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EEG Spikes and Sharp Waves as a Guide to Anti-Epileptic Drug Therapy in Patients with Chronic Headache. A Retrospective Observational Analysis.

J. Keba[1], John Rajpathy[2], Jeyanthi Arulneyam[3]

[1]Assistant Professor, Velammal Medical College Hospital and Research Institute, Madurai.
[2]Professor, Velammal Medical College Hospital and Research Institute, Madurai.
[3]Professor, Pondicherry institute of Medical sciences, Puducherry.

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ABSTRACT

Background: Purpose: Indiscriminate use of anti-epileptic drugs (AED) in all patients with chronic headache exposes the non-responders to harmful side effects. This retrospective study was aimed to find a common factor identifying patients with chronic headache who specifically benefited from AED therapy. **Methods:** The medical records of 100 cases with chronic headache were analyzed. Patients with history of birth asphyxia, migraine, head trauma, epileptic attacks (past/recent, of any type), psychiatric illnesses, stroke, intra cranial space occupying lesion and ophthalmic problems were excluded. Those who did not respond to analgesics and exhibited spikes and sharp waves in their EEG were treated only with AEDs and followed for 12 months after which a repeat EEG was done. **Results:** Patients were in the age group between 10-50 years. Headache duration varied from 4 months – 7 years. 65% had abnormal EEG findings. Among these patients, 93% (61 patients) had active epileptic activity in the form of spikes and sharp waves, and 7% had diffuse slow waves. These 61 patients were treated with AEDs for 12 months (12 patients lost to follow-up) 43 had improvement in their symptoms. **Conclusion:** Patients with chronic headache presenting with subclinical epilepsy on EEG with sharp waves and spikes benefitted most from AED therapy in terms of duration and frequency of episodes. We propose that all patients with chronic headache be screened with EEG for subclinical epilepsy and then start on AED only for those who exhibit epileptiform activities.

Keywords: Chronic headache, EEG, Spike and Sharp waves, Anti-epileptic therapy.

INTRODUCTION

Chronic Headache is common and related to stress. More than 40% adult world population suffer from chronic headache.[1] Often migraine and chronic headache are used synonymously though there are differences in criteria. Silberstein devised the "International Classification of Headache Disorders" ICHD-II - criteria to classify headaches.[2] Individuals who suffer from chronic headache show decreased productivity, depression, and often behavioural abnormalities.[3]

The success rate in the treatment of chronic headaches is not very encouraging due to the difficulty in pinpointing the exact aetiology, consequently giving rise to a plethora of treatment options with varying effects. Treatment with analgesics is the most common initial approach however often without sufficient relief of pain.

Name & Address of Corresponding Author
Dr. John Rajpathy
Professor,
Department of physiology
Velammal Medical College and research institute
Madurai 625009

Treatment with antidepressants has gained much importance in recent times as it is not only effective in treating the pain but also in preventing future attacks.[4] Other modalities which have been successfully tried are the cognitive behavioural therapy and the biofeedback and relaxation therapy.[5,6] Some of the recent modalities in treatment include acupuncture,[7] occipital nerve stimulation and treating certain specific trigger region over the face.[8,9]

Currently anti-epileptic drugs (AEDs) have gained major importance in the treatment of chronic headache, due to its efficacy in preventing attacks. Some of the commonly used anti-epileptics are valproate, topiramate and gabapentin. They act mainly by modulating gamma-amino butyric acid (GABA) and /or glutamate-mediated neurotransmission.[10] A review by Pappagallo has shown that newer antiepileptic drugs have better tolerance and drug interactions than treatment with standard tricyclic antidepressants.[11] This has made the AEDs popular as a preferred treatment of choice for chronic headaches.

Although the AEDs were tolerated by the patients it is not without side effects. Some patients withdrew from treatment because of severe cognitive effects.[12] Indiscriminate use of AEDs in all patients with chronic headache may expose them to these effects and make them noncompliant to treatment. This retrospective study was aimed to find a common factor identifying patients with chronic headache who benefited from AED therapy. This would be later developed as a guide in the selection of patients for AED therapy.

MATERIALS AND METHODS

This is a retrospective study analysing records of 100 (n=100) patients with complaints of chronic headache and follow-up [Figure 1]. The study patients were diagnosed to have frequent episodic or chronic tension type of headache using the ICHD II criteria for chronic headache. The duration of headache varied from four months to a maximum of seven years. Study population included both male (20%) and female (80%) subjects. The age group of the study population varied from 10-50 years (Mean = 28 yrs).

Patients with history of birth asphyxia, head trauma, ophthalmic aetiology like refractory errors, glaucoma, psychiatric illnesses, stroke, intra cranial space occupying lesions and history suggestive of migraine were excluded from the study. Those with history of any form of epileptic attack in the past, family history of epilepsy, or taking AED for any other reason were also excluded from the study.

