Original Article

The Study of Electroencephalographic changes in Patients Diagnosed with Dementia

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Abstract

Dementia refers to a group of disorders caused by the gradual dysfunction and death of brain cells. This disorder can be described clinically as a syndrome that causes a decline in cognitive domain (i.e., attention, memory, executive function, visual-spatial ability, and language)EEG may play an important role in detecting and classifying dementia because of its significant influence on dementia abnormalities in terms of rhythm activity. An increase in EEG slow wave activity (theta and delta frequencies) together with decreased activity in the alpha frequency band is considered to be typical findingin the various types of dementia.

AIM AND OBJECTIVES: An analysis of electroencephalographic changes in patients diagnosed with dementia to find significance in diagnosis.

METHODS AND MATERIALS: This study is an observational cross sectional study carried out in 30 patients diagnosed with dementia attending outpatient department in a tertiary care hospital over a period of 6 months. Subjects are enquired about their history of diagnosis, family history, Treatment history and diagnostic tests such as EEG. Additionally MMSE (Mini Mental State Exam) scoring was also performed for all patients.

RESULTS: Out of the 30 patients with dementia incidence was higher in males (56.66 %) compared to females (43.33 %). EEG was found to be normal in 9 patients and abnormal in 21 patients.

The study also shows statistically significant correlation between MMSE Scoring and EEG findings in patients with dementia.

CONCLUSION: There is a definite EEG abnormality found in majority of the patients. Combined MMSE scoring and EEG in evaluation of dementia patients in larger study group will reveal more insight.

KEYWORDS: Dementia- MMSE scoring- EEG

Introduction

Dementia is a progressive deterioration of intellect, behavior and personality as a consequence of diffuse disease of cerebral hemispheres, maximally affecting the cerebral cortex andhippocampus.This disease can occur at any age but is most common in elderly. Incidence increases with increasing age. If itis occurs below the age of 65 years then it is labeled as presenile dementia.

Dementia Classification

Classification isbased on causes

1. Degenerative-Pure dementia, Alzheimer's disease Front temporaldementia

2. Dementia plus syndrome-Dementia with lewy bodies, Parkinson's disease with dementia Progressive supranuclear palsy, Huntington'sdisease

3. Cerebrovascular disease-Multiple infarct dementia, Sub cortical ischemic vasculardementia

4. Structural disorders-Normal pressurehydrocephalus

5. Infectious-Creutzfeltd jakob disease, HIV, Syphilis

6. Nutritional-Thiamine and Vit B12def

7. Metabolic-Liver disease, Thyroid disease

8. Trauma-Headinjury

9. Neoplasia or paraneoplasia-Frontaltumour

Symptoms

Classified based on the site of involvement,

1. Frontal premotor cortex-Behavioural changes, Irresposible, Antisocial behavior, Antisocial behavior;
2. Parietotemporal region- Disturbances of memory andlanguage
3. Subcortical-Apathetic,   Poorknowledge, Cortical-Dysphasia, Agnosia, Apraxia

Criteria for Dementia

Diagnostic and statistical manual of mental disorders [DSM-5] criteria classifies dementia as a major cognitive disorder.

Criterias:

One or more significant impairments in cognitive behaviors such asMemory, Language, Execution of purposeful movement, Recognition, Familiarity, Self control\management, Mathematics, Emotional expression\comprehension and Writing.

Initial Patient Assessment:

The patient assessment should begin with detailed clinical history with focus on cognitive and behavioral symptoms. Detailed description of behavioral changes should be obtained from patient attendee's especially close relatives such as spouses, parents,children etc.

Examinations

During examination look for focal signs, abnormal movements, pseudo-bulbar signs, Primitive reflexes like prout reflex, grasp reflex, glabellar tap reflex, palmomental reflex.

Mini mental status examination[MMSE]

1. 25-30:No cognitive improvement
2. 18-24:Mild cognitive improvement
3. 0-17:Severe cognitive impairment

Eeg In Demetia

An increase in EEG slow wave activity (theta and delta frequencies) together with decreased activity in the alpha frequency band are considered to be typical findings in the various types of dementia   J. Greene.[1] MannM, R.Baker,[2-4] N. Malek,-(2016): Study of 38 patients with a diagnosis of AD at various stages of dementia EEG recordings wereevaluated and found a decrease in alpha coherence and an increase in delta coherence were found to be most significantly correlated with the degree of dementia, assessed using the Mini-Mental State Examination score. EEG can be a useful tool in differentiating dementia from pseudodementia on the one hand. Role of EEG as Biomarker in the Early Detection and Classification of Dementia Al- qazzaz, NK, Ali, SHBM, Ahmad, SA, Chellappan, K, Islam, MS & Escudero-(2014): EEG as a useful clinical evaluation tool in the discrimination of AD and/or VaD and/or other types of ddementia.[5,6]

