



ORIGINAL RESEARCH PAPER

Neurology

STUDY ON COGNITIVE IMPAIRMENT IN EPILEPTIC PATIENTS.

KEY WORDS: Epilepsy, cognitive impairment, memory, executive function, parietal lobar functions, focal seizures, generalized seizures.

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ABSTRACT

Many patients with epilepsy also have associated cognitive impairment which is very important in determining their quality of life. In this study, 100 patients with epilepsy were assessed for various modalities of cognitive function and their performance was scored. These scores were compared against those of a control population to determine the prevalence and severity of the condition. The prevalence was 74% for Memory impairment, 82% for executive dysfunction, 63% for constructional ability impairment, 58% for impaired calculation ability, 20% for right to left confusion and 14% for finger agnosia. All the modalities except constructional praxis worsened with longer duration of the disease and with poorer seizure control. Patients on Sodium valproate had the least degree of memory and executive dysfunction. Patients with focal seizure semiologies had the most degree of executive dysfunction.

INTRODUCTION.

Epilepsy is defined as the propensity for an individual to get epileptic seizures. In addition to seizures, epilepsies are often associated with cognitive impairments (1). This is an important determinant in the reduction of the quality of life observed in epileptic patients (2). The seizures themselves often directly contribute to cognitive impairment. However, changes in brain function that lead to epilepsy could independently cause impairment in cognition. Antiepileptic drugs have the potential to negatively impact cognitive function, as well as to enhance cognitive function(3).This study attempts to assess epileptic patients of southern Tamil Nadu who are under treatment in Tirunelveli Medical College, for their cognitive function and its association with various clinical parameters.

Aims and Objectives

1. To study the prevalence, severity and pattern of cognitive impairment in patients with epilepsy in the study population.
2. To assess the impact of various factors like duration of epilepsy, degree of seizure control, semiology of seizures and the choice of drug therapy on cognitive function.

Type of study.

Cross- Sectional study.

Inclusion criteria.

Patients with epilepsy of duration of more than a year who are on regular follow up in department of Neurology, Tirunelveli Medical college.

Exclusion Criteria.

Patients who had seizures during the 5 days prior to performing the cognitive assessment.

Methodology.

While dealing with cognition, the domains of memory, executive function and visuospatial orientation were given importance. Examination showed no impairment of language functions in all the cases selected for the study.

Memory was divided into five sections of object recall, story recall, new learning ability(tested with paired associate memory), visual memory and semantic memory (tested with category fluency). Each section was scored according to performance with each of them assigned three points as a maximum score.Thus, the total memory score is 15. Frontal lobe and executive functions were also divided into five sections of attention, response inhibition, set shifting, abstract thinking and letter fluency. Similar to scoring of memory assessment, a total score of 15 was assigned to executive function.

Non dominant parietal lobar function of constructional praxis was assessed by the ability to copy the diagrams of intersecting polygons and necker cube. With a score of 5 to each, a total score of 10 was assigned. Dominant parietal lobar function of ability to perform simple and complex calculations, finger gnosis and right left orientation were also tested.

A control group of 25 individual with similar age distribution and educational status as the study population, performed these tests. All of them scored 14 and above for memory and executive functions and 8 or above for constructional praxis. All of them performed the tests for calculation, right left orientation and finger naming, without errors.

The type of seizures, duration of illness, control of seizures, the medications used were also recorded and they were assessed against the cognitive performance scores for any significant associations.

OBSERVATIONS AND RESULTS.

A total of 100 cases were included in the study. Significant memory impairment (score of 13 and below) was present in 74% cases. Of these cases, 54% had mild impairment (score: 11-13), 18% had moderate impairment (score 7-10), 2% had severe impairment (score: 6 and below).Executive dysfunction was present in 82% of patients. 46% cases had mild dysfunction, 26% had moderate dysfunction and 10% had severe executive dysfunction. Constructional apraxia (score: 7 and below) was present in 63% of the patients. 39% cases had mild impairment (score:5-7) and 24% had severe impairment (score : 4 and below).58% of the patients had difficulty in performing complex calculations involving two digits. 20% of the patients had right-left disorientation and 14% of cases had finger agnosia.

Relationship with duration of illness

40% of patients had duration of illness between 1 to 5 years. 18% had duration of six to 10 years and 42% had epilepsy for more than 10 years.

Memory impairment was more in patients who had a longer duration of illness.

Table 1.

Duration of seizures	1-5 yrs	5-10 years	More than 10 years
Memory score (Max 15)	13	11.8	11

Executive dysfunction also increased with duration of illness. Constructional apraxia did not show worsening with duration of illness.

Table 2.

Duration of seizures	1-5 years	More than 5 years
Executive Fn. Score (Max 15)	11.5	10.4
Constr. Praxis score (Max 10)	6.1	6.4

Other dominant parietal lobar functions also worsened with duration of illness except for finger anomia.

Table 3.

Duration of seizures.	1-10 years	More than 10 years
Dyscalculia	52%	70%
Right-left confusion	13%	30%
Finger agnosia	14%	13%

Relationship with seizure control

28% of the cases had adequate control of seizures. They were seizure free for more than a year. 72% of cases had uncontrolled seizures with one or more seizures per year. Of these cases, 30% cases had very poor seizure control with one or more seizures per month.

Memory and executive function average scores were worse for those with uncontrolled seizures and worst in those with very poor seizure control. Constructional ability did not show any worsening with poorer seizure control. All the dominant parietal lobar functions worsened with poor seizure control and were worst in those with poorest seizure control.

