



Clinical and etiological evaluation of secondary seizures by computed tomography and electroencephalogram

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Abstract: This study was conducted to determine the clinical evaluation and various etiological factors of secondary seizures in patients admitted to Government Medical College, Nagpur. We evaluated 58 patients of secondary seizures from Dec 2011 to Oct 2013. Secondary seizures were defined as case of seizure with CT (brain) or MRI (brain) abnormality¹. Out of 58 cases 35 were males and 23 were females. Mean age of study subjects was 34.85. The commonest presenting feature was generalized tonic clonic convulsions (42 patients) followed by focal seizures (16 patients). Todd's palsy was observed in 4 cases. Aura was present in 24 cases. According to CT brain scan the aetiology was neurocysticercosis (34.48%), post stroke (27.59%), tuberculoma (24.14%). Space occupying lesions (SOLs) were present in 8 patients, out of whom 4 had brain tumour, 2 patients had brain abscess, 1 had hydatid cyst and 1 had metastasis. Majority of lesions were located in frontal region (58.62%), followed by in parietal region (44.83%), in temporal region (25.86%) and in occipital region (13.79 % patients). In our study neurocysticercosis was found to be the commonest cause of secondary seizures. As in a meta-analysis it was found that cysticidal drugs result in better outcome in patients of neurocysticercosis, we recommend that the patients of secondary seizures should be identified for the aetiology and treated at the earliest².

Key words: Secondary seizures; Neurocysticercosis; Computed tomography; Electroencephalogram

Introduction

Seizures are classified into primary and secondary seizures¹. Secondary seizure is defined as case of seizure with CT brain or MRI brain abnormality¹. Seizures are an important cause of morbidity in adults. It is therefore important to establish accurate diagnosis of seizures and its etiologies to appropriately manage such patients. The etiology of seizures is different in India and other developing countries as compared to the developed world. Tuberculoma and neurocysticercosis have relatively high frequency in India^{3,4}.

The evaluation of seizure include detail history, clinical examination, EEG, advanced neuroimaging and functional neuroimaging. Various physicians use various combinations of these methodologies considering their cost factor and yield of information. The literature contains a considerable number of studies devoted to analyze etiological factors of seizures in adults and there are different etiologies found in various regions in these studies. Studies from western countries reveal noninfectious causes for seizures whereas Indian literature shows infectious etiology for seizures. In view of these facts this study was conducted to determine the clinical evaluation and various etiological factors of secondary seizures in

patients from central India admitted to Government Medical College and Hospital, Nagpur.

Materials and Methods

This cross sectional study was carried at Government College Medical College and Hospital, Nagpur during period Dec 2011 to Oct 2013. Total 58 patients with history of focal or generalized seizures and CT (brain) abnormality were included in the study. A detailed clinical history and examination were done to identify any neurological abnormality, fundus changes, any malformation, and/or associated illness. Patients with metabolic cause for seizure and normal neuroimaging studies were excluded from the study. Detailed history regarding onset and type of seizure was taken in every patient. All necessary investigations e.g. complete blood count, biochemical parameters were done in all patients. An EEG was performed using 12 lead EEG recorders in all patients. EEG without any sedation and activation procedures was done as and when feasible. CT scan of head with contrast was also performed in all patients with history of seizures and those with abnormal CT Reports were included. CT head was done with 3rd generation CT scan machine with Schmadzu 3000j

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CT scanner at Govt. Medical College, Nagpur. All the findings were recorded in a proforma specially designed for this study, consent was obtained and results were analyzed by standard statistical method. The study was approved by ethical committee.

Results

A total number of 58 cases above 13 yrs of age who attended Medicine OPD or admitted in medicine wards of Govt. Medical College & Hospital were included in the study after satisfying the inclusion criteria. Mean age of patients was 34.85. Male to female ratio was 1:0.65 in our study. Among 58 cases history of generalized tonic clonic seizures was present in 42 (72.41%) cases and history of focal seizures in 16 (27.59%) cases.

