

Analysis of Role of Computed Tomography of Brain in Children with Partial Seizures at a Tertiary Care Hospital

Ghanshyam G. Patel¹, *S R Chauhan²

¹Assistant Professor, Department of Paediatrics, Index Medical College Hospital & Research Centre, Indore, Madhya Pradesh, India.

²Assistant Professor, Department of Radiology, Index Medical College Hospital & Research Centre, Indore, Madhya Pradesh, India.

Abstract

Background: Partial seizures are relatively common in pediatric populations and are categorized into two distinct types: simple partial seizures, which do not involve a loss of consciousness, and complex partial seizures, which do result in altered consciousness. Hence; the present study was conducted to analyze role of computed tomography of brain in children with partial seizures at a tertiary care hospital. **Materials & Methods:** A cohort of 100 children diagnosed with seizure disorders, specifically those experiencing partial motor seizures, was evaluated in a prospective manner. The participants ranged in age from 1 to 12 years. Only those exhibiting partial seizures characterized by predominantly focal motor symptoms were included in the study. The classification of seizures was determined through comprehensive medical history and clinical assessments, alongside the results of brain CT scans for all subjects. Standard laboratory investigations were performed, which included a complete blood count with erythrocyte sedimentation rate, basic renal and liver function tests, a Mantoux test, and a chest X-ray. Additionally, cerebrospinal fluid analysis was conducted via lumbar puncture and/or electroencephalography when clinically warranted. A contrast-enhanced CT scan of the brain was also performed, utilizing a system capable of 128 slices per rotation. **Results:** A total of 100 children were evaluated. Mean age of the children was 8.9 years. Focal seizures were seen in 82 percent of the children. Fever, headache, vomiting, cyanosis, visual disturbances, altered sensorium, papilledema and cranial nerve palsy was seen in 48 percent, 45 percent, 42 percent, 5 percent, 2 percent, 46 percent, 18 percent, and 14 percent of the patients. CT scan of brain was normal in 29 children (29%) and was abnormal in 71 children (71%). Tuberculoma, Neurocysticercosis, Vascular lesions and Congenital (Gliosis) lesions were seen on CT in 12 percent, 2 percent, 12 percent and 3 percent of the patients respectively. Significant correlation was seen while correlating computed tomography findings with types of seizures. **Conclusion:** Partial seizures characterized by significant motor manifestations exhibit a notably increased prevalence of underlying structural causes, particularly in relation to neurological infections. Furthermore, there exists a positive correlation between clinical observations and findings obtained from CT scans.

Key Words: Computed Tomography, Brain, Children, Partial Seizures.

INTRODUCTION

Partial seizures are relatively common in pediatric populations and are categorized into two distinct types: simple partial seizures, which do not involve a loss of consciousness, and complex partial seizures, which do result in altered consciousness. The defining characteristic of both types is the initiation of the seizure from a specific area within one cerebral hemisphere, as evidenced by the presence of focal spikes or sharp waves on an electroencephalogram (EEG).¹ Symptoms associated with simple partial seizures can manifest as focal motor or somatosensory experiences, special sensory disturbances, autonomic responses, or psychic phenomena. During the complex partial phase, a child may exhibit a cessation of ongoing activities accompanied by altered awareness and a vacant stare, or they may display automatisms, which can include gestural, alimentary, mimicking, verbal, or ambulatory movements.²

Automatisms are primarily observed in complex partial seizures originating from temporal lobes, although they can also occur in seizures with extratemporal origins. Should the epileptic activity disseminate across both cerebral hemispheres, the child may experience a secondarily generalized tonic-clonic seizure. It is essential to conduct an EEG for any child suspected of experiencing partial seizures. The presence of focal spikes or sharp waves provides substantial evidence supporting a diagnosis of partial seizures within the appropriate clinical context.³

