaneshwari V in year 2004 – published in IAP Journal.[10]

Single ring enhancing lesion (SREL) in the predominant finding in our study, 60% (n=3), multiple ring enhancing lesion (MREL) and multiple calcified lesions (MCL) each constituting only one each out of total 5 cases of ring enhancing lesion.

This corroborates with the study by Singhi PD, Barawal AK in October 2001 – where single, small enhancing computed tomography lesion in Indian children presenting with focal or at times generalized seizures is evident. Here neurocysticercosis has been implicated as the predominant findings – criteria for confirmation was visualization of scolex on MRI was undertaken.

In the study by Trentin AP, Teivett A, in 2002 June – calcification or cysticercosis was evident in 14%, neurocysticercosis / cysts (9.6%) was the predominant findings in generalized seizure. This study result is much higher in comparison to present study.[11]

In the present study of granuloma two patient who were not definitely diagnosed as cysticercosis or tuberculoma the diagnosis remains undetermined. Many of these could be either neurocysticercosis or tuberculoma or some other unidentifiable pathology. As these constitute a major percentage (40%) of all granulomas identified one can not be certain of the percentage of either infection in this study. There is a need for histological diagnosis of the brain lesion before a definitive comment can be made on the varying etiology of the ring enhancing lesion in different parts of the country.

In the study it was also evident that most of the granulomas were supratentorial in location. Out of total 5 cases of granuloma 75% (n=5) located in supratentorial region – 25% (n=1) located in infratentorial location.[12] Among the supratentorial lesions – 2 was in parietal lobe, 1 in occipital lobe and 1 in temporal lobe. The single infratentorial granuloma was located in cerebellum.

CONCLUSION:

The incidence of radioimaging abnormality in first episode of unprovoked generalized seizure is significant (11.86%). Majority of lesions being granuloma -either tuberculoma or cysticercosis.

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