Past history of tuberculosis was present in 6 patients (1 of generalized seizures and 5 patients of focal seizures). All of these patients had tuberculoma as a cause of seizure on CT (head) scan. Symptomatology of all patients is depicted in table 1. In our study maximum number of patients had transient loss of consciousness (72 %), (All these patients had GTCs) followed by headache (63.7%), aura (41 %) and vomiting (39.65 %). Aura was in the form of sensation of obscure smell, flashing of lights and sound in the ear, sensation of pain in epigastrium with vomiting and vertigo. 42 patients had history of transient loss of consciousness. Out of 58, 23 patients (39.66%) had motor symptoms in the form of left

hemiplegia (2 patients), left hemiparesis (4 patients), right hemiplegia (3 patients), right hemiparesis (3 patients) paraplegia (2 patients) and post ictal paralysis (2 patients). 9 out of 58 patients had sensory symptoms, 5 of generalized tonic clonic seizures had sensory symptoms, 4 patients had tingling and numbness and one patient had hemianesthesia. Four out of 16 cases of focal seizures had sensory symptoms, 3 had hypoaesthesia on left side and 1 patient had tingling and numbness.

In present study out of 42 cases of generalized tonic clonic seizures 5 patients had papilloedema (11.90 %) and out of 16 cases of focal seizures 3 patients (18.75 %) had papilloedema. ESR was raised in 16 cases; lymphocytosis was present in 7 cases and X ray Chest PA view suggestive of PTB was present in 8 patients. (Table 2).

Table 1: Symptoms in patients of secondary seizures

Symptoms	GTCs (n = 42)	Focal seizures (n = 16)	Total (n = 58)
Loss of consciousness	42	0	42
Headache	23	14	37
Aura	20	4	24
Vomiting	15	8	23
Motor symptoms	16	7	23
nerve palsy	7	0	7
Sensory symptoms	5	4	9

Table 2: Investigations in patients of secondary seizures

Seizure type	Total patients (n = 58)	Lymphocytosis (n = 7)	ESR at first hour (n= 16)	X ray chest s/o PTB (n= 8)
GTCs	42	2	9	2
Focal	16	5	7	6

Abnormal EEG was present on 30 cases (51.72%). Focal slowing was commonest abnormal recordings followed by generalized activity. (Table 3)

Table 3: EEG findings in cases of secondary seizures

Seizure	Total cases n = 58	Normal EEG n = 28	Abnormal EEG			Total
			Focal slowing	Focal spike	Generalized activity	
GTCs	42	19	13	3	7	23
Focal	16	9	4	1	2	7
Total	58	28	17	4	9	30

The commonest abnormality observed in CT head was neurocysticercosis (in 34.48% cases), followed by post stroke or scar epilepsy (in 27.59%), tuberculoma (in 24.14%), brain tumour (in 6.90%), brain abscess (in 3.45%) and hydatid and metastasis in 1 case each. (Table 4) All lesions were supratentorial, found in frontal region (n= 34, 58.62%), in parietal region (n= 26, 44.83%), in temporal region (n= 15, 25.86%) & in occipital region in 8 cases (13.79%).

Table 4: Aetiologies as revealed by CT (head) scan

Etiology	Number of patients (%)
Neurocysticercosis	20 (34.48)
Post stroke epilepsy	16 (27.59)
Tuberculoma	14 (24.14)
Brain Tumor	4(6.90)
Brain Abscess	2 (3.45)
Hydatid	1 (1.72)
Metastasis	1 (1.72)
Total	58 (100)

Discussion

The study was conducted to assess etiological factors in patients of partial or generalized seizures and to assess the role of EEG and CT head in these patients. Majority of cases were in age group of 21 to 40 years. Our observations were comparable to Kumar N *et al.*,⁵ who also observed the similar occurrence of cases (49.50 %) in age group of 20- 39 years, similarly Washimkar *et al.*,⁶ found 71.6 % cases in age group of 10 – 40 years.

In our study male preponderance was observed, male: female ratio being 1: 0.65. We observed post ictal weakness in 6.89% cases while Washimkar *et al.*,⁶ observed post ictal weakness in 18.33% of cases.