An EEG investigation was done for patients whose headache persisted even after a course of analgesics. The EEG was analysed by a neurologist. Only those patients showing epileptic abnormalities (spikes and sharp waves) were treated with AEDs. The patients were reviewed after twelve months for symptomatic relief and an EEG was repeated.

Statistical analysis was done using Z test for proportion. (All the data like patient details, treatment history, EEG reports and follow up history after treatment were obtained from patient charts.)

RESULTS

Of the 100 patients 65% (n = 65: 15 male and 50 females) of the study population showed abnormal EEG findings (p value 0.03) [Figure 2]. Among them 93% (n=61: 13 male and 48 females) had evidence of active epileptiform activity in the form of spikes and sharp waves and 7 % (n = 4) exhibited diffuse slow waves [Figure 3].

These 61 patients were treated with AEDs and had no other intervention. They were followed for the next twelve months. 12 patients did not report for the follow-up consequently only 49 patients were available for follow–up analysis. Among these 49 patients, 43(87%) reported significant reduction in intensity and the frequency of headache episodes (p value 0.02) following treatment and 6 (12%) patients reported no improvement [Figure 1]. Out of the 43 patients who had symptomatic relief from headache, 32 patients (74%) (p value 0.08) repeat EEG exhibited no spikes and sharp waves and 11 (25%) retained these changes even after their symptomatic relief.

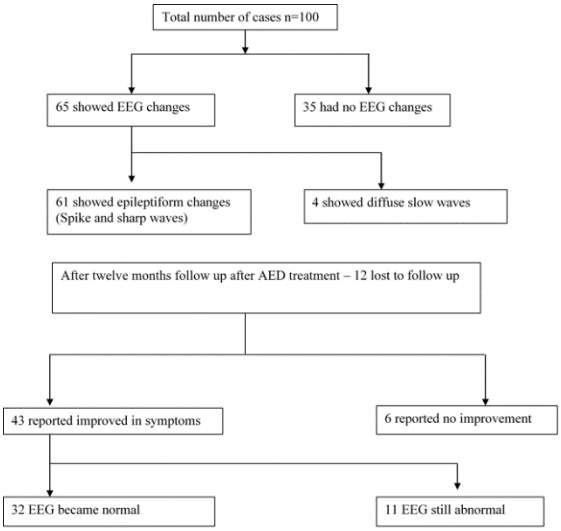

Figure 1: Schema and flow of the study.

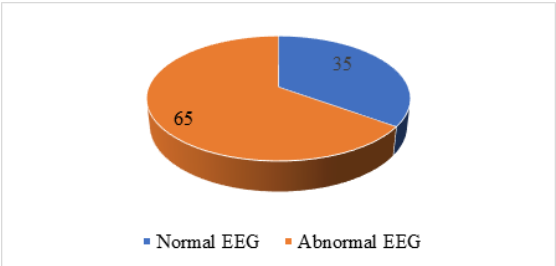

Figure 2: EEG findings of the study population (n=100)

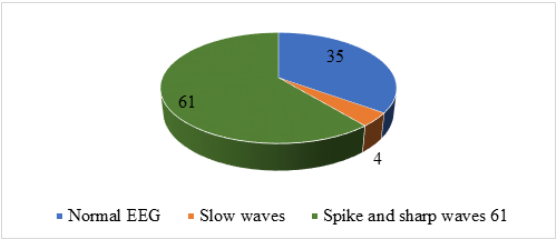

Figure 3: Type of waves seen in EEG of the study population (n=100)

DISCUSSION

The novel finding from our study is that, considerable number of patients with history of chronic headache have spikes and sharp waves in their EEG. This finding is in correlation with the findings of Ziegler and Torres who found spike potentials in the EEG of a 6-year-old girl with history of chronic headache.[13] Other studies have found Spike potentials in non-epileptic patients which were limited to the subcortical structures and did not express as a frank epileptic attack. This

phenomenon was termed as subclinical or masked epilepsy.[14] Subclinical epilepsy can cause much physical and mental impairment to the individual. Some of the documented effects of the spike waves are hyper activeness in autism,[15] regression in pervasive developmental disorders and cognitive impairment.[14]

AEDs act by enhancing GABA mediated inhibition in non-epileptic conditions. Other actions include inhibition of GABA metabolism and facilitation of GABA receptors.[10] These actions help in reducing and regulating excessive neuronal activity in the brain.

We did not find studies looking at patients with chronic headache, specifically benefiting from AEDs, however there were many studies which looked at prevention of episodes of headache with AEDs. Many patients after AEDs experienced side effects such as paraesthesia, cognitive effects, and dizziness without much relief from pain.[12] The adverse effects and the limited beneficial effect of AEDs demand the need for selecting the patients who would receive maximum benefit with AED therapy for their chronic headache.