The management of complex partial seizures (CPS) commences with a precise diagnosis. It is essential to exclude episodes of staring and unresponsiveness that may arise from non-epileptic origins. The diagnostic process should encompass electroencephalography (EEG) conducted in both awake and sleep conditions. Standard activation techniques, along with high-resolution magnetic resonance imaging (MRI) targeting mesial temporal structures and subtle cortical dysplasia, are recommended. Computed tomography is insufficient for brain imaging in the assessment of individuals experiencing seizures. Given that the majority of children with CPS are unlikely to outgrow their seizures, and only half will achieve adequate seizure control, it is imperative to initiate early and aggressive treatment strategies.⁴⁻⁶ Hence; the present study was conducted for assessing Clinico – diagnostic and therapeutic relevance of computed tomography scan of brain in children with partial seizures.

Address for correspondence*

Dr. S R Chauhan,

Assistant Professor,

Department of Radiology,

Index Medical College Hospital & Research Centre,
Indore, Madhya Pradesh, India.

Email: drsrchauhan1981@gmail.com

METHODS

The current research was commenced for evaluating relevance of computed tomography scan of brain in children with partial seizures.

A cohort of 100 children diagnosed with seizure disorders, specifically those experiencing partial motor seizures, was evaluated in a prospective manner. The participants ranged in age from 1 to 12 years. Only those exhibiting partial seizures characterized by predominantly focal motor symptoms were included in the study. Children for whom a CT scan was either not feasible or contraindicated for any reason were excluded from participation.

The classification of seizures was determined through comprehensive medical history and clinical assessments, alongside the results of brain CT scans for all subjects. Standard laboratory investigations were performed, which included a complete blood count with erythrocyte sedimentation rate, basic renal and liver function tests, a Mantoux test, and a chest X-ray. Additionally, cerebrospinal fluid analysis was conducted via lumbar puncture and/or electroencephalography when clinically warranted. A contrast-enhanced CT scan of the brain was also performed, utilizing a system capable of 128 slices per rotation.

All the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Univariate analysis was done for evaluation of level of significance.

Table 1: Clinical examination

Presenting symptoms	Number	Percentage
Focal seizure	82	82
Generalized seizure	18	18
Fever	48	48
Headache	45	45
Vomiting	42	42
Cyanosis	5	5
Visual disturbances	2	2
Altered sensorium	46	46
Papilledema	18	18
Cranial nerve palsy	14	14

Table 2: CT findings

CT findings	Number	Percentage
Normal	29	29
Abnormal	71	71
Total	100	100

Table 3: CT findings of 29 patients with abnormalities on CT

Lesions	Number	Percentage
Tuberculoma	12	12
Neurocysticercosis	2	2
Vascular lesions	12	12
Congenital (Gliosis)	3	3

Table 4: Correlation of computed tomography scan findings

Type of seizures	Abnormal CT	Normal CT	Total patients
Simple partial seizures	35	17	52
Complex partial seizures	20	10	30
Secondary generalization	10	8	18
p-value	0.001 (Significant)		

RESULTS

A total of 100 children were evaluated. Mean age of the children was 8.9 years. Focal seizures were seen in 82 percent of the children. Fever, headache, vomiting, cyanosis, visual disturbances, altered sensorium, papilledema and cranial nerve palsy was seen in 48 percent, 45 percent, 42 percent, 5 percent, 2 percent, 46 percent, 18 percent, and 14 percent of the patients. CT scan of brain was normal in 29 children (29%) and was abnormal in 71 children (71%). Tuberculoma, Neurocysticercosis, Vascular lesions and Congenital (Gliosis) lesions were seen on CT in 12 percent, 2 percent, 12 percent and 3 percent of the patients respectively. Significant correlation was seen while correlating computed tomography findings with types of seizures.

