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PHOTOSENSITIVITY AND EPILEPSY: CURRENT CONCEPTS AND PERSPECTIVES – A NARRATIVE REVIEWA Martins da Silva^{1,2,3} & Bárbara Leal^{2,3}¹Serviço de Neurofisiologia, Hospital Santo António/Centro Hospitalar do Porto – Porto (Portugal)²Instituto de Ciências Biomédicas Abel Salazar (ICBAS) - Universidade do Porto – Porto (Portugal)³UMIB/ICBAS – Universidade do Porto – Porto (Portugal)**Highlights**

- Photosensitive Epilepsy (PSE) is more frequent in younger females, time limited and closely related to JME. Functional and structural abnormalities provide evidence for the involvement of the visual cortex in PSE.
- PPR are restricted to the occipital lobe at low stimuli frequencies spreading to parietal and central regions at higher.
- Despite the relevance of the familial transmission of epileptiform IPS pattern no evident association between PSE and specific genes has been identified, so far.
- Preventive measures include stimuli manipulations: (duration, frequency, filters protection). Because of the higher frequency of PSE in young females, the risks and benefits of drug treatment need to be carefully weighed up. Given the gender/age group most commonly affected by PSE, the risks and benefits of drug treatment need to be carefully weighed up.
- Although there are indications of ethnic differences (with a lower incidence in Black Africans) the comparisons between series are difficult. An improvement in comparison studies, based on similar methodologies, is necessary.

Abstract

The authors review the influence of photic stimuli on the generation of epileptic seizures, addressing the first descriptions of the phenomenon and its subsequent exploration. Initially defined in the 1950's, links between intermittent photic stimulation (IPS) and seizures were well understood by the 1970. Since then the increasing exposure to photic stimuli associated with modern life (for instance through TVs, patterns, computer games and electronic instruments with flickering displays) has led to an increased interest in this issue. Diverse stimulation procedures have been described and difference in the effects of stimulation frequencies and types, colour and lighting have been recognised. Approximately 5% of patients with epilepsy have photosensitive epilepsy (PSE). PSE is commoner in younger individuals, more frequent in women, often time-limited, generally easy to treat and closely related to generalised epilepsies, especially Juvenile Myoclonic Epilepsy (JME).

Structural and functional studies of PSE indicate abnormalities beyond the frontal lobes and evidence for the role of the visual cortex in human PSE. A reduction in connectivity between prefrontal and frontopolar regions and increased connectivity between occipital cortex and the supplementary motor area may be the basis for triggering motor seizures in JME. Due to the changes observed in such areas, it is hypothesised that photoparoxysmal responses (PPR) could be a final expression of pathogenic phenomena in the striato-thalamocortical system, and possibly a core feature of JME as system epilepsy. The familial transmission of epileptiform responses to IPS is well-recognised, but no clear relation between PSE and specific genes has emerged. Although the influence of ethnic factors on PSE has been widely studied, clear conclusions are still lacking. Pharmacological therapeutic approaches are beyond the scope of this review although preventive measures allowing patients to avoid PS seizure initiation and/or generalisation are discussed. Given the gender/age group most commonly affected by PSE, the risks and benefits of drug treatment need to be carefully weighed up.

Keywords: Photosensitivity; Epilepsy; Photoparoxysmic Response; JME; IGE

INTRODUCTION

The effect of photic stimulation on the Electroencephalogram (EEG) was first described by Adrian and Matthews, in 1934, when studying the Berger Rhythm[1], and was subsequently assumed to be related to epilepsy. This view is reflected in statements such as: “the Electroencephalogram (EEG) had demonstrated that precipitation of seizures by light is not a purely emotional phenomenon”; or “closing the eyes brings out the heightened Berger rhythm in the occipital leads”; or even “this also may precipitate a petit mal (3/sec SW)” and “brain waves could be

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