Our study finds that 61 out of 100 patients with chronic headache exhibited Spikes and sharp waves on the EEG an indication of subclinical epilepsy. This could have manifested as chronic headache and not as an epileptic attack possibly because these waves were limited to the subcortical regions. This also explains why they did not respond to analgesics. After twelve months of follow-up 43 out of 49 patients treated with AEDs (12 lost to follow up from the total 61 treated) showed improvement in their symptoms in terms of intensity and frequency of head ache attacks. In 32 out of these 43 patients, their repeat EEGs showed normal patterns with complete resolution of spikes and sharp waves. This probably is due to reduction in the excessive neuronal discharge which could have been the cause for headache. This reduction in excessive neuronal discharge may be due to the action of AEDs via GABA mediated inhibition.

Based on our findings from this study we conclude that those patients who present with sharp waves and spikes on EEG most benefited from AED therapy for chronic headache. We propose that all patients with chronic headache be screened with a non-invasive EEG and only those presenting with epileptiform activity with spikes and sharp waves be chosen for AED therapy. Other forms of treatment may be tried for patients who did not show epileptiform activities.

Limitations of this study: This is a retrospective observational study with its limitations. Our patients (35) without any EEG abnormality could have been used as controls, treated with AEDs and further evaluated for symptom relief. From the 49 people who were available for final analysis 6 did not have symptomatic relief which may be non-responder which again is speculative. Also from the 43 patients who had symptomatic relief there were 11 who did not return to normal EEG pattern and we are unable to explain this. Prospective randomized control studies and better follow up of patients could shed more light on the effectiveness of AEDs in treating chronic headache. If conclusive evidence could be found using the rationale of AED in patients with underlying EEG abnormality, selecting the patients with chronic headache for AED treatment could be done and indiscriminate use of AED could be avoided.

CONCLUSION

Based on our findings we recommend that all patients with chronic headache be screened for subclinical epilepsy with an EEG. Only those who present with evidence of subclinical epilepsy on EEG should be initiated on AED therapy. Indiscriminate use of AEDs in all Patients with chronic headache should be discouraged and avoided.

Abbreviations

- AED – Anti-Epileptic Drug
- EEG – Electroencephalogram
- GABA – Gamma Amino Butyric Acid
- ICHD – International Classification of Headache Disorders

REFERENCES

1. Stovner LJ, Hagen K, Jensen R, Katsarava Z, Lipton RB, Scher AI, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. Cephalalgia. 2007;27(3):193-210.
2. Silberstein SD, Lipton RB, Sliwinski M. Classification of daily and near-daily headaches: Field trial of revised IHS criteria. Neurology. 1996;47(4):871-5.
3. Philips H, Jahanshahi M. The effects of persistent pain: the chronic headache sufferer. Pain. 1985;21(2):163-76.
4. Tomkins GE, Jackson JL, O'Malley PG, Balden E, Santoro JE. Treatment of chronic headache with antidepressants: a meta-analysis. Am J Med. 2001;111(1):54-63.
5. Bakal DA, Demjen S, Kaganov JA. Cognitive behavioral treatment of chronic headache. Headache: The Journal of Head and Face Pain. 1981;21(3):81-6.
6. Blanchard EB, Appelbaum KA, Guarnieri P, Morrill B, Dentinger MP. Five Year Prospective Follow- up on the Treatment of Chronic Headache with Biofeedback and/or Relaxation. Headache: The Journal of Head and Face Pain. 1987;27(10):580-3.
7. Vickers AJ, Rees RW, Zollman CE, McCarney R, Smith CM, Ellis N, et al. Acupuncture for chronic headache in primary care: large, pragmatic, randomised trial. BMJ. 2004;328(7442):744.
8. Schwedt TJ, Dodick DW, Hentz J, Trentman TL, Zimmerman RS. Occipital nerve stimulation for chronic headache—long-term safety and efficacy. Cephalalgia. 2007;27(2):153-7.
9. Davidoff RA. Trigger points and myofascial pain: toward understanding how they affect headaches. Cephalalgia. 1998;18(7):436-48.
10. Cutrer FM. Antiepileptic drugs: how they work in headache. Headache: The Journal of Head and Face Pain. 2001;41(s1):3-11.

11. Pappagallo M. Newer antiepileptic drugs: possible uses in the treatment of neuropathic pain and migraine. Clin Ther. 2003;25(10):2506-38.
12. Mathew NT, Kailasam J, Meadors L. Prophylaxis of migraine, transformed migraine, and cluster headache with topiramate. Headache: The Journal of Head and Face Pain. 2002;42(8):796-803.
13. Ziegler DK, Torres F. Focal spike and wave activity in a patient with headaches. Electroencephalogr Clin Neurophysiol. 1956;8(1):133-5.
14. Binnie CD. Significance and management of transitory cognitive impairment due to subclinical EEG discharges in children. Brain Dev. 1993;15(1):23-30.
15. Tuchman R, Rapin I. Epilepsy in autism. The Lancet Neurology. 2002;1(6):352-8.

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