Case Report

Journal Of Clinical & Medical Images Case Reports

Open Access, Volume - 2

A short note in a long-standing discussion on the utility of EEG in patients with headache

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Received Date : June 15, 2022
Accepted Date : July 19, 2022
Published Date : Aug 12, 2022
Archived : www.jcmimagescasereports.org

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Abstract

Headache, especially migraine, has long been associated with epilepsy, based on the common clinical features, pathophysiological mechanisms and therapeutic options of these disorders. Epilepsy and headache can exist independently in the same patient or correlate in different ways. The utility of routine electroencephalogram (EEG) in patients with headache is to exclude a possible ictal origin when atypical symptoms exist. However, EEG abnormalities in migraine have been reported by a number of authors over the years. Herein, we report a case of a patient with migraine and paroxysmal epileptiform discharges (EDs) in the EEG, in an effort to contribute to the investigation of association between headache and abnormal EEG findings.

Keywords: Epilepsy; headache; migraine; electroencephalogram (EEG); epileptiform discharges.

Introduction

Headache, especially migraine, and epilepsy are both common neurologic disorders, which cause transient, paroxysmal and recurrent attacks of altered brain function, and share some similar clinical features, genetic predisposition and therapeutic approaches [1]. Patients suffering from migraine are often referred for routine electroencephalogram (EEG), especially when atypical symptoms exist, in order for a possible epileptic disorder to be excluded [2]. On the other hand, there are plenty of cases of adult migraineurs presenting with an abnormal EEG [3]. In this study, we report a case with migraine and paroxysmal epileptiform discharges (EDs) in the EEG, in an effort to contribute to the investigation of association between headache and abnormal EEG findings.

Case Presentation

A 21-year-old woman patient presented with a history of several headache attacks in the past two months. She described these episodes as an acute thumping -moderate to severe - headache, located in the right occipital area, accompanied by photophobia, phonophobia and numbness of the sculp and the right arm, with a frequency of 1-2 attacks every week. The episodes were lasting for 3-24 hours and lessening partially with sleep. Her medical and family history was unremarkable. The neurological examination and the laboratory exams were normal. The routine EEG revealed very often paroxysmal epileptiform discharges (EDs) consisted of generalized sharp waves (**Figure 1** & **2**). The patient was administered on lamotrigine in a dose of 25mg twice a day and reported no further headache attacks afterwards. However, a headache relapse occurred 4 weeks later and eventually the patient responded to a titration of lamotrigine of 50mg twice daily. Two months after treatment initiation, the EEG recording was remarkably improved, since the frequency of the EDs had decreased. The patient remains free of headache for 6 months until today.

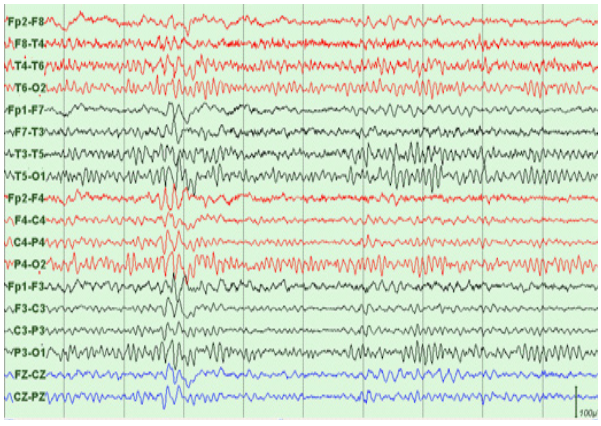

Figure 1

Citation: Christina Pourlou. A short note in a long-standing discussion on the utility of eeg in patients with headache J Clin Med Img Case Rep. 2022; 2(4): 1213.

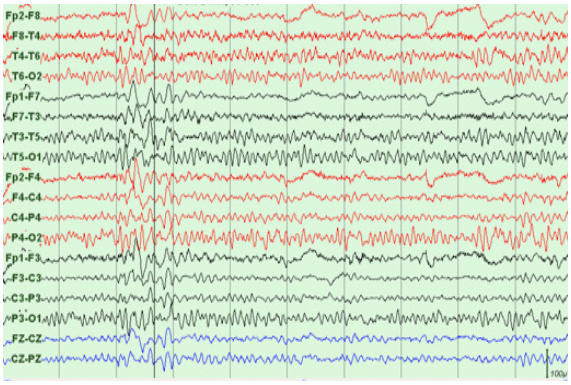

Figure 2
Figure 1 & 2: *Patient's EEG recording showing paroxysmal epileptiform discharges (EDs) of generalized sharp waves.*

Discussion

Epilepsy and headache can exist independently in the same patient or correlate in different ways. According to their temporal occurrence, headache in epileptic patients can be either interictal or peri-ictal. Headaches occurring between seizures, without a time-locked association, are called interictal headaches, whereas peri-ictal headaches are further classified as preictal, ictal and postictal, depending on the time they occur since the beginning of the seizure [4].