Table 4.

	Seizure free for >1year	Uncontrolled	one or more seizures every month
Memory (Max 15)	12.2	12	11.7
Executive Fn. (Max 15)	11.4	10.7	10.2
Constr. Praxis (Max 10)	5.7	6.8	7.1
Dyscalculia	53%	59%	79%
Right-left confusion	7%	25%	27%
Finger agnosia	7%	17%	20%

Relationship with seizure types

62% of the patients generalized seizures. 26% had focal seizures including complex partial seizures as the semiology and the rest 12% had combined focal and generalised seizures as the semiology.

Table 5.

Semiology	Generalised seizures	Focal seizures	Dual semiology
Memory (15)	12.7	12.4	11.3
Executive Dysfn.(15)	11.2	10.2	10.7
Constr. Praxis (10)	6.0	5.7	8.7
Dyscalculia	62%	50%	67%
Right-left Confusion	19%	15%	33%
Finger agnosia	10%	23%	17%

Relationship with drug therapy

28% of the patients were treated with Sodium Valproate, 18 % of the cases were treated with phenytoin. 12% were treated with carbamazepine and the rest 40% were treated with multiple first line anti-epileptic drugs.

Table 6.

Drug	VPA	PHT	CBZ	Multiple drugs
Memory (15)	12.8	12.3	11.9	11.3
Executive function (15)	12.1	11.8	10.1	9.7
Constructional praxis (15)	5.7	6.9	5.5	6.5
Dyscalculia (%)	64%	22%	33%	52%
	Single drug therapy	Multiple drug therapy.		
Right left confusion	13%	25%		
Finger agnosia	13%	15%		

DISCUSSION

In the study, 74% cases had mild memory impairment. Of these

20% had moderate to severe impairment. In the study conducted in USA in 1992, 54% patients complained of memory disturbances(4). Memory performance scores worsened with the duration of the illness and also with poor seizure control. When comparing the seizure type, cases of GTCS had a better memory score than those with CPS but the difference is not significant. Patients with combined semiology had worse scores than both. The general assumption is that that patients with CPS ought to have comparatively more memory impairment because of mesial temporal sclerosis (5). With regard to drugs, patients on Valproic acid had the best memory scores and those on carbamazepine had the worst. The difference between the two was however not statistically significant. Phenytoin occupied the middle spot. But patients on multiple drugs had the worst memory score of the all. This is in line with other studies that show that Valproate has little detrimental impact on cognitive function and is preferable to CBZ and phenytoin (6,7). Other studies have also shown that multiple drug therapy is associated with worse cognitive outcomes(8)

Upto 82% of the patients had some degree of executive dysfunction. Of these 36% had moderate to severe impairment. In a study conducted in Cincinnati USA, up to 30% cases had working memory impairment and 17% had problems in problem solving/cognitive flexibility(9). Similar to the memory function, average scores were lower in those with long standing as well as poorly controlled epilepsy. The mean score was lower in those with focal seizures when compared to those with generalised seizures. Sodium valproate was associated with least impairment and carbamazepine was associated with the worst, which is in line with the previous studies (6,7). A double-blind trial in 2009 showed that carbamazepine use caused deterioration in attention and information processing speed (10). Phenytoin had a slightly lower average score than that of sodium Valproate. Similar to memory, multiple drug therapy was associated with the worst performance in executive function.

For constructional praxis, 39% cases had mild impairment and 24% cases had severe impairment. Another study from 2015 showed that 18% of cases had impaired visuospatial skills (11). There was however, no associated worsening of performance with the duration of illness and with poor control of seizures. No major difference was also noted between seizure semiologies. Phenytoin users had the highest average scores when compared to Valproate and carbamazepine users who themselves had similar scores.

Dyscalculia was prevalent in 58% of the cases. Only 2% had problems in performing single digit arithmetic and the rest could not perform double digit arithmetic reliably. It is more prevalent with longer duration of illness, poor seizure control and generalised seizure semiology. In contrast to other domains, dyscalculia was most prominent in Valproate users when compared to others. It was second most prominent in the cases on poly-drug therapy.

Right-left disorientation and finger agnosia were prevalent in 20% and 14% of the cases respectively. Both of them become more prevalent with longer duration illness and in those with poor seizure control except for finger anomia in relation to epilepsy duration, which showed no major difference. Finger agnosia was more prevalent in focal seizure semiology and right-left confusion was much more prevalent in patients under poly- drug therapy when compared to those under monotherapy.

Highlights

- Memory impairment(74%), executive dysfunction(82%), constructional ability impairment(63%)and impaired calculation ability(58%) were highly prevalent in the study population. Right to left confusion (20%) and finger agnosia (14%) were less prevalent.
- All of the tested cognitive functions except for constructional praxis worsened with longer duration of the illness and with poorer seizure control
- Patients with combined focal and generalized seizure semiologies had the most degree of memory impairment and those with focal seizures had the most degree of executive dysfunction.

- Patients on sodium valproate had the least impairment in memory and executive function. Those on multiple drugs had the most impairment in memory and executive function. However, patients on sodium valproate had the most prevalence of impairment in calculation ability.

CONCLUSION.

Cognitive impairment is an important factor determining the quality of life in epileptic patients. According to this study cognitive impairment of varying severity and in multiple domains is highly prevalent in epileptic patients and is influenced by the duration and control of epilepsy, the semiology and the choice of drug used. Future studies preferably with larger sample sizes would be helpful in understanding more about the topic.

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