A Clinical and CT scan Study of Partial and Generalized Seizures

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Abstract

Aims and Objectives: 1. To assess clinical profile of patients presenting with seizures, 2. To determine the etiological factors of seizures, 3. To evaluate role of computed tomography scan in diagnosis of seizures.

Method: The present study was conducted in 100 cases of age more than 12 years and seizure onset after age of 12 years. The study included patients admitted for other medical conditions and developing seizure during hospital stay. Clinical data and CT scan brain report was collected and analyzed to derive the etiological diagnosis for the seizures.

Results: Mean age of the patients was 44 years, ranging from 13-90 years; with a male:female ratio of 1.2:1. Headache, vomiting, fever were important associated non-convulsive symptoms of which headache was most common in 41% cases. Altered sensorium (30 cases) and focal neurological deficits (21 cases) were the most important neurological signs. Generalized tonic-clonic seizure (GTCS) was the most common type of seizure (63%) than partial seizures (37%). The aetiologies found for GTCS were alcohol abuse, CVA, infections and poisonings. In most cases of partial seizures, the aetiology was found to be brain tumour, infections and post traumatic seizures. CT brain was abnormal in 54% cases and normal in 43% cases; abnormal CT brain reports were more common in partial seizures (73%) as compared to GTCS (43%).

Conclusion: Imaging is the most important factors determining the aetiology of seizures so as to guide the further treatment of the patient.

Introduction

Seizure is a symptom of an underlying disorder, which may be of varied aetiologies. In these cases the underlying disorder must be identified and treated in order to control seizures and prevent brain dysfunction. Epilepsy is a group of conditions and not a single homogeneous disorder and seizure may be symptoms of both diverse brain disorders and otherwise normal nervous system. In past, a large number of cases used to be labeled as epilepsy of unknown origin. The introduction of computed tomography (CT) scan has really helped to sort out the causes of epilepsy. The evaluation of cases of seizures includes a detailed history, clinical examination, advance neuroimaging, electroencephalography, functional neuroimaging etc. Various combinations considering their cost factor yield of information, method availability and patient convenience. Localization abnormalities in cases of partial seizures are from 28% to 80% as observed in different studies. Studies done on patients of generalized seizures also show similar abnormalities.

CT image is cross sectional representation of anatomy created by a computer generated analysis of the attenuation of X ray beams passed through section of body. A computer calculates “back projection” image from 360 degree x ray attenuation profile. CT evaluates anatomy of brain structures reasonably well. There have been numerous epidemiological studies of epilepsy in the general population in India, the first study conducted in 1968. Subsequently a large number of community based prevalence studies have been carried out, based on the world health organization (WHO) protocol.

In view of above facts we conducted this study to determine various etiological factors in patients with partial and generalized seizures and also to evaluate role of CT scan of brain as diagnostic aid in various seizure
Table 1: Distribution of patients according to past history and personal history

<table>
<thead>
<tr>
<th>Past history</th>
<th>No. of cases</th>
<th>Personal history</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>19 (19%)</td>
<td>Alcoholic</td>
<td>18 (18%)</td>
</tr>
<tr>
<td>Brain tumor</td>
<td>13 (13%)</td>
<td>Smoking</td>
<td>16 (16%)</td>
</tr>
<tr>
<td>CVA</td>
<td>10 (10%)</td>
<td>Tobacco chewer</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Trauma</td>
<td>6 (6%)</td>
<td>Poisoning</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Infection</td>
<td>5 (5%)</td>
<td>Post natal case</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Cardiac</td>
<td>3 (3%)</td>
<td>No significant past history</td>
<td>58 (58%)</td>
</tr>
<tr>
<td>COPD</td>
<td>2 (2%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information Package, graph pad prism 5. Using this software range, frequencies, percentages, means, standard deviations, chi square and ‘p’ value were calculated. Kruskul Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate’s test for qualitative variables. A ‘p’ value less than 0.05 was taken to denote significant relationship.

Results

Total 100 clinically proven cases with seizures disorder was included in the study, having mean age was 44 years, ranging from 13-90 years. Among these, 56 were males and 44 were females. Male to female ratio was 1.2:1. Headache was most common associated symptom in 41 (41%) cases followed by vomiting 22 (22%). Most of these patients had mass lesions like tumour, neuro-cysticercosis and CVT. Only 12 (12%) cases had fever at the time of seizures. Patients with acute symptomatic seizures due to infections and CVT had headache, vomiting and fever. Fever was present in the patients of meningitis, brain abscess and encephalitis. History of ear discharge was present in a single patient with septic thrombosis of veins. In 23 (23%) cases, no associated symptoms were found. Table 1 show the number of patients with past and personal history.