Out of 42 patients of GTCs 23 patients (54.76%) had abnormal EEG recording, and out of 16 patients of focal seizures 7(53.84%) had abnormal EEG. Various authors observed different incidence of EEG abnormality, some authors had observed high incidence. Abhirup Biswas *et al.*,³ observed abnormal EEG in 73% of patients with partial seizures and 76.9% of patients with generalised seizures. Ramesh *et al.*,⁷ observed 73 % of patients with partial seizures and 76.9 % of patients with generalized seizures were having EEG abnormality. Al- Sulaiman *et al.*,⁸ and Doose *et al.*,⁹ reported abnormal EEG in 81% of patients with partial seizures and 78% of patients with generalised seizures.

Out of this focal slowing was the commonest abnormality observed in 17 cases (29.31%), generalized activity was observed in 9 cases (15.51%), Focal spikes were observed in 4 cases (6.89%). However, Homes *et al.*,¹⁰ observed most common EEG abnormality to be a focal slowing. Ramesh *et al.*,⁷ observed that sharp wave and spikes (either alone or both) were the commonest abnormality in both the seizure groups.

When evaluated for etiology and it was found that neurocysticercosis was the most common abnormality observed in 34.48% of cases, followed by post stroke seizures (scar epilepsy in 27.59%), tuberculoma (24.14%) brain tumor (6.90%), brain abscess (3.45%) and hydatid and metastasis were present in 1.72% patients each.

Our finding of infection as the commonest etiology was consistent with study done by Washimkar *et al.*,⁶ who observed tuberculoma as the commonest abnormality (60.9% patients). However, they observed neurocysticercosis in 3.41% patients. This may be due to high prevalence of tuberculosis in past in Indian population. Majority of studies conducted in developed countries have not reported any case of

tuberculoma or neurocysticercosis as etiological factors in cases of seizure disorders².

Ramesh *et al.*,⁷ observed that in patients with partial seizure, the most common abnormality found was cerebral atrophy (23%), followed by calcification (7.6%), tuberculoma (3.8%), neurocysticercosis (3.8%), hypoplasia of thalamus (3.8%), and infarction of basal ganglion (3.8%); whereas among patients with generalised seizures, commonest finding was cerebral atrophy (15.3%), followed by cerebral oedema (11.5%), hydrocephalus (3.8%), and subdural effusion (3.8%). Bogdanoff *et al.*,¹¹ and McGahan *et al.*,¹² observed cortical atrophy as the most common finding in 22% and 38% of patients with partial and generalized seizures respectively. Similarly, Kramer *et al.*,¹³ observed calcifications in 4.2% patients and hydrocephalus in 2.1% patients with partial seizure disorder, whereas McGhan *et al.*,¹² reported hydrocephalus in 2% patients of generalized seizures.

When we tried to localize the lesion, it was observed that most of the lesions were in frontal region (58.62%), followed by in parietal area (44.83%), in temporal region (25.86%) and in occipital region 13.79%. Our findings were consistent with study done by Washimkar *et al.*,⁶ who also observed commonest involvement of frontal lobe (60.22%), followed by parietal area.

Conclusion

Seizures are an important cause of morbidity in adults. It is therefore important to establish accurate diagnosis of seizures and its etiologies to manage appropriately such patients. The commonest possible etiology of secondary seizures revealed by CT (head) scan was neurocysticercosis. With advent of CT and MRI it has now been possible to diagnose and treat patients of secondary seizures effectively. In central India it appears that neurocysticercosis is still prevalent and in our study it tops the list in differential diagnosis of secondary seizures. And hence as neurocysticercosis is a treatable condition it is important to recognize it early to treat it effectively. In a meta-analysis done by Del Brutto OH *et al.*, it was concluded that Cysticidal drug therapy results in better resolution of colloidal and vesicular cysticerci, lower risk for recurrence of seizures in patients with colloidal cysticerci, and a reduction in the rate of generalized seizures in patients with vesicular cysticerci¹³.

Limitations of the study

- 1) Though CT scan does not give confirmatory diagnosis and confusion with neoplasm may occur. For confirmation of NCC EITB (Electroimmuno transfer blot assay) is needed; however, in our setup we could not perform EITB because of lack of monitory support and expert personnel.

- 2) Our study didn't focus on control of seizures as an outcome.

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