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Clinical Evaluation of the Association Between Prolonged Febrile Seizures and Mesial Temporal Sclerosis in Patients with Mesial Temporal Lobe Epilepsy: A Prospective Observational Study Using Imaging Modalities

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ABSTRACT

Introduction: Febrile seizures (FS), the most common form of childhood seizures, are categorized into two types: simple and atypical FS. Prolonged febrile seizures (lasting more than 30 minutes), specifically febrile status epilepticus, have been associated with mesial temporal lobe epilepsy (mTLE) due to neuronal loss, gliosis, and hippocampal atrophy occurring in early life.

Aim of the study: This study aimed to clinically evaluate the association between prolonged febrile seizures and mesial temporal sclerosis (MTS) in patients with mesial temporal lobe epilepsy (mTLE) using MRI of the brain.

Methods: A prospective cross-sectional observational study was conducted at the epilepsy clinic, Department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU), from February 2021 to May 2022.

Results: The study included 84 patients diagnosed with temporal lobe epilepsy (TLE). Among them, 58 patients had MRI-confirmed mesial temporal sclerosis (MTS) on epilepsy protocol imaging. Of these 58 mTLE patients, 35 (60%) had right-sided MTS, while 23 (40%) had left-sided MTS. The age range of the patients was 18-60 years, with 37 males and 21 females. A positive history of prolonged febrile seizures was found in 38 (45%) patients.

Conclusion: A history of prolonged febrile seizures appears to be a significant causative factor for the later development of hippocampal damage and mesial temporal lobe epilepsy (mTLE). This study demonstrates that MRI findings show a notable association between prolonged febrile seizures in childhood and mesial temporal sclerosis in patients with mesial temporal lobe epilepsy.

Key Words: Febrile Seizures (FS), Mesial Temporal Sclerosis (MTS), Mesial Temporal Lobe Epilepsy (mTLE), Prolonged Febrile Seizures, MRI Brain Imaging.

INTRODUCTION

Febrile seizures (FS), the most common form of childhood seizure, have prevalence in the West of 2% to 5% [1] FSs can be separated into two categories: simple and atypical. Simple FSs are generalized and brief seizures (lasting <15 min) that do not recur within 24hours. Atypical FSs are prolonged (>15 min), recurrent within 24 hours, or lateralized seizures or express more than one of these characteristics. In contrast to simple FSs, prolonged FSs, more specifically febrile status epilepticus (lasting >30 min), have been associated with mTLE. Based on

retrospective clinical studies, it has been shown that up to 30 to 60% of patients with mTLE have a past history of prolonged FSs [2] in one important yet controversial series, children with atypical febrile seizures showed an eightfold increased risk of developing epilepsy compared to those with simple FSs and controls. Mesial temporal lobe epilepsy (mTLE) is the most common form of partial onset epilepsy approximately 65% of all epilepsy, and is generally refractory to treatment [3] It is characterized by seizures that originate in limbic structures, namely, the hippocampus, the parahippocampal gyrus and the amygdala. The underlying pathology is Ammon's horn sclerosis characterized by neuronal loss, gliosis and atrophy of the hippocampus. mTLE thought to happen in early life, namely, after prolonged febrile seizures (FSs) [4] Two prevailing hypotheses exist to explain the possible relationship between prolonged FS, hippocampal sclerosis, and mTLE. Hypothesis states that hippocampal sclerosis predisposes to prolonged FS and mTLE [5].

OBJECTIVE

We have tried to evaluate clinically the association between the effects of prolonged febrile seizure and mesial temporal sclerosis in cases of mesial temporal lobe epilepsy (mTLE) by MRI of the brain.

MATERIALS & METHOD

Prospective-cross sectional observational study was done in epilepsy clinic, department of Neurology, Bangabandhu Sheikh Mujib Medical University (BSMMU) from February 2021 to May 2022. This study was done among 84 patients with TLE, Age range 18-60 years. Among them 58 TLE (69%) patients were Mesial temporal sclerosis (MTS) by MRI of the brain. Patient with history of prolonged febrile seizuresc (lasting >30 min) are included. MRI of the brain with epilepsy protocol were used to detect mesial temporal sclerosis from radiology department of BSMMU& also outside of BSMMU. MRI have shown that early febrile seizure causes acute hippocampal injury leads to later development of hippocampal sclerosis and hippocampal atrophy in mesial temporal lobe epilepsy.