Distribution of cases according to CT findings and neurologic signs were statistically significant (<0.05) as shown in Table 2. Hence in presence of neurologic signs, there was significant CT abnormality. Figure 1 shows distribution of cases according to Aetiology and type of seizures.

The most common radiological abnormality on CT scan of brain was reported as cortical atrophy in 13 (24%) cases of which 10 cases were of focal type and 3 cases were of diffuse type (Image 1). Second most common abnormality on CT scan of brain was hyperdensity in 12 (22%) cases which included 4 cases of meningiomas, 3 cases of each cerebral bleed and cerebral venous thrombosis and a single case of TBM (Image 2), hypodensity in 10 (20%) cases, hemorrhage contusion in 5 (9%) cases, heterogeneous isodensity was noted in 3 glioma cases (Image 3), ring enhancing lesion in 5 (9%) cases (Diagnosed as neurocysticercosis) (Image 4), and hyperdensity in 4 (7%) cases, generalized cerebral edema and subdural hematoma in 1 (2%) cases each.

Discussion

In the present study, GTCS was more common than partial seizures in all age groups. In male group, highest number of cases (19 males, 34%) was in the middle-age group (35-59). 32 (50.8%) males had GTCS as compared to 31 (49.2%) females. Partial seizures were more common in young age group (18-34 years). 24 (65%) males had partial seizure as compared to 13 (35%) females. This suggests more males were suffering from individual type of seizures as compared to females. Male preponderance was consistent with other studies.6,8 Out of total cases, 21 cases had focal neurological deficit. Hemiplegia was present in 11 cases and Monoplegia in 3 cases. Hemianopia and

Table 2: Distribution of cases having abnormal neurological signs with CT scan of brain

<table>
<thead>
<tr>
<th>Abnormal neurological signs</th>
<th>CT scan of brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal</td>
<td>Normal</td>
</tr>
<tr>
<td>Altered sensorium</td>
<td>10</td>
</tr>
<tr>
<td>Focal neurologic deficit</td>
<td>21</td>
</tr>
<tr>
<td>Raised intracranial tension</td>
<td>11</td>
</tr>
<tr>
<td>Tremor</td>
<td>0</td>
</tr>
<tr>
<td>Status epileptics</td>
<td>5</td>
</tr>
<tr>
<td>Signs of meningeal irritation</td>
<td>7</td>
</tr>
</tbody>
</table>

P value: <0.0001 (Significant)

performed usually within six hours and always within 24 hours of the seizure. The scans were reported jointly by a junior radiologist and a senior neuro-radiologist. We reviewed the written reports and categorized the findings as no abnormality; localized or generalized atrophy; focal structural lesions etc. In case of acute febrile illness or signs of meningeal irritation associated with the seizures, Peripheral smear- for malaria parasite and cerebrospinal fluid analysis was done. When these showed abnormalities, anti herpes simplex virus antibodies were done when relevant. In suspicious patients, like those who had cryptococcal meningitis, tuberculous meningitis, viral encephalitis, HIV- ELISA and VDRL were done. ECG was done for all the patients. Chest X-ray was done in necessary cases.

The clinical profile, brain imaging findings was analyzed to derive the etiological diagnosis for the seizures. The aetiology of seizures was established by an independent review of the hospital charts, including procedural and pathological reports, by two experienced doctors (one specialist in internal medicine and one neurologist) blinded to the purpose of the study. In cases of dissent the final aetiology was determined by consensus.

Statistical Analysis

Data analysis was done with the help of computer using Epidemiological
cranial nerve palsy was present for 4 patients. Aphasia was present in single patient. Cerebellar signs were present in one patient with metastasis in cerebellum due to carcinoma breast. In all these cases, weakness persisted for more than 5 days of hospital stay. None of these patients had Todd’s palsy. It was the motor system abnormality in clinical examination, which most frequently predicted an abnormality in the CT scan of brain.