DISCUSSION

Benign childhood focal seizures and associated epileptic syndromes represent one of the most prevalent and intriguing subjects within the field of pediatric epileptology. These conditions impact approximately 25% of children experiencing non-febrile seizures and constitute a substantial aspect of the routine clinical practice for pediatricians, neurologists, and clinical neurophysiologists involved in the management of pediatric seizure disorders. Rolandic seizures (RS) are particularly well-documented and are linked to a favorable prognosis, a fact supported by extensive research and literature. Pediatricians have shown a commendable openness to this information and have effectively integrated it into their clinical practice.^{7,8}

It is important to note that a normal routine EEG does not definitively exclude a diagnosis of epilepsy in patients exhibiting symptoms consistent with simple or complex partial seizures. A significant proportion of children with partial seizures may have identifiable underlying etiologies. While most of these causes are static and result from prior cerebral injuries, some patients may present with slow-growing gliomas or other mass lesions. Therefore, MRI or CT imaging is recommended for nearly all children diagnosed with partial seizures.^{9, 10} Hence; the present study was conducted for assessing Clinico – diagnostic and therapeutic relevance of computed tomography scan of brain in children with partial seizures.

A total of 100 children were evaluated. Mean age of the children was 8.9 years. Focal seizures were seen in 82 percent of the children. Fever, headache, vomiting, cyanosis, visual disturbances, altered sensorium, papilledema and cranial nerve palsy was seen in 48 percent, 45 percent, 42 percent, 5 percent, 2 percent, 46 percent, 18 percent, and 14 percent of the patients. CT scan of brain was normal in 29 children (29%) and was abnormal in 71 children (71%). Nair KP et al conducted a study

to evaluate the role of computed tomography (CT) in the management of seizures associated with suspected partial seizures (SPS) in pediatric patients. The objective was to identify differences in clinical characteristics between children exhibiting focal brain lesions on CT scans and those without such lesions. The researchers reviewed the CT scans of all patients aged 15 years or younger diagnosed with SPS over a 15-month period. A comparative analysis was performed on the clinical features of patients with focal lesions versus those without focal abnormalities. Among the 198 children studied, 117 (59.09%) presented with focal structural lesions, which included solitary contrast-enhancing lesions (16.16%), focal calcifications (12.12%), cysticercosis (10.10%), focal atrophy (9.59%), tuberculoma (6.56%), and infarction (6.06%). Neuro-infections or their sequelae were identified as the cause of seizures in 89 children (44.94%). The study found no statistically significant differences in the clinical features between the two groups. The findings underscore the important therapeutic implications of CT imaging in managing SPS in children, particularly in developing countries.¹¹

In the present study, tuberculoma, Neurocysticercosis, Vascular lesions and Congenital (Gliosis) lesions were seen on CT in 12 percent, 2 percent, 12 percent and 3 percent of the patients respectively. Significant correlation was seen while correlating computed tomography findings with types of seizures. Maytal J et al investigated the diagnostic value of emergency brain computed tomography (CT) in pediatric patients presenting to the emergency department with newly onset seizures. The study included 66 participants, comprising 34 males and 32 females, with an average age of 4.9 years. Among these, 52 patients (78.8%) exhibited normal CT findings, while 14 patients (21.2%) displayed abnormal results. The etiology of seizures was classified as cryptogenic in 33 patients, of whom 2 (6%) had abnormal CT findings; however, neither of these cases necessitated any intervention. In contrast, 20 patients were identified as having symptomatic seizures, with 12 (60%) showing abnormal CT results. Notably, in two patients with abnormal scans (both categorized as acute symptomatic), the imaging results had immediate therapeutic implications and were anticipated based on clinical history and physical examination. Furthermore, none of the 13 patients diagnosed with complex febrile seizures exhibited abnormal CT findings. Patients experiencing partial convulsive seizures were found to have a higher likelihood of abnormal CT results compared to those with generalized convulsive seizures, although this difference did not reach statistical significance. Consequently, the common practice in numerous pediatric emergency departments of routinely performing brain CT scans for all patients with new onset of nonfebrile seizures lacks justification.¹²

CONCLUSION

Partial seizures characterized by significant motor manifestations exhibit a notably increased prevalence of underlying structural causes, particularly in relation to neurological infections. Furthermore, there exists a positive correlation between clinical observations and findings obtained from CT scans.

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