In accordance with the recently revised International Classification of Headache Disorders 3rd Edition (ICHD-3 2018) [5], there are three disorders correlating headache and epilepsy: migraine aura-triggered seizure, ictal epileptic headache and postictal headache. Migraine aura-triggered seizure is a seizure triggered by an attack of migraine with aura. Ictal Epileptic Headache (IEH) is caused by and occurs during a partial epileptic seizure, ipsilateral to the epileptic discharge and remits immediately or soon after the seizure has terminated, whereas postictal headache is caused by and occurs within three hours after an epileptic seizure, and remits spontaneously within 72 hours after seizure termination.

According to the ICHD-3rd edition [5], the aforementioned patient presented with a primary headache, since medical history, physical examination and imaging studies were normal. Specifically, she fulfilled the diagnostic criteria of a migraine disorder, considering that the recurrent headache attacks were lasting several hours, had unilateral location, moderate to severe intensity and were accompanied by photophobia and phonophobia.

A primary headache is diagnosed through comprehensive medical history and neurological examination [6]. If a specific cause, such as a brain tumor or epilepsy is suspected, the patient undergoes brain imaging or EEG, to differentiate it from a secondary headache. Although many physicians tend to perform EEGs in cephalalgic patients, it is not routinely indicated for headache diagnosis. American Academy of Neurology suggests EEG is not useful in the routine evaluation of patients with headache [2]. This does not exclude the use of EEG to evaluate headache patients with associated symptoms suggesting a seizure disorder such as atypical migrainous aura or episodic loss of consciousness [7]. Therefore, if a patient presents with a headache and features suggestive of an ictal origin, an EEG should be performed to rule out an underlying epileptic mechanism. Regarding our case, we assumed the numbness of the sculp and right arm could represent either an ictal or postictal phenomenon, especially an analog of Todd paresis. Therefore, an EEG recording was performed.

EEG abnormalities in migraine have been reported by a number of authors over the years and mostly include focal or diffuse slowing findings and abnormalities during activation procedures such as hyperventilation [8]. Epileptiform discharges are less commonly reported. Sethi et al. performed EEGs in 50 cephalalgic patients and found a total of 13 abnormal EEGs, of which 8 had nonepileptiform slowing, while epileptiform features were noted in 5 patients [3].

The presumably ictal phenotype of the female patient's headache attacks is pointed out by the presence of the concurrent symptom of numbness, the EDs in the EEG and the sufficient clinical response to an anti-epileptic drug (lamotrigine) which is commonly not used for the prevention of migraine without aura [9]. Considering the aforementioned definitions according to ICHD-3rd edition [5], migraine aura-triggered seizure is not a possible diagnosis, since an epileptic seizure never takes place. Likewise, ictal epileptic headache could not be suggested, due to lack of an EEG recording during the headache attack [10]. However, if we assume that a subclinical epileptic seizure has occurred before, postictal headache could be a reasonable explanation. Lastly, a random coincidence between a migraine disorder and epileptiform discharges in the EEG can occur and simply represent this patient's case.

In conclusion, when a patient presents with a resistant, drug-refractory headache or cephalalgic attacks suggestive of ictal origin, an EEG should be performed. Subsequently, if the EEG demonstrates epileptiform discharges and the headache presents with epileptic features, it could be reasonable to administer anti-epileptic drugs (AEDs). However, if the patient's cephalalgic events do not imply an apparent ictal nature, it is prudent applying at first common anti-migraine medication and eventually, if no remission is accomplished, AEDs.

Statements and Declarations

Acknowledgements: None.

Funding: No funding was received to assist with the preparation of this manuscript.

Ethics Declaration

Conflicts of interest: The authors declare that they have no conflict of interest.

Ethical approval: Written informed consent in respect of this case report was obtained in accordance with the Declaration of Helsinki. No ethics board approval was required for this case report.

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