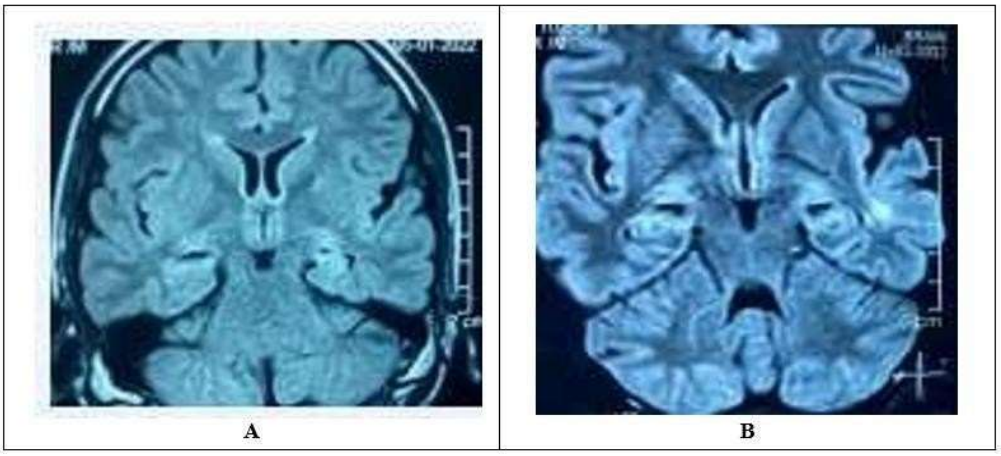

Figure: Coronal FLAIR image of MRI with epilepsy protocol showing A) right mesial temporal sclerosis, B) left mesial temporal sclerosis.

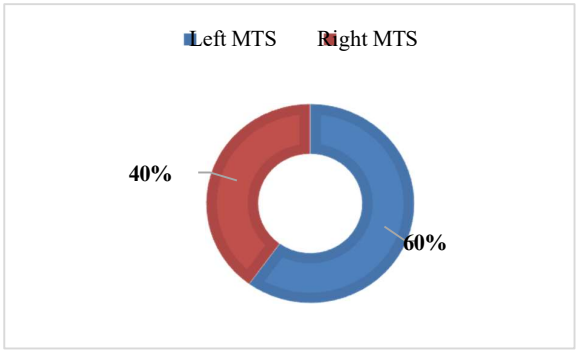

Figure: Distribution of mesial temporal sclerosis (MTS), 35 patients (60%) had right MTS and 23 patients (40%) had left MTS.

RESULT

This study was done among 84 patients with temporal lobe epilepsy (TLE.). Among them 58 patients were MTS by MRI of the brain with epilepsy protocol. Among 58 mTLE patients, 35 patients (60%) had right MTS and 23 patients (40%) had left MTS. Age range was between 18-60. Male are 37 and female are 21. Among them 38 (45%) patients had positive history of prolonged febrile seizure.

DISCUSSION

The study was conducted among a cohort of 84 patients diagnosed with temporal lobe epilepsy (TLE), which is consistent with the well-established observation that TLE is one of the most common focal epilepsy syndromes in adults [6]. The patient sample size of 84 is within an acceptable range for observational studies investigating the clinical and imaging correlates of mesial temporal sclerosis (MTS) [7]. Out of these 84 patients, MRI of the brain with an epilepsy protocol revealed that 58 patients had radiological evidence of mesial temporal sclerosis (MTS). This finding aligns with existing literature, which suggests that approximately 60–70% of patients with refractory temporal lobe epilepsy exhibit hippocampal sclerosis on MRI [8]. The use of MRI epilepsy protocols is considered the gold standard in identifying structural abnormalities like MTS [9]. Further analysis of the 58 patients with MTS revealed that 35 patients (60%) had right-sided MTS, whereas 23 patients (40%) had left-sided MTS. This observation is comparable to previous studies, though there is some variation across populations. Some studies suggest left-sided dominance in MTS, while others indicate a relatively even distribution, or right-sided preponderance, especially in certain demographic groups [10]. The right-sided predominance in this study could reflect a regional or population-specific trend that warrants further investigation. The age range of the study population was between 18 and 60 years, reflecting the typical age group in which TLE and MTS are diagnosed [11]. The gender distribution included 37 males and 21 females, which aligns with some previous studies indicating a slight male predominance in epilepsy populations [12], though gender distribution can vary depending on the setting. A significant finding in this study was that 38 patients (45%) with TLE had a positive history of prolonged febrile seizures. This finding is consistent with the widely recognized association between prolonged febrile seizures (particularly febrile status epilepticus) and later development of mesial temporal sclerosis, leading to mesial temporal lobe epilepsy [13]. This study further supports the notion that prolonged febrile seizures can act as an initial precipitating injury, contributing to hippocampal injury and the eventual onset of TLE [14]. Overall, the study findings reaffirm the established association between prolonged febrile seizures in childhood and the development of mesial temporal sclerosis in adulthood, as evidenced through imaging with epilepsy protocol MRI. This supports the critical role of early recognition and management of prolonged febrile seizures to potentially mitigate long-term epileptogenic consequences.

CONCLUSION

The possibility of hippocampal damage in early febrile seizure leads to mesial temporal sclerosis in mesial temporal lobe Epilepsy. (mTLE). Prolonged febrile seizure is a causative factor for the later development of MTS and mTLE. In this study, MRI of the brain have shown that there is a significant association between the long-term effect of prolonged febrile seizure and mesial temporal sclerosis in cases of mesial temporal lobe Epilepsy.

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