Altered sensorium was most common neurologic sign in 30 cases, out of which 20 cases had normal CT scan of brain and 10 cases had abnormal CT scan. Focal neurologic deficit was present in 21 cases, all of which had abnormal CT scan of brain. Raised intracranial tension was present in 12 cases suggested by papilloedema, headache, projectile vomiting etc. and out of which 11 cases had abnormal CT scan of brain while it was normal in one case. Tremors were present in 12 alcohol abuse cases all of whom had normal CT scan of brain. Signs of meningeal irritation were present in 8 cases of which CT abnormality was found in 7 cases. Status epilepticus was present in 11 cases with CT abnormality in 5 cases whereas 6 cases had normal CT scan of brain. The results of present study with regards to neurological signs were correlated with previous studies.8-11

The present study had more cases (11 cases) of status epilepticus, it may be due to more cases of poisoning (28%) and alcohol withdrawal (18%). Out of 11 cases, 10 patients had convulsive status epilepticus and one had non-convulsive status epilepticus having underlying tuberculous meningitis. Seizures can rapidly progress to status epileptics in case of organophosphate poisoning, contributing to mortality and in survivors to neuronal damage and neurological impairment.12 Out of 100 cases, 18% cases of seizures were due to alcohol abuse. Cerebrovascular accident was a cause of seizure in 17% cases while brain tumour was a cause of seizure in 14 cases, 13% cases of seizures were due to infectious origin, 3% cases due to cortical venous thrombosis, 6% cases due to trauma, 4% cases due to poisonings, 2% cases due to dementia. In 23% cases, no aetiology was found and was labeled as idiopathic cases.

Idiopathic cases were common in middle age with mean age of 42 years. Maximum cases (9, 39%) were between 18-34 years. Alcohol abuse was common aetiology in 35-59 years in 7 (39%) cases. Cerebrovascular accident was most common in older cases i.e. 9 (53%) while brain tumour was common in both middle and old age group i.e. 6 (43%) cases in each age group. Infectious aetiology and acute history of poisoning was most common cause of seizures in younger population (18-35 years). History of trauma and dementia was common above 60 years of age i.e.3 (50%). The major aetiologies in male group were alcohol abuse 17 (30.3%) cases, cerebrovascular accident 11 (19.6%) cases and post-trauma 5 (8.9%). Both acute and remote seizures were more common in male patients i.e. 27 (65%) and 24 (66%) respectively. These results are comparable with the study done by Hauser et al [13] and Sim et al.14

In current study non contrast CT scan of brain was done in all cases and when necessary contrast study was done. Out of 100 cases, 54 (54%) cases had significant CT abnormality. 36 (57%) cases who presented with of generalized tonic clonic seizures had normal CT findings while abnormality detected in 27 (43%) cases. In cases presenting with partial seizures, CT abnormality was detected in 27 (73%) cases and CT was normal in 10 (27%) cases. Hence CT abnormality was more common in partial seizures. These findings are correlated with other studies.13,14 This study found that CT imaging is useful for emergency patients presenting with seizures for diagnosis and appropriate acute management, especially when patients present with partial seizure as compared to GTCS.

CT abnormality was detected in 17 cases of cerebrovascular accident, in 14 cases of brain tumour, in 6 cases of post traumatic, in 3 cases of cortical venous thrombosis and in 2 cases of dementia. CT was normal in all 23 cases of idiopathic type, 18 cases of alcohol abuse, 4 cases of poisoning and single case of infection. The most common radiological abnormality on CT scan of brain was cortical atrophy followed by hyperdensity and hypodensity. Similar results are reported by Reinickaien et al,17 De La Sayette et al18 and Bajaj et al.19

In present study, 41 (41%) cases were classified as having acute symptomatic seizures out of which 30 (73%) cases presented with GTC seizures and 11 (27%) cases presented with partial seizures. 36 (36%) cases having remote symptomatic seizures out of which 16 (44%) cases presented with GTC seizures and 20 (56%) cases presented with partial seizures. 23 (23%) cases having idiopathic seizures of unknown aetiology of which 17 (74%) cases
presented as GTCS and rest 6 (26%) cases presented as partial seizures. In acute symptomatic seizures CT abnormality was in 18 (43%) cases while in remote symptomatic seizures CT abnormality in all 23 (100%) cases. Hence it is important to perform CT scan of brain in every case of remote symptomatic seizures. In idiopathic type of seizures, CT was normal in all 23 (100%) cases. In acute symptomatic seizures, CT normality was found in 23 (57%) cases which include alcohol abuse, poisoning and single case of infection. Hence it is important to sort out the history of toxic insult before CT scan of brain, as no underlying structural damage is caused by the toxic aetiology in these cases. Immediate CT brain is useful for emergency patients presenting with partial seizure as to guide appropriate acute management, especially where there is focal seizure onset.

**Conclusion**

Immediate CT brain is useful for emergency patients presenting with partial seizure as well as in patients presenting with abnormal neurological signs to guide appropriate acute management, especially where there is focal seizure onset.

**Imaging is the most important factors determining the aetiology of seizures so as to guide the further treatment of the patient. So every patient with new onset of seizures should undergo CT-Plain/contrast.**

**References**

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