EEG comparisons in early Alzheimer's disease (AD), dementia with Lewy bodies (DLB) and Parkinson's disease with dementia patients (PDD) with a 2-year follow-up Laura Bonanni, Astrid Thomas, PietroTira-boschi, Bernardo Perfetti, Sara Varanese1 and Marco-Onofrj1-(2008)

The authors in above study evaluated whether EEG abnormalities can discriminate between DLB, AD and PDD in the earliest stages of dementia and to do this 50 DLB, 50 AD and 40 PDD patients and they found Our first relevant finding was the identification of slow activities (5.6–7.9 Hz) in posterior derivations of all DLB patients, which significantly differentiated these patients from those with AD.

EEG findings in dementia with Lewy bodies and Alzheimer's disease(Briel et al, 1999) Seventeen of the total of 19 records from the patients with DLB were abnormal. Thirteen showed loss of alpha activity as the dominant rhythm and half had slow wave transient activity in the temporal lobe areas.

Materials and Methods

This study is an observational cross section study to analyze the EEG changes in dementia patients in a tertiary care hospital. A total of 30 patients were included in this study. All the patients diagnosed with Dementia/ Major NeuroCognitive Disorder (DSM-5) attending the OPD were included. Patient below the age of18 and patients who were found to have technical difficulty in carrying out EEG were excluded from this study.

Descriptive statistics were applied to calculate demographic variables like Mean, Median, Standard Deviation, Confidence Interval. Pie chart / Bar graph will be used to explain the EEG changes in demented individuals.

Results and Discussions

In this study surprisingly 70 Percent of the patients were females in contrast to many other studies in literature.

In this study maximum number of age group is 65-75 (30%), in accordance with other studies. Younger the age lesser was the incidence.

This study showed more than 70 percent of the patients with abnormal EEG activities

More male patients showed abnormal EEG patterns than their female counterparts.

As expected the EEG finding shows more abnormalities with increase in age.

Commonest EEG activity seen is slowing of activity of all the waves.

Longer the duration of the dementia higher the incidence of EEG abnormalities seen in this study.

Analyzing the EEG findings of 30 patients who were on medications and who were without medications , it is found to be 11 abnormal patients without medications and 10 abnormal patients under medications and 9 normal patients were without medications and none of them were under medication.

MMSE scoring and EEG findings had statistically significant correlation between MMSE Scoring and EEG Findings (P <0.001).

Conclusion

In this study EEG was done for patients presenting with Dementia to a tertiary care hospital during the study period. Additionally MMSE scoring was also performed for the patients. EEG was found to be normal in 9 patients and abnormal in 21 patients. It was also found that the incidence of dementia is higher in males (56.66 %) compared to females (43.33 %).According to the age group, this study shows maximum number of age group involving the dementia is65-75yrs(30%).The study shows a statistically significant correlation between MMSE Scoring and EEG Findings in patients with dementia attending a tertiary care hospital (P <0.001). Combined MMSE and EEG in dementia patients with larger group will give more information.

References

1) D. Pond. Dementia an update on management. Australian Family Physician.2012; 41(12): 936–939.

2) P. Luu, D. M. Tucker, R. Englander, A. Lockfeld, H. Lutsep, and B. Oken. Localizing acute stroke-related EEG changes: assessing the effects of spatial undersampling. Journalof Clinical Neurophysiology.2001;18(4):302–317.

3) S. M. Snyder, J. R. Hall, S. L. Cornwell, and J. D. Falk. Addition of EEG improves accuracy of a logistic modelthat uses neuropsychological and cardiovascular factors to identify dementia and MCI. Psychiatry Research.2011; 186(1):97– 102.

4) Schreiter-Gasser U, Gasser T, Ziegler P. Quantitative EEG analysis in early onset Alzheimer's disease: a controlled study. Electroencephalogr Clin Neurophysiol. 1993;86:15–22.

5) McKeith IG, Galasko D, KosakaK. Consensus guidelines for the clinical and pathologic diagnosis of dementia with Lewy bodies (DLB): report of the consortium on DLB international workshop. Neurology. 1996;47(5):1113–24.

6) Briel RC, McKeith IG, Barker WA. EEG findings in dementia with Lewy bodies and Alzheimer's disease. J Neurol Neurosurg Psychiatry. 1999;66(